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Equal possibilities in multimodal spatial accessibility of sports facilities with children's organized sports activities in the Helsinki Metropolitan Area

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Abstract

Organized sports for children provide important health benefits continuing also later in life and are highly segregated based on gender. Having opportunities of organized physical activities within reasonable travel times has been shown to have an effect in participation of sports. In this thesis few of the most popular sports for each gender; dance, horse riding, floorball and football were chosen and the service level of the facilities providing organized sport activities in the age group of 7- to 12-year-olds were analysed in the Helsinki Metropolitan Area. Special interest lied in how equally these services can be reached with different travel modes in reasonable travel times also in relation to spatial socioeconomic differences. As the research on the topic has been inconsistent and sparse, this thesis contributes to the research field with comprehensive outlook on equality considerations and a seldomly used perspective of children's sports facility accessibility focused on provided services.

The methods used included identifying locations used by children in the chosen sports, analysing travel times to these locations with the Helsinki Region Travel Time Matrix and comparing the resulting spatial accessibility conditions to a sum index of disadvantage calculated from a population grid database. This comparison was done through a Student's t-test and testing of local bivariate relationships.

Generally, the results indicated quite similar spatial patterns and good spatial accessibility conditions in floorball, football and dance when it comes to travel times to closest facilities. The horse riding facilities were located in more remote areas and were significantly fewer which resulted in longer travel times. Overall, most children reached their closest floorball, football or dance facilities within 15 minutes of biking, public transport or car travel times. Biking travel times were found to be shorter than public transportation travel times while private car provided the shortest travel times.

The t-test revealed many statistically significant relationships indicating difference in travel times in the most and least disadvantaged quintile areas of the sum index of disadvantage. In these results, travel times especially in football were found to be shorter in more disadvantaged areas. This was the direction of the findings also in floorball and dance. Horse riding travel times were longer in most disadvantaged areas. The bivariate relationship tools revealed variation in the local relationships between the travel times and the sum index. In conclusion, due to travel times being of reasonable length considerable inequalities in the spatial accessibility conditions were not found, although horse riding facilities indicated some inequalities.

Keywords

Spatial accessibility, GIS, equality, sport facilities, sports services

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Tiivistelmä

Ohjatut liikuntaharrastukset tarjoavat lapsille tärkeitä terveysetuja, jotka jatkuvat myös pitkälle aikuisuuteen. Yleisesti lasten liikuntaharrastukset ovat eriytyneet sukupuolen mukaan. Liikuntamahdollisuuksien kohtuullisten matka-aikojen päässä on myös todettu vaikuttavan liikuntaan osallistumiseen. Tässä tutkielmassa onkin valittu muutama suosituimmista tyttöjen ja poikien liikuntaharrastuksista; tanssi, ratsastus, jalkapallo ja salibandy ja tutkitaan näiden harrastusten spatiaalista saavutettavuutta tasapuolisuuden näkökulmasta suhteessa sosioekonomisiin tekijöihin ja sitä, kuinka tarjonta näissä liikuntapalveluissa 7-12 -vuotiaiden ikäryhmässä toteutuu spatiaalisesti.

Käytettyihin metodeihin kuuluvat harrastuspaikkojen identifioiminen, matka-aikojen analysoiminen Pääkaupunkiseudun matka-aikamatriisin avulla ja näiden matka-aikojen vertailu sosioekonomiseen summaindeksiin, joka pohjautuu Tilastokeskuksen tuottamaan ruututietokantaan. Tämä vertailu tehtiin Studentin t- testin avulla ja myös Local bivariate -analyysejä testattiin.

Yleisesti jalkapallon, salibandyn ja tanssin kohdalla havaittiin harrastuslokaatioiden samankaltaista spatiaalista sijoittumista. Näissä lajeissa spatiaalisen saavutettavuuden olosuhteita eri kulkumuodoilla mitattuna lähimpään urheilupaikkaan voidaan pitää yleisesti hyvinä. Hevostalleja alueella on huomattavasti vähemmän ja ne sijaitsevat kauempana asutuskeskittymistä, mikä näkyi pidempinä matka-aikoina kaikilla eri kulkumuodoilla. Yleisesti, suurin osa lapsista saavutti lähimmän tanssi-, jalkapallo- tai salibandypaikan 15 minuutissa pyörällä, julkisella liikenteellä ja autolla. Matka-ajat pyöräillen olivat lyhyempiä kuin julkisella liikenteellä ja autolla taas kaikista lyhyimpiä.

Käytetty t-testi paljasti monia tilastollisesti merkittäviä suhteita, jotka kertoivat eroista matka-ajoissa hyvä- ja huono-osaisimman kvintiilin alueiden välillä. Näissä tuloksissa matka-ajat erityisesti jalkapallossa olivat lyhyempiä huono-osaisimmalla alueella. Samansuuntaisia tuloksia oli nähtävissä myös tanssin ja salibandyn kohdalla. Ratsastuspaikkojen kohdalla tulokset olivat päinvastaisia. Tiivistettynä voidaankin sanoa, että merkittäviä eroja liittyen tasa-arvoiseen saavutettavuuteen ei löytynyt tutkittavien lajien kohdalta ja matka-ajat olivat yleisesti kohtuullisia. Kuitenkin ratsastustallien kohdalla voidaan ajatella esiintyvän myös epätasa-arvoisia matka-aikojen vaihteluita.

Avainsanat
Spatiaalinen saavutettavuus, liikuntapalvelut, liikuntaharrastukset, geoinformatiikka

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Muita tietoja

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1. Introduction

Having equal opportunities to access sports facilities is especially meaningful for children since they are an important user group of sports facilities and have differing opportunities to participate in sports based on their interests, gender, socioeconomic background and location. Importantly, they have been identified as an age group that benefits from high amounts of physical activity, which has a positive impact in the health and activity levels also later in life (Telama et al. 2005). Increasing the amount of opportunities to participate in organized sports means that more children can meet the important guidelines for physical activity and enjoy the resulting health benefits.

Children are active users of sports facilities and have highly differentiated patterns of participating in organized sports based on gender. These differences in the most popular sports, such as football and floorball for boys and dance and horse riding for girls, stem from a range of historical and cultural expectations and assumptions, peer pressure to fit in as well as simple preferences to engage in certain sports (Clark & Paechter, 2007). These differences can be seen to be diminishing to some extent, for example in the case of growing popularity of girl's football (Kokko & Martin, 2019), but still these differences in sports prevail, especially in sports such as hockey, horse riding and dance.

Resulting from this gender difference in sports, girls tend to move more in private facilities and boys in public facilities, in which there has been indications of sports receiving more public funding (Komi, 2007). As in Finland, the role of the public sector in building sports facilities is high and it is therefore important to study how these facilities serve the needs of children as well as their gendered preferences for sports facilities. As children's sports also utilize private facilities, it is important to not be limited in the public sector, but to look at the whole picture and the spatial accessibility conditions of reaching the services provided in different types of facilities.

Firstly, this research aims at studying the service level of some of the most popular children's sports for both genders through spatial accessibility. The sports chosen for the analyses are football, floorball, horse riding and dance, which have been in previous research indicated to be some of the most popular children's sports in Finland (highlighted in section 2.3.2.). In the research area of the Helsinki Metropolitan Area the age group studied is 7-to-12-year-olds, which was defined through the age categorizations of the population grid database (Statistics Finland, 2020). To find out about the service level and spatial accessibility conditions of the chosen sports, locations of the sports practices for the chosen age group were gathered from different sources. Researching the services provided in the sports facilities provides a more comprehensive outlook to the physical activity opportunities available for the 7- to 12-year-olds as opposed to simply looking at fixed physical activity locations, which may not accurately present the different types of facilities used. Filtering facilities based on the services provided is an approach not used in many spatial accessibility studies especially in combination of socioeconomic variables, gender considerations and with children as a focus group. Although some studies such as Cereijo et al. (2019) have included variables related to for example prizing of the physical activity services or whether the facilities are private or public in their spatial accessibility analyses.

Secondly, having the ability to compare the spatial accessibility data to census data, provides an opportunity to see how the spatial accessibility conditions to these sports facilities are connected to the amounts of children in the Helsinki Metropolitan Area and the socioeconomic background of families. The relationship between travel times and socioeconomic factors is studied through a sum index of disadvantage and a student's t-test as well as investigations of bivariate relationships. With these tools, the spatial patterns of the spatial accessibility conditions can be considered through the lens of equality and equity. Equality or equity considerations in connection to spatial accessibility is an emerging field of spatial accessibility that in relation to physical activity locations can be considered to be in need of new research and improved understandings in light of inconsistent findings of previous studies (introduced in section 4.2.1).

Based on the issues and possibilities described above, this thesis aims to find out about the equality or inequality patterns in spatial access to sports facilities in the Helsinki Metropolitan Area (HMA). The main interest is in the spatial accessibility for children. To conclude, the research objectives can be condensed as:

- Finding out and comparing the service level, distributional patterns and spatial accessibility conditions of the chosen sports locations (floorball, football, horse riding and dance) providing organized activities for 7- to 12-year-olds.
- Finding out how well the 7 to 12-year-olds reach the studied facilities.

- Finding out how the spatial accessibility conditions to these facilities are connected to the socioeconomic patterning in the Helsinki metropolitan area and equality of these conditions.

2. Children and sports

2.1. The benefits of physical activity for children

Physical activity for children has been studied to be fundamental in its health benefits. WHO (2010) condenses the scientific evidence on the health benefits of sports to include a variety of favorable health indicators. Among which are increased physical fitness regarding cardiorespiratory fitness and muscle strength, improved cardiovascular and metabolic disease risk profiles, enhanced bone health and reduced depression symptoms (Janssen, 2007, Janssen & Leblanc, 2009). Importantly, continuous physical activity in youth increases the probability of becoming an active adult (Telama et al. 2005).

Along with general physical activity, participating in organized sports has been connected to several positive dimensions. For example, participating in organized sports has been connected to better health literacy compared to those moving on their own terms. Additionally, physical activity and belonging to sports clubs has been associated with less loneliness as sports can offer a social environment, where feelings of belonging and acceptance of peers can have a positive impact. Sports clubs can then be important for developing of social and emotional skills and social networks. Other positive findings of participating in organized sports or general physical activity include positive views of one's health and body image and regular eating and sleeping patterns. Kokko and Martin (2019) conclude that it is important to support participation in sports and organized sports in childhood and youth to build a foundation for a healthy lifestyle. (Kokko & Martin, 2019).

2.2. Guidelines for physical activity and achieving them

According to international guidelines by WHO (2010) children and youth should move at least one hour a day with moderate- to vigorous intensity. Increases in this amount are shown to provide additional health benefits. WHO further stresses that most of daily physical activity should be aerobic and vigorous-intensity activities to strengthen muscle and bone and should be included at least 3 times per week. In addition to sports, physical activity in this context includes play, games, transportation, recreation, physical education or planned exercise. In the finnish context the one hour a day physical activity guideline is commonly used (Kokko & Martin, 2019). The national guidelines (Ministry of Education and Culture, 2021) highlight how this exercise should be versatile and age appropriate, while long periods of inactivity should be avoided. These guidelines are also in line with international recommendations by WHO (2010).

In Kokko and Martin's (2019) study of national sports of children and youth, 88% of children stated they had some kind of sport hobby and around half of those who did not would like to have a sports hobby. In under 10 years old's the amount of children doing sports was 97%. Participating in sports does not indicate that the guidelines for physical activity are met, since only around a third of 9-15-year-olds meet these guidelines. Especially age is an important factor. For 9-year-olds around half move according to recommendations and the amount decreases with age. From 15-year-olds only 10 percent are meeting the guidelines (Kokko & Martin, 2019). Consequently, the youngest school aged children seem to be the most active. The children who reached the national moving recommendations were more commonly participating in sports clubs or moving in private facilities as opposed to moving on their own terms (Kokko & Martin, 2019).

When it comes to the Helsinki metropolitan area, significant differences in the amount of physical activity in relation to the rest of the country have not been found. According to a school health survey from 2017, in the elementary school classes of 4 and 5 around 45 percent of children were moving at least one hour a day similarly to the national average, while Espoo had slightly higher and Vantaa slightly lower percentage (Keskinen, 2019). Additionally Keskinen (2019) notes how on all school levels, boys have been found to move more compared to girls, although these gender differences are not as significant in younger school age children and increase in adolescents.

2.3. Sport hobbies of the Finnish children

2.3.1. General background

According to Hakanen and Myllyniemi (2018) the range of different sports has grown in recent years. New forms of play with the use of augmented reality, a large range of different dance and martial arts styles are examples of sports or play which can be distinguished into a growing number of different categorizations. Despite the growing number of options to be active, Hakanen and Myllyniemi point out that traditional forms of sports are still prevailing. The most popular ways of moving were jogging or running, outdoor activities, walking, cycling and going to a gym, which were especially popular for older children and youth.

Kokko and Martin (2019) also highlights that children engage in physical activity mostly on their own terms, not participating in supervised activities. 39% of respondents were participating in sports clubs, 19% used commercial services and 15% in other organized sports and 10% in school's organized sports. In 9-15-year-olds 66% were actively participating in sports clubs.

The popularity of non-organized physical activity should be noted in the discussions of children's sports. Facilities such as running trails or parks that provide opportunities for non-organized sports have an important role in the overall activity of children. These facilities have an important role of providing spaces to move more in one's own terms, often with less monetary boundaries and competitive pressures. Therefore, places where children can engage in unorganized activities are crucially important to investigate as well. However as noted previously, participating in organized sports brings many advantages as well, which, as well as to limit the scope of this study, is why they are in the interest of this study. Furthermore, organized sports are also activities that take place in designated sports facilities and have a certain entry point. Therefore, accessibility to them as a point feature is easier to measure as opposed to parks or sidewalks where many non-organized forms of physical activity happen.

2.3.2. Sport activities of children of different ages

The most common age for starting in a sports club or organized sports was 6 years old (Kokko & Martin, 2019). Hakanen and Myllyniemi (2018) state that the age of starting a sports hobby has been decreasing. They also highlight the fact that supervised sports are most importantly hobbies of children, since 7-15-years-olds' attendance in sports clubs or other organized sports is the highest. In this age the percentage of children participating in organized sports has been increasing since

1976 from 20% for girls and 40% for boys to more than half of all children participating in organized sports today.

Merikivi and Myllyniemi (2016) have investigated the changes in sports throughout the ages of 7 to 29 and highlight the differences in the most popular forms of exercise. The so-called early sports are swimming for both genders, football and floorball for boys and horse riding for girls. Trampoline, skating and ice skating are also popular for 7-9-years old's. The attendance to these sports is highest in 7-years old's and decreases steadily until the age of 15, when more unorganized sport activity, such as running and walking, gym and cycling takes over. One of the challenges identified in the Finnish studies around the topic is the diminishing amount of physical activity and organized sports in teenage years (Kokko & Martin, 2019).

According to Hakanen and Myllyniemi (2018) private and public facilities are used in equal amounts in all age groups. For under 15-year-olds usage of private facilities has been increasing due to the popularity of commercial play and sports parks. It should also be noted that many children engage in multiple types of physical activity. Under 25 years old's commonly move in more diverse places compared to older children. Even two thirds of under 15-year-olds have stated to use at least three different sports facilities every week (Hakanen & Myllyniemi, 2018). This is due to engaging in multiple different sports or training in multiple facilities for the same sport.

2.3.3. The most popular sports for girls and boys

Finnish sports studies such as Kokko and Martin (2019) collect information on the most popular sports, which are often divided based on gender. Some of these studies include more thorough listings and some have stated only the most popular sports. The most popular sports for both genders are collected in the Figures 1 and 2 and provide information about the changes of the most popular sports in the last decades. It should be noted that these studies have used different methodologies and performed their questionnaires in different times of the year. Some studies guided their question to include all forms of physical activity, in which case only the activities which can be commonly seen as something done in the form of organized sports in a sport facility were included. Additionally, these studies commonly used age groups including school aged children and youth and some such as the Kokko and Mehtälä (2016) and Kokko and Martin (2018) studies also included young adults.

The Figures 1 and 2 do still provide some direction on which organized sports have been the most popular. For boys the most popular sports are more static and include a larger percentage of the children. The most common sports were football, floorball and ice hockey, in which football especially has gained popularity in recent years. Notably, these sports are team sports as opposed to more individual sports preferred by girls. For girls the most popular sports have been changing more. Generally, dance and horse riding have been the most popular. Gymnastics have also become more popular in recent years.

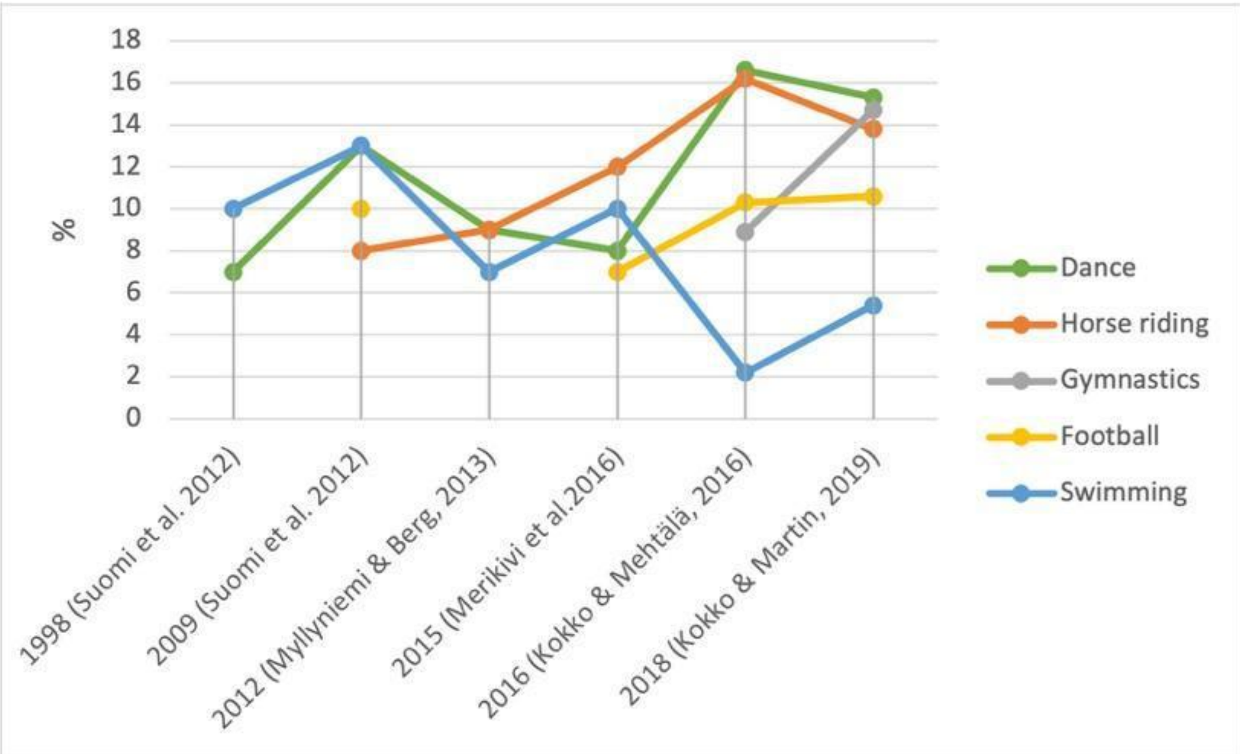


Figure 1. Some of the most popular sports for girls (% of children and youth engaging in these sports) according to different literature sources

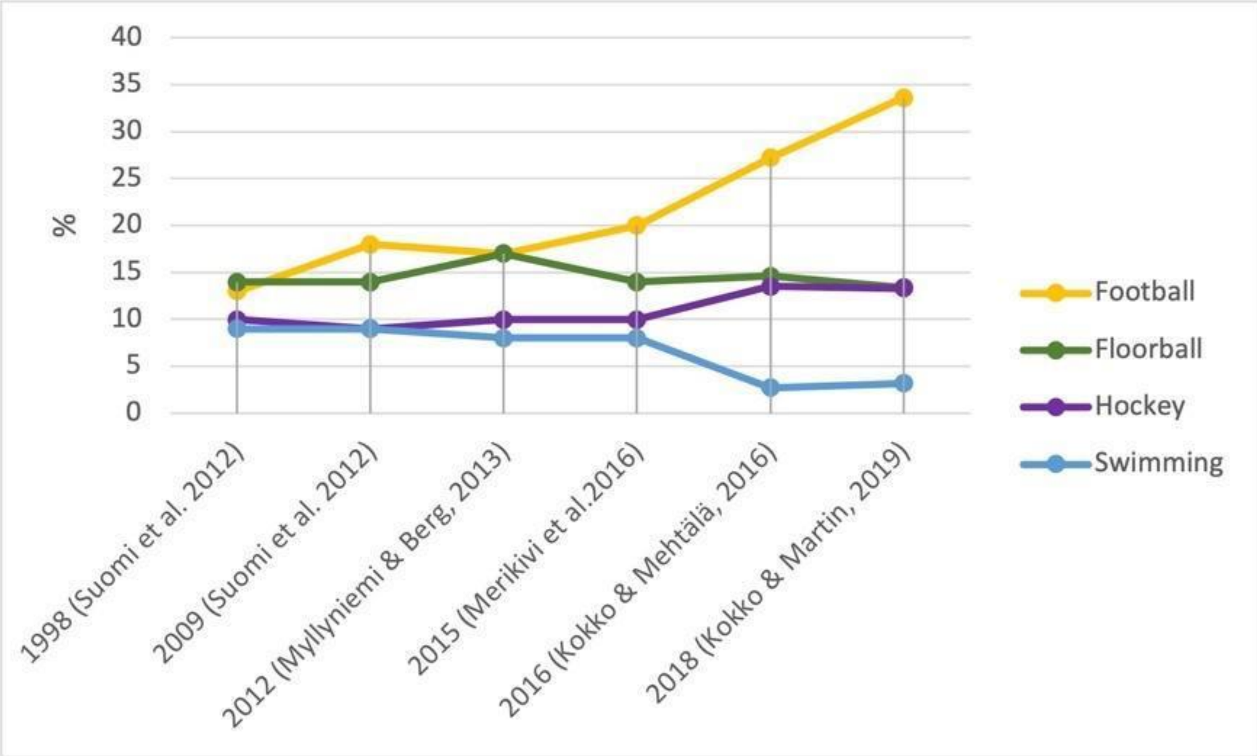


Figure 2. Some of the most popular sports for boys (% of children and youth engaging in these sports) according to different literature sources

Swimming has lost some of its popularity but has commonly been a sport of both genders. Another sport popular for both genders is football, which has in recent years seen a rise in popularity among girls as well. Dance and hockey can be considered most clearly as hobbies of one gender. In 2018 around 1-3 percent of boys danced and an insignificant amount of girls played hockey (Hakanen & Myllyniemi, 2018). Moreover, horse riding, gymnastics and floorball are quite heavily hobbies of one gender.

Keskinen (2019) notes how information on the popularity of different sports is not readily available, especially in the capital region, since it is not something that has been asked for example in school health surveys. Latest indications on the topic come from 2011 questionnaires to 11-19-year-olds, which include all forms of physical activity and does not include information on specific ball games nor younger age groups activities (Keskinen & Nyholm, 2012). Nevertheless, in comparison to the chosen sports on national level around the same time, for girls in Helsinki dance was even popular (30 %) and horse riding about as popular (around 12 %). In line with the national results different ball games were the most popular for boys when it comes to more guided activities. (Keskinen &

Nyholm, 2012). Indicating somewhat similar popularity, Stenvall (2009) finds all the chosen 4 sports among the 8 most popular hobbies of elementary school pupils in Helsinki. Additionally, Kumpulainen (2013) notes how football has traditionally been more popular in Helsinki compared to national averages, noting numbers of nearly half of underage boys and every sixth girl already in 2006 having it as a hobby, making it by far the most popular in the region. Moreover from slightly newer perspectives, Kurki (2018) presents numbers of active under 20-year-old hobbyists in the sports clubs of Helsinki, in which football is the most popular. Interestingly in Kurki's study gymnastics seemed to be more popular than dance contrary to Keskinen and Nyholm (2012) and Stenvall (2009).

Based on the statistics of the popularity of certain sports in recent years presented above, this study chooses two of the most common sports for each gender to analyze in this study. These are football and floorball for boys and dance and horse riding for girls. Noting the fact that these studies have used different questionnaires and even slightly different age groups, the studies are only indications of the most popular organized sports in national level.

2.4. Gender in children's sports participation

Historical and cultural factors and expectations have traditionally determined which sports are appropriate for each gender and therefore shape the sport choices of children from an early age. For example, in the early 1900s United States team sports were seen as dangerous for girls, since it was thought to enable too much social cohesion among girls (Driscoll, 2002). Ethnographic studies use the term of homosociality to describe the preference to act in groups of the same gender, which is discussed in the context of horse stable girls and normative control by Ojanen (2016). As an related example, Clark and Paecther (2007) state that "For 10- and 11-year-old girls soon to enter adolescence, behavior and gender expectations are highly monitored and peer acceptance is of utmost importance (Hey, 1997; George & Browne, 2000)." In addition, their study revealed patterns of ideological connections, restraint and femininity and behavioral gendered expectations resulting in the girls holding back or being hyper aware of their bodies during physical activity.

Many studies have noted that girls participate slightly less in physical activities and sports clubs (Limstrand & Rehrer, 2008; Keskinen, 2019; Turpeinen & Hakamäki, 2018 and Hakanen &

Myllyniemi, 2018). Notably, according to Kokko and Martin (2019) and Rafoss and Troelsen (2010) girls participate more in privately owned sports facilities. Reasons for this might be related to the provision of sports such as dance and riding which are more prevalent in the private sector as opposed to sports preferred by boys (Suomi et al. 2012). Culture and sports minister Arhinmäki (2014) notes that the popularity of private facilities for women might be due to public sports facilities, maybe unawarely, being directed towards men. In Helsinki in sports clubs receiving funding from the municipality, 23 percent of the users were girls and 31 percent boys (under 20-year-olds) (Kurki, 2018). Additionally, the facilities used for sports differ. For girls most used sports facilities were school sports halls, swimming halls, large and sport specific halls and horse sports areas. For boys, school sports and swimming halls and large sports halls were mentioned as well in addition to ball fields and ice rinks (Suomi et al. 2012).

As a result of the gender division visible in many sports throughout different age groups, discussions about the public funding of sports have been brought up. Aikio (2016) notes how gender equality has been promoted in sports cultures since the 1990's and more recently has also been noted in sports legislation and public funding criteria. Still, a thesis by Komi (2007) brings up how traditional girls sports such as dance and horse riding receive less public funding compared to the commonly practiced sports by boys and men. Aikio (2016) on the other hand states how in 2012 44 percent of funding of sports and physical activity was targeted towards women and 56 towards men, while slow development has been ongoing. Better gender equality was found to be more prevalent in job related and municipal led sports activities, while the differences were larger in sports clubs and association, which can only partly be explained by girl's and women's lesser participation in sports.

In absolute numbers in Helsinki sports clubs that have more boys in them receive more funding since there are more people in these clubs. Although importantly, per user the public funding does cover both genders equally (Kurki, 2018). Although, ice hockey for example received more facility related funding compared to figure skating. Kurki (2018) does not indicate reasons for the generally lower participation of girls in sports clubs and notes the limitation of the study to sports clubs and need for further research to understand the whole picture.

Komi (2007) notes the difference in funding stemming from general appreciation of traditional men's sports as opposed to women's as well as sports cultures being still highlighted as one of the more male dominated societal domains with male oriented values. As an example, many sports boards have been predominantly male led, despite the large female presence of some sports (Komi, 2007), although positive developments have been recognized (Turpeinen & Hakamäki, 2018). In related notions, media coverage on sports has been investigated to be focused on male sports, which is seen as the default form of sports (Kankaanmäki, 2020). Kankaanmäki further highlights how women's sports in media are despite improvements marginalized and trivialized and how the media coverage is related to the so-called circle of success, in which the media coverage is connected to monetary resources, time invested and subsequent sports success. Nuances of this ongoing dichotomy can be picked up in children's sports as well. For instance in the interviews made by Berg (2016) where girl's football was seen as less serious and consequently even less preferred by some coaches compared to boy's football.

Hakanen and Myllyniemi (2018) note the public conversation of the gender division in children's sports, which is especially visible in the topic of gender divided school sports (Yle/Vähäsarja 29.5.2015; Yle/Ranta 6.4.2018). They also note that in these conversations the voice of children and youth has not been in focus. In their study 80% of children and youth responded that girls and boys should move together or that gender does not matter in sports. The views of children and youth were then quite equal. Therefore, Hakanen and Myllyniemi (2018) see gender inequality and segregation in sports stemming from structures and the views and values of adults.

2.5. Determinants and barriers in physical activity participation

Variables affecting levels of physical activity or sports participation are manyfold and can be considered as potential barriers to physical activity. These barriers affect the possibilities of equal participation of sports and range far beyond spatial accessibility conditions in the focus of this study. Some of the factors associated with children's physical activity are according to Sallis et al. (2000); "*sex (male), parental overweight status, physical activity preferences, intention to be active, perceived barriers (inverse), previous physical activity, healthy diet, program/facility access, and time spent outdoors."* Blok et al. (2018) further note the impact of the individual's social environment including social cohesion and social influence as well as prize and accessibility conditions of sports facilities. Additional factors recognized as affecting the physical activity of children are for instance knowledge gaps, personal and interpersonal characteristics (parental and peer support) and environmental characteristics such as traffic and safety (Limstrand, 2008). Furthermore, transport related disadvantages can act as barriers and are discussed in section 2.7.2.

In subjective experiences of finnish children's barriers to physical activity similar and additional reasons can be found. For example, in Kokko & Martin's (2019) survey, respondents mentioned several external barriers, such as lack of interesting sporting clubs and facilities near one's home and monetary costs. Furthermore, in a school health survey (Keskinen, 2019) 25 % of respondents felt that there were no possibilities of participating in interesting sports near their homes and that these hobbies were located too far. Additionally, different internal reasons such as disabilities, hostile sports clubs or lack of parental support can be reasons for inequality and not participating (Kokko & Martin, 2019). Moreover, according to Hakanen and Myllyniemi (2018), the few children (7-9-year-olds) that mentioned not participating in sports, stated reasons such as not liking sports, too competitive sports and fear of not being accepted in a group. Only a few mentioned lack of sports facilities or suitable sports hobby groups or economic reasons. Older children's reasons were similar, although reasons such as sports being too expensive and not finding time were mentioned.

As an important notion, socioeconomic reasons have been shown to have an effect on physical activity and participation in organized sports. For example, according to Hakanen and Myllyniemi (2018) only 23 % of children from the lowest income families were involved in a sports club, while those from good income families 46 % participated in sports clubs. In the same study, mother's education level was shown to be connected to participating in sports clubs, as only 25 percent of the lowest education group were participating in sports clubs compared to 45 percent of those with a higher education. Similar findings have been made in international studies. For example, Voss et al. (2008) have found evidence on children from low-income families attending significantly fewer structured sessions of out-of-school activities compared with higher income families. But interestingly, the poorer families' children did not show diminished overall activity levels and make up their activity more in unstructured forms of exercise. Contrarily, Drenowatz et al. (2010) find lower socio-ecomic status to be connected to sedentary behavior and remind how this pattern has been studied to be less consistent compared to adults.

In addition, additional barriers may rise in the finnish context as prices of sports and particularly organized sports have risen significantly in 2000's (Ministry of Education and Culture, 2016 & Puronaho, 2014). High prizes were also noted by Hakanen and Myllyniemi (2018), who note that the prices tend to rise after the age of 10. The prices paid were higher in cities and especially in city centers. Helsinki and Uusimaa were among the highest categories, with around 40% of parents paying more than 70 euros per month for a child's hobby. These prices were tied to the financial state of the families (Hakanen & Myllyniemi, 2018). Puronaho (2014) found horse riding and dance to be the most expensive and floorball and swimming least expensive. Ministry of Education and Culture (2016) states that the significance of the sporting costs has been on the rise as a reason behind polarization of children and youth sports. Regardingly, Keskinen (2019) notes the trend of increasing division of physical activity of children to ones that move significantly and ones who do not move barely at all.

2.6. General characteristics of the development of the Finnish sports facility scene

In Finland public authorities have a large role in sports and municipalities are responsible for 75 percent of all sports facilities (Aukio, 2016). Although from 1980 onwards around 1 % of facilities per year have been privatized (Suomi et al. 2012). Finland is one of the countries with the most sports facilities, with 1 facility per 170 people (Suomi et al. 2012). Equality in physical activity environments and goals of sports facilities for all are focal elements of sports facility planning in Finland. Sports facility planning is also mandated by law to be organized in collaboration between public officials and sport's civic participants with municipal officials acting as mediator of interests (Suomi et al. 2012). According to Suomi et al. (2012) the governments and municipalities role is to enable physical activities by building sports facilities and financing activities. In such, private operators are not completely separated from the public realm as they might receive public funding and even operate in the same facilities. Rafoss and Troelsen (2010) introduce the development of sports facilities in nordic countries which highlight similar development as the finnish context as well. The Nordic model operates through strong public management of sports, in which gambling profits have had a significant role.

The history of planning for physical activity environments stems from industrialisation and needs to develop healthy activities for workers' free time (Suomi et al.2012). Consequently, Suomi et al.

(2012) notes how movements of improving living conditions, with healthy attributes such as recreation areas and parks were developed. As an example Howard's (1998) garden city movement with emphasis on recreation and green areas within the city structures were also seen in suburban developments in Finland (Suomi et al. 2012).

In the United States, Chapin (2000) observed three focal phases when it comes to the spatial development of sports facilities in the 20th century, First wave of construction took place between 1909 and 1925, in which facilities were built mainly on the outskirts of cities. Kozma (2014) notes how inner city locations of sports facilities were once located in these edges of developing settlements but have since become central locations. Then throughout the 1950s to mid-1980s the suburbanization of the facilities was the most focal development, which has also been observed in Europe (Kozma, 2014). Reasons for the popularity of suburban locations included cheap suburban plots, decentralization ideals and motorway access (Kozma, 2014).

In Finland Suomi et al. (2012) notes how suburbanization developments also led to the rise of neighborhood level sports facilities near one's home environments. The 1960's were especially significant in the construction of sports facilities with municipalities taking on the responsibility (Haukka, 2020). Furthermore, in functional planning paradigms the emphasis was on rational efficiency and counting of facilities per capita (Meurman 1947) as well as separated functionalities in the city accelerated by developments in the ownership of automobiles. Suomi et al. (2012) further notes how social issues resulting from fast paced urbanization were attempted to be alleviated by building of suburban sport facilities. As an example of the suburban development of sports clubs Kumpulainen (2013) notes this development for football clubs in Helsinki, which have moved from original city center locations more into suburbia reflecting the development of the expanding city and lesser amount of children in the center. Overall, Haukka (2020) highlights how in the years 1960-1989 the growing welfare state was characterized by growing costs of physical activities as well as appreciation of the field of sports.

As the last phase of development of sports facilities in the US, in the 1990s down-town locations became more popular in sports facility construction due to their potential in renewal of inner city areas as well as economic reasons such as proximity to corporate supporters of professional sports (Chapin, 2000). As of modern day construction, Kozma (2014) notes the emphasis on building within areas that are easily accessible by public transportation. Suomi et al. (2012) on the other hand notes the inclusion of collaborative planning through taking into account the user's in today's sports facility planning. In addition, Jyväskylä based methodologies have emphasized the inclusion of the 'lifecircle' thinking, including perspectives of different spheres of physical activity such as the home or neighborhood spheres noted especially for children and the city or municipality wide spheres focused on larger terminal locations such as swimming halls. On the other hand, with the growing role of private sports facilities Suomi et al. (2012) notes how research on managerial physical activity environments and facility management through business plans has emerged.

These spatial developments of sports facility planning and construction can be considered also from the view of distributing public facilities characterized by larger societal changes. For instance, Shen et al. (2020) notes the rise of Neoliberalism prompted from the 1970s and changes in governmental interventions in the knowledge-based globalized economies in the 1990s which have made room for the multi-supply theory of public services. In a related notion, Shen et al. (2020) raise up the issues of nimbyism and increasing social differentiation in the use of public facilities.

In more recent developments, Rafoss and Troelsen (2010) note how in international perspectives the nordic countries' coverage of sports facilities is among the highest in the world, but pinpoint the change to more individualized, commercial and multifunctional sports in which the public sector led facilities are not able to keep up. As a result many facilities are "*either outdated, mono-functionalistic or adjusted to spectator sports*". However, they note the advantage of urban areas and big cities, as opposed to rural areas, in which many of the more multifunctional and private centers are located.

2.7. Mobility and travel to hobbies

The theme of children's mobility to hobbies gives important information for the choosing of the most accurate transportation modes for this spatial accessibility study. Looking at the transportation modes also highlights the importance of facilities close by to promote the role of active transportation modes such as walking and biking as well as the role of environmental and social sustainability in hobby journeys. Additionally, considerations of potential transportation disadvantages provide important information for the socioeconomic aspects of the travel time analyses of this thesis.

2.7.1. Children’s free time journeys

In the studies of children’s mobility, interesting research directions include for instance studies of activity spaces researching daily mobility patterns such as how far children travel from their home environments (Villanueva et al. 2012). Some of these studies have noted gender differences such as boys' activity spaces reaching further compared to girls’ (Herman et al. 1987, Sjolie & Thuen, 2002). Other interesting discussions include indications of change to less independent travel modes, although in Finland children have been noted to still enjoy high levels of independent mobility in international comparisons (Kyttä et al. 2015).

Times spent traveling to physical activities or sports facilities have been studied, although not abundantly specifically concentrating on children’s point of view. Generally, travel-distance thresholds can be used as determinants in accessibility studies on how far or how long people are willing to travel to different activities. For instance, based on travel time-diary data Spinney and Millward (2013) find 4-20 km travel and 15-30 minutes thresholds to sports and recreation activities. These journey times can then be used in determination of service areas of different physical activity services, although Spinney and Millward (2013) note how a lot of arbitrary distance thresholds have been used in spatial accessibility studies.

As of finnish studies, according to the City of Helsinki (2020) free time journeys including trips to sport and other hobbies as well as culture or other free time visitations are the most abundant of all journeys. Importantly Helsinki Regional Transport Authority (HSL, 2016) researches hobby journeys for children in the area of this study. In these trips private car was found to be the most common transportation mode for 55 percent of the children whereas 23 percent were found to use public transportation and 14 percent by bike. In addition, 14 percent were mainly using private car rides offered by their friends' parents. When it comes to the distances traveled by different travel modes, under one kilometer journeys were commonly traveled by walking, but in any longer distances the most common travel mode was private car. On a related notion, HSL (2016) finds hobby journey’s increasing in length as a child gets older. Reasons for this development included reasons such as larger children not having enough space in the small sports halls of their home neighborhoods.

2.7.2. Transport disadvantages

When transporting potentially multiple children to different locations across a city, a private car can become a necessity for many families to be able to engage in some sporting hobbies, especially as the child grows as noted above in the increasing journey lengths. According to Bradt and Lindeqvist (2016) in Helsinki around 50 percent of all households do not have a car and in Espoo, Vantaa and Kauniainen this number is around 30 percent. Families with children on the other hand had higher car ownership rates. Numbers for not owning a car were around 20 percent of two parent households in Helsinki and around 5 in Espoo, Vantaa and Kauniainen in 2012. Noting that these numbers do not include single parent households, which are less likely to have a car (Oakil et al. 2018). Single parent households consist of around 31% of all families in Helsinki, in some areas even of 49 % (Kallahti) or 45% (Itäkeskus) (Ristimäki, 2017). A two-parent household can be considered as potentially having more resources to transport children to hobbies as well as dual-income to financially support those hobbies. Consequently, the children of these families are more likely to have a sports hobby as well (Stenvall, 2009). In a related notion, in Stenvall's (2009) study, 17% of children in the sample were found to live in two homes and this form of multilocality most likely has consequences to the accessibility and mobility conditions of these children as well.

Moreover, Brand and Lindeqvist (2016) note car ownership to be related to income and being lower for immigrant populations. Car ownership can also be considered as 'forced' especially for young low-income families with children and contributing to financial stress (Carrie et al. 2010). What is the role of children's hobbies in car dependencies is another issue to be looked at, as it has been indicated that the presence of children leads generally to higher car dependency (Oakil et al. 2016).

Consequently, socioeconomic and demographic factors can be seen as something affecting the possibilities of transportation and therefore accessing different amenities. In literature this has been called a transport disadvantage. Murray and Davis (2001) divide elements creating transport disadvantaged individuals into three intertwined issues:

- Dispersed Services (health care, employment, recreation, etc.)
- Constraints on Locational Choice (cost of housing etc.)
- Inadequate Transportation (no private car access, poor access to public transportation etc.)

Moreover, Murray and Davis (2001) recognize groups that are most likely to need public transport. These groups include youth, children and senior citizens unable to operate motor vehicles, low-income citizens, migrants, single and no car households and disabled. Additionally, Rosier & McDonald (2011) recognize transport disadvantages for families with young children and solo parents as groups facing barriers in transport. In Hurni's (2007) Australian study, children of solo parents were found to miss out on opportunities for recreational activities such as sports for example due to time constraints and not making it possible to attend events with public transportation on time.

3. Spatial accessibility

3.1. Significance of spatial accessibility

The data and studies regarding accessibility analyses reveal information on the different accessibility conditions spatially, which are important information for urban planning and decision making (Tenkanen & Toivonen, 2020). In relation, Laatikainen et al. (2017) recognize the provision of services, location of facilities and related accessibility questions as focal elements in urban planning fields. The aim in locating facilities is to find suitable locations with equal accessibility and minimized travel costs. The service areas around these facilities are based on the thought that the greater the distance, the less likely people are willing to travel for certain services (Spinney & Millward, 2013). In the concept of accessibility planning, accessibility has been noted as a key planning element in which, in addition to maximizing access to opportunities and improving efficiency of transport systems, the importance of social as well as environmental sustainability have been recognized (Coppola & Papa, 2014).

In connection to land use and planning perspectives, spatial accessibility has furthermore been studied as an economic indicator. Economic benefits relating to spatial accessibility have been studied through for example direct impacts on travel-cost savings in infrastructure projects and wider indirect economic impacts through for example productivity gains and distributional effects (Geurs & van Wee, 2004). These benefits can additionally be seen as connected to the so-called soft features such as nature and free time amenities as well as consumption possibilities which can have an important role in facilitating growth of cities as well as reducing the transportation costs in more urban areas (Glaeser et al. 2001). Urban amenities relate to all kinds of urban services and can be considered key qualitative life factors, which are key to attractiveness of places (Allen, 2015). Moreover, looking at the accessibility to different facilities provides important information on the quality of the everyday living environment of the residents (Coppola & Papa, 2014). As an example relevant to this study sports facilities can be seen as an important urban amenity and an attractive feature. The terms of urban amenities, facilities, opportunities as well as services are examples of terms used in accessibility studies correspondingly.

Furthermore, improving access to vital services such as education and health services is a central theme of the Sustainable Development Goals set by the United Nations (United Nations, 2015). Therefore, accessibility to different services and to urban areas can be seen as an important theme regarding global disparities and opportunities of individuals. In this context, sports facilities are one important amenity central to wellbeing.

3.2. Definitions of accessibility

Kim and Lee (2019) bring up key definitions for accessibility as “the potential of opportunities for interaction” (Hansen, 1959) and “an indicator of opportunities to reach places efficiently” (Cervero et al. 1999). Different understandings use different definitions and corresponding metrics, from simpler travel time considerations to more nuanced understandings of different features having an effect on spatial accessibility. As such there are many different definitions to accessibility and spatial accessibility. For example, a newer related spatial accessibility definition by Cascetta et al. (2013) is derived as “the ease in meeting one’s needs in locations distributed over space for a subject located in a given area”. In which accessibility is dependent on involved subjects, the quantity, quality and location of the amenities in question and attributes such as travel time, cost and quality of travel.

The term accessibility has been used in different fields to for example refer to accessibility of different services such web accessibility or accessibility for the disabled or other accessibility measures depending on socioeconomic constraints. This form of accessibility has also been called aspatial accessibility (Neema & Ashik, 2020) to distinguish from spatial accessibility. Notably, for the use of this study the term accessibility refers to its use spatially, in the contexts of land-use and transportation. Therefore, the widely used term spatial accessibility is best suited for the purposes of this study. In addition to spatial accessibility the term proximity has been used similarly, while the term availability has been related to the number or density of destinations as a metric of exposure to resources (Reimers et al. 2014).

In the context of sports facilities Muukkonen (2022) notes the different aspatial aspects of accessibility in addition to spatial accessibility and divides them based on how easily measurable they are. The more measurable dimensions can be easier to take into account in sports facility planning as opposed to other more vaguely measured aspects which might be noted but not applied in planning faces. In this division spatial accessibility, physical, technological and temporal accessibility fall into the more easily measured category. Physical accessibility refers to the physical ability of all population groups to use a facility without physical risks. Technological accessibility on the other hand, refers to the ability to use the technology involved to access or use the facility and temporal accessibility relates people's ability to use the facility within their personal time budgets.

The other aspects of accessibility which are not as easily measured include knowledge based accessibility, kognitive and skill based accessibility, mental accessibility and social and economical accessibility. From these, the concept of knowledge based accessibility concerns the availability of information about the service or facility, which has been recognized as a remarkable barrier in physical activity participation, in which different language speakers should be noted as well. Kognitive and skill based accessibility means the skills and information needed to take up certain physical activities. Mental accessibility however relates to the individual motivational and subjective capabilities and fears to participate. Another important factor, economical accessibility refers to the financial abilities to participate, which can be alleviated to some extent and in some forms of physical activity with public funding. As perhaps the most vague concept Muukkonen (2022) notes social accessibility as something that has not been clearly defined, but relates to socioeconomic patterns and foremost to the interplay between individuals and groups and related values, cultural contexts and attitudes. (Muukkonen, 2022).

3.3. Measuring of spatial accessibility

In essence, accessibility is often measured through travel time or distance, which can be considered as a proxy for travel impedance (Kim & Lee, 2019). According to Apparicio et al. (2008) five of the most commonly used ways of measuring spatial accessibility are shortest distance, number of services in certain proximity, mean distance to all services, mean distance to closest service and gravity model measures.

In terms of destination of locations, accessibility studies commonly concentrate on access to facilities such as healthcare (eg. Vadrevu and Kanjilal, 2016 ; Neutens, 2015 ; Guagliardo, 2004), parks (Lee and Hong, 2013; Higgs & Langford, 2012), transit stops (El-Geneidy et al. 2014), supermarkets or retail (Salze et al. 2011 ; Kim and Park, 2020) or jobs (eg. Boisjoly and El-Geneidy, 2016 ; Cheng and Bertolini, 2013 ; Kim & Lee ,2019). From these job and health care facility approaches are the most abundant (Kelobonye et al. 2020). Some studies even consider multiple types of amenities (eg. Kelobonye et al. 2020 ; Taleai et al. 2014 ; Burdziej, 2019) which are often public. As of the starting or origin locations for example home locations or population weighted centroids can be used. Fewer consider accessibility from work locations or schools which may in fact be important starting locations of many journeys (Salze et al. 2011).

The following sections introduces the most common people and place based measures used in spatial accessibility studies as well as some particularities that relate to the physical measuring of travel times and distances with different travel modes.

3.3.1. People-based spatial accessibility measures

Location based spatial accessibility has been distinguished from other types of accessibility by using the term place-based accessibility (or passive accessibility by Cascetta et al. 2013) referring to accessibility based on geographical units, as opposed to people-based accessibility measures (Park & Goldberg, 2021). People-based measures have also been referred to as individual accessibility

(Zuo et al. 2021) or active or person-based accessibility (Cascetta et al. 2013) focusing on accessibility of individual trajectories (Park & Goldberg, 2021). Cascetta et al. (2013) have defined person based accessibility to indicate the ease of carrying out activities such as free time activities, for subjects in a certain area. Whereas place-based accessibility have been referred to as "the ease of being reached by potential users (e.g. clients, workers, providers, etc.) for an activity located in a certain zone". On the other hand, Geurs and van Wee (2004) for instance have used access when talking about a person's perspective and accessibility in location's perspective.

The people-based accessibility measures are based on measuring accessibility from an individual perspective and are rooted in space-time geographies of Hägerstrand (1970). In these measures the individual activity possibilities are investigated through spatial and temporal constraints and space-time prisms, which tell about the potential traveling patterns and are considered as accessibility measures (Geurs & van Wee, 2004). The space-time prism consists of a 3D cube in which space-time budgets tell about individual space-time paths (Delafontaine et al. 2012). In comparison to place based methods, consideration of temporal components is a significant advantage of person based measures. Additionally, as individual variations in accessibility are investigated, differences relating to gender or ethnicity can be better taken into account as demonstrated by Kwan (1999 & 2000).

Disadvantages of people-based accessibility measures include detailed data needs of individual travel data, which can be demanding to compute and obtain as well as lead to difficulties in aggregating the results to a larger scale. Lack of competition effects and difficulties in communicating the results are additionally mentioned by Geurs and van Wee (2004) as the method's weaknesses. On the other hand, Delafontaine et al. (2012) note how many issues relating to computing have been improving with developments in GIS technology. As an interesting example of application of these measures Delafontaine et al. (2012) combines place- and person based measures by introducing PrismMapper GIS toolkit based on space-time prism concept. More recently, Zuo et al. (2021) base their methodology on neural network models to form short term forecasts of individual accessibility to bus systems.

3.3.2. Place-based spatial accessibility measures

Perspectives on measuring spatial accessibility can be furthermore divided into several groups. For example Geurs and van Wee (2004) recognize four basic perspectives; infrastructure-based, person-based, location-based and utility-based accessibility measures. From these perspectives person based measures were introduced above. From the remaining place oriented perspectives infrastructure based measures relate to analyzing performance or service level of transport infrastructure, for example travel speeds in road networks, and are commonly used in transport planning. All in all, location based measures are commonly used in geographical or planning approaches and analyze accessibility at locations, measuring the level of accessibility to different amenities. This can be done for example through counting numbers of amenities within certain travel time from origin locations. The location based measures identified by Geurs and van Wee (2004) consist of two different kinds of approaches commonly identified in spatial accessibility studies; gravity based measures (also known as potential accessibility measures) and cumulative opportunities measures belonging to the group of distance or connectivity measures. Next, the cumulative, gravity and utility based spatial accessibility measures are introduced with some research examples.

Cumulative opportunities measures have also been called a contour measure, isochronic measures, proximity count and daily accessibility (Geurs & van Wee, 2004). As another umbrella term Kolebonye et al. (2020) also recognize opportunity-based measures which in addition to the cumulative approach include simply calculating nearest distances as “catchment profile analyses”. Cumulative opportunities measure is known as the most applied accessibility measure in planning (Kelobonye et al. 2020). Cumulative opportunities tell about the amount of possibilities within certain predefined accessibility zones, eg. counting the number of job locations within a given travel time or distance or the time or cost it takes to reach a number of these locations. The benefits of using cumulative opportunities measures lies in its relative simplicity and easiness of communicating the results as well as more undemanding data needs.

As it is a more simplistic approach many limitations have been recognized. For instance, Kolebonye et al. (2020) find its biggest weakness to be its low accuracy, which stems from not considering competition effects. These include considerations of the spatial distribution of demand for the amenity and possible capacity restrictions (Geurs & van Wee, 2004). Moreover, these measures imply that all opportunities are equally attractive and do not take into account individuals' perspectives or preferences. Another issue is related to the travel time thresholds, which can be seen as arbitrary and in which small changes can have large impact on which opportunities are deemed inaccessible (Kelobonye et al. 2020, Geurs & van Wee, 2004). As these issues are recognized by Kolebonye et al. (2020) for instance, include competition measures to more accurately present spatial inequalities in accessibility and find significant differences when including the competition measures. Other approaches include a study by Cascetta et al. (2013) who include behavioral indicators based on perceived opportunities in their cumulative accessibility measures.

As another measuring approach, gravity measures are based on distance or time decay functions normalizing the cost of travel between the origin and destination locations. As such in Gravity Model's assumption "the interaction between activities is directly proportional to their size and inversely proportional to the distance/cost of traveling between them (Hansen, 1959)" (Kolenonye et al. 2020). Therefore, as noted by Geurs and van Wee (2004) the smaller and more distant opportunities are of diminishing influence. The impedance functions used in gravity measures are the most used negative exponential cost function, power, Gaussian and logistic functions. Moreover, as these measures include considerations of perceptions of transport as well as land-use and transportation factors, they can act as more appropriate social indicators as considering differences in accessibility to opportunities for different socio-economic groups (Geurs & van Wee, 2004). Limitations of gravity measures include not including individual considerations and as a result these metrics might for example indicate that persons with the same housing location have similar accessibility conditions despite potential differences between people's abilities to move (Cascetta et al. 2013). Additionally, Geur and van Wee (2004) note how competition effects are excluded from these measures as well, but adaptations have been made to better include them. In the Gravity measures difficulties in interpreting and communicating the more complex results are additionally recognized.

To answer to some of the limitations, in the recent decade gravity model based two-step floating catchment area (2SFCA) methods have been recognized as an important application of place-based accessibility (Chen et al. 2019). These measures were developed by Luo and Wang (2003) for the need of studying spatial inequities in health care services and have since been used to study accessibility to other types of facilities as well. The 2SFCA is based on various forms of distance decay functions and also considers supply and demand interactions, which are overlooked in traditional place based methods (Chen et al. 2019). As the 2SFCA method has been applied and improved in multiple papers (see Chen et al. 2019 for evaluation of metrics), for instance Xiao et al. (2022) propose a multi-preference Gaussian two-step floating catchment area (MG2SFCA) taking into account different travel modes, catchment sizes and preferences among different age groups. While another more recent approach by Wang (2018) introduces an inverted two-step floating catchment area (i2SFCA) method to capture the "crowdedness" of facilities and switches the demand and supply from resident oriented approach to assessing accessibility based on services.

Lastly, utility-based measures originate from economic studies and analyze the benefits derived from access to different activities for individuals or communities. As such they are useful in economic evaluations, since they are able to compute benefits of accessibility changes from land-use and/or transport developments (Geur & van Wee, 2004) and therefore allow for forecasting of future accessibilities (Hasnine et al. 2019). This quantification of expected maximum utility in choosing particular locations can be done using discrete location choice models. Consequently, the utility based measures can be divided into random utility theory based measures using multinomial logit model (logsum) and measures based on doubly constrained entropy models (Geurs & van Wee, 2004). Similarly to gravity measures, Geur and van Wee (2004) recognize its disadvantages to be related to the difficulties in interpretability and communicability as relatively complex theories in the explanations of results are involved.

3.3.3. Travel modes and measuring of travel times and distances

Many spatial accessibility studies are focusing on a certain transportation mode, such as public transportation or walking accessibility. Traditionally private car based accessibility analyses have been overrepresented and car ownership even assumed (Mao & Nekorchuk, 2013), while public transportation based accessibility analyses have been popular as well (Shi et al. 2020). Multimodal spatial accessibility refers to studies investigating various transportation modes such as public transit, bicycle and car in terms of spatial accessibility. Multimodal approaches have the advantage of comparing accessibility conditions between different transportation modes. Particularly comparisons between car and public transportation have been made, as Yang et al. (2017) notes how many empirical studies in the U.S. and Europe have found accessibility by private car to be much better than public transportation with an exception found in Hong Kong. In terms of other comparisons, some such as Ogilvie (2011) find cycling to be a competitive travel mode compared to walking and Tenkanen and Toivonen (2020) find a faster pace cycling to be even faster on average than public transportation.

On an important note the distances measured can be counted as Euclidean or Manhattan distances or network distances (Apparicio et al. 2003). Euclidean distance refers to the straight line distance between locations and Manhattan distance to a measure of two sides of a triangle that uses the Euclidean line as its hypotenuse (Apparicio et al. 2003). The network distance on the hand refers to the shortest distance along a road network and provides a more detailed analysis of real world accessibility. For example, El-Geneidy et al. (2014) concludes that there is a consensus in the transit literature that Euclidean buffers, meaning circular buffers around a point, overestimate service areas of stops and that network buffers should be preferred. Apparicio et al. (2003) and Higgs et al. (2012) identify this change to more precise measures also in other accessibility applications. In some cases buffer methods continue to be used due to their simplicity and applicability to study the availability of facilities in near vicinity of origin locations (e.g. Billaudeau et al. 2011).

As the method of network distances is often chosen due to its better application of real world accessibility, several considerations have to be made as the travel modes included in spatial accessibility analyses pose different implications on how the distance or time involved in the journey is counted. For instance, analyzing biking and walking accessibility requires information on bikelines and walking paths, car accessibility on speed limits and public transportation on bus routes and timetables. Moreover, in the case of walking and biking, Tenkanen and Toivonen (2020) note how the travel times are influenced by personal characteristics, like fitness levels and age. In their case biking travel times for example are counted for faster and slower bikers separately.

Furthermore, the starting and ending points of the journeys and possible changes and waiting times between travel modes should be considered. To answer to the needs of more realistic travel times, many studies have implemented door to door approaches to their travel measures (e.g. Tahmasbi & Haghnenas, 2019). The door to door measures attempt to include travel time impedances, times added for different travel time delaying reasons to their analyses (Lehtonen, 2021). These impedances can include adding of time delays due to congestion. In the Helsinki Region Travel Time Matrix developed based on door to door estimations of travel time, for instance rush hour impedances and times to return bike and search for a parking lot are added (Tenkanen & Toivonen, 2020).

3.4. Topical developments of spatial accessibility studies

Reviews such as Shi et al. (2020) focus on the findings and issues of spatial accessibility studies. While Neutens (2015) in the context of health and Park and Goldberg (2021) in their more recent outlook give insights into the developing methodological metrics of spatial accessibility studies. Foremost, Shi et al. note that the number of publications on the topic of accessibility has risen significantly especially in the 2010s, as well as the geographical extent of the papers. Although the majority of publications on the topic are USA based, China has produced an increasing number of papers on the topic. Other top 5 countries publishing actively in this field are UK, Canada and the Netherlands.

By reviewing 2000-2019 publications Shi et al. (2020) categorize the most common thematic and methodological frameworks. In terms of methodology GIS approaches were most used in addition to more seldomly used survey or economic based approaches. Public transportation accessibility especially by bus or high-speed rail and active transportation modes such as walking and cycling for specific population groups were common interests. In terms of research objectives and applications investigating the social impacts regarding land use and social equity were common themes. Shi et al. (2020) further categorize themes of the most cited accessibility implementations to the following topics.

- Transport network performance Assessment
- Accessibility and Vulnerability
- Accessibility and Social Equity
- Accessibility and Travel behavior
- Accessibility and Autonomous vehicles

In addition to the accessibility-based implementations Shi et al. (2020) recognize some topical trends in accessibility indicators regarding methodologic approaches as following.

- space-time accessibility
- virtual accessibility
- positive and normative accessibility
- equitable accessibility
- traditional place-based and individual-based measures
- temporal approaches through the development of big data and ICT

Park and Goldberg's (2021) review of studies benefitting from advanced geospatial information, note multimodal spatial accessibility and temporal changes in spatial accessibility as recent trends in spatial accessibility studies as well. Temporal changes refer to studies which consider temporal features such as hourly measures throughout a day or changes over time in their analyses. Implementation of different approaches can be seen in the topical developments of accessibility studies as Shi et al. (2020) note the improvements in taking account human mobility patterns of diverse transport user groups as opposed to more conventional accessibility measures not considering traveler behavior.

Kim and Lee (2019) highlight the evolving methods of accessibility studies in the case of transit; "*Thanks to recent developments in transit data standardization, big data, and cloud computing technologies, researchers can easily compute detailed profiles of complex transit systems, which was nearly impossible only a few years ago.*" For example, navigation system or social media data are giving new possibilities to study the temporal accessibility dynamics (e.g. Moya-Gómez et al. 2018). For example, Qian et al. (2020) used social media derived data to map real-time population locations to analyze a demand component in hospital accessibility. In relation, the Helsinki region travel time matrix used in this thesis is an example of the developing data availability of more comprehensive travel time data. Although, there are still limitations to these more evolved methodologies. In fact, despite the progress for the simplicity of the analyses, cruder methods of estimating travel time are still being used (Kim & Lee, 2019).

As future considerations for accessibility research, Shi et al. (2020) note the need for better distinguishing of the appropriate measures for differentiating objectives, especially noting the new context of data availability and spatial-temporal resolutions of the analyses. Additionally, bringing up the need to develop more efficient ways to utilize accessibility analysis in planning processes. Moreover, noting the newest developments of accessibility studies, Park and Goldberg (2021) propose further improvements in the accuracy measurements by the use of more dynamic variables and improving the linkage between accessibility and policymaking. With these new approaches, more refined and accurate metrics capturing the complexity of transportation systems can evolve and better inform decision making and planning (Kim & Lee, 2019). Neutens (2015) also notes the need of developing metrics that are more individualized and dynamic as well as exploiting existing data sources in new ways to more realistically represent individuals accessibility conditions and consequently equality in these conditions.

3.5. Equity perspectives in spatial accessibility

The relationship between socioeconomic variables and accessibility and the equitable distribution of different amenities has been of interest in several studies on different scales. Shi et al (2020) even distinguish it as another hot topic of accessibility studies, with its concepts such as social exclusion, social equity and social justice evaluation measuring social dimensions of transport and accessibility. Segregation trends and socio spatial differentiation have also been seen as fostering interest in equitable accessibility (Chen et al. 2021). Still, as the conceptualizations of equity differ, so do the research approaches. Studies assessing spatial equity in the context of accessibility are most often focusing on public facilities. In addition to sports facilities accessibility to jobs or shopping opportunities are examples of private facilities where spatial equity approaches have been used (e.g. Kelobonye et al. 2020 ; Kim & Park, 2020).

According to Camporeale et al. (2016) the concept of equity refers to a fair distribution of effects or fair sharing of resources. Although, this fairness can be difficult to define as social norms and moral judgments define equitable distributions of different amenities. Dadashpoor et al. (2016) rise related notions by bringing up the concept of 'inequities of inequality', meaning that all inequalities in urban facility distribution are not necessarily inequitable as assumed by previous studies (e.g. Taleai et al. 2014 ; Omer, 2006). This is because the distribution of facilities will always result in variations in accessibility and it is only when the distances become too large and impractical, inequity forms. The differences themselves do not then result in inequity, especially when noting other factors, such as service areas, capacities of facilities and other overlapping facilities.

From the concept of spatial equity Ashik et al. (2020) and Camporeale et al. (2016) note its useful categorizations into horizontal spatial equity and vertical spatial equity. Horizontal spatial equity refers simply to the equal distribution of facilities among residents not considering their locations or socioeconomic variables. Vertical spatial equity on the other hand takes these aspects into account and focuses on equitable distribution of facilities in relation to the needs and demands of the user populations. In the case of vertical equity, distribution of facilities is considered fair if the resources to more deprived populations or individuals are better corresponding to their elevated needs. Furthermore, the two types of equities can even be found to be overlapping or conflicting (Comporeale et al. 2016). To tie these concepts together Ashik et al. (2020) distinguish the following; *"The concept of 'equality' follows the principles of horizontal spatial equity while 'need' and 'demand' based approaches are consistent with the idea of vertical spatial equity."* The need and demand-based approaches take needs into account by for instance considering social disadvantage as need and demand by measuring users of a facility.

Regarding the related concepts of spatial equity, some studies use the term spatial justice in a similar manner to describe even distribution of services in relation to needs (e.g. Asefi & Nosrati, 2020). Sociologists such as Macintyre (2007) have also pondered the term 'deprivation amplification' in the context of accessibility to understand potential patterns of lacking community resources amplifying poverty. In relation Lucas (2012) and Preston and Rajé (2007) bring up the concepts of social exclusion and transport disadvantage (discussed in previous sections) in relation to accessibility.

In terms of methodologies, Kolebonye et al. (2020) take the demand approach in spatial equity context further by applying competition components to the use of cumulative opportunities measures. Spatial equity in accessibility to urban facilities can then be viewed in the context of competing facilities and demand and supply. For example, Currie (2010) analyzes spatial gaps in public transport supply based on social needs of disadvantaged populations. In a similar approach Lee and Hong (2013) use the concept of spatial disparity to describe service levels of an amenity (supply) in relation to population size (demand). In this case spatial disparity does not necessarily include socioeconomic components. Contrastively, Dadashpoor et al. (2016) use an integrated model for spatial inequity measurement to identify the spatial inequalities in relation to different sets of facilities. While Camporeale et al. (2016) use a Gini coefficient to measure equity. Furthermore, equity perspectives have been studied from place and person based accessibility approaches, in which person-based measures have been found to be more conservative in assessing equity levels of services (Neutens et al. 2010). Kwan (1999 & 2000) introduced some of the integral person based equity perspectives with gender and ethnicity considerations.

Consequently, results from studies concentrating on spatial accessibility and socioeconomic factors are not unanimous, since methodologies, scales, cultural context, and the amenities investigated differ. For instance, Weiss et al. (2018) investigated the global scale of disparity in accessibility. Their findings indicate spatial accessibility to cities to be better in high income countries compared to lower income settings. Contrastively, many studies focus on high income countries and analysis on a city scale, with differing findings. For example, Forth et al. (2013) find transit accessibility to jobs to be better and travel times lower for the most socially disadvantaged census tracts in Toronto. Omer (2006) further stresses the importance of scale in analyses of spatial accessibility related inequality.

On a related note, reasons for differing accessibility can stem from different geographical and cultural context relating to the locating of different socioeconomic groups and locating of jobs or other urban amenities in focus. For instance, Forth et al. (2013) bring up how many poor workers in American cities live in city centers where accessibility to jobs in suburbs can be diminished but in other American circumstances accessibility to downtown jobs and opportunities can contrastively be better for low-wage workers. This pattern can be different based on local conditions. In many European cities like in the Helsinki metropolitan area as seen in the socioeconomic patterns of the study area (section 5.1.1), the different distributions can have different implications for the equality of the spatial accessibility conditions. Moreover, independent from socioeconomic spatial distributions, differences in urban form and transportation structure can pose different implications to spatial accessibility conditions with different travel modes as well. For example Yang et al. (2017) note how these structures are very different in Chinese compared to western cities.

4. Spatial Accessibility and sports facilities

Studies on the topic of spatial accessibility to sports facilities have differing research agendas for example analyzing the service level and distribution of certain sports facility types. These studies use different metrics and spatial resolutions to measure accessibility and can further be divided based on research approaches, such as social equity, relationship with sports participation or location allocation for planning purposes (Kwon et al. 2020). From these topics, relevant approaches of spatial accessibility of sports facilities from the perspective of corresponding physical activity, equity perspectives and finnish studies are introduced next.

4.1. Spatial accessibility of sports facilities and physical activity

In the context of spatial accessibility of sports facilities, many studies have concentrated on the relationship between accessibility to facilities and physical activity. Generally, these studies have found proximity to sports facilities to be positively associated with physical activity levels. This pattern has been studied in the subjective perceptions of accessibility and spatial accessibility in adults (Lee et al, 2016 ; Deelen et al, 2016 ; Halonen et al. 2015 ; Sallis et al. 1990). Eime et al. (2017) find participation rates heightened by better provision of facilities to be complicated by socioeconomic and regional factors, which indicate higher participation being positively related to socioeconomic factors in metropolitan regions in Australia. Karusisi et al. (2013) on the other hand, independently from socioeconomic factors, find only spatial accessibility of swimming pools to have an effect on participation. Furthermore, Hallmann et al. (2012) note that different sports and their differing infrastructures have different implications and causes for sports participation and substation effects between different sports occur. Although, more research is needed to better understand participation in different sports.

When it comes to children and adolescents, Reimers et al. (2014) find conflicting results, only finding girls in rural areas to be less likely to engage in indoor sports activities as the distances to these facilities increased. Powell et al. (2007) also find similar patterns for female adolescents, while Prins et al. (2012) do not find sports participation to be connected to neighborhood level sports availability. In the case of children, Steinmayr et al. (2011) find the participation levels of children to be connected to facility proximity only in smaller cities and villages and a larger effect on girls than boys. On the other hand, the presence of particular sports facilities such as swimming pools have been associated with physical activity (Wicker et al. 2009) and number of outdoor facilities at schools such as soccer fields with boys' sports participation (Haug et al. 2010). Furthermore, including socioeconomic factors, Casey et al. (2012) find the likelihood of being overweight to be higher with poorer spatial accessibility to physical activity facilities for children of blue-collar workers. While these results convey conflicting results changing according to facility type, gender, socioeconomics, degree of urbanity, scale or methods of the studies, Heitzler et al. (2006), Timperio et al. (2004), Brodersen et al. (2005), Sallis et al. (2000) and Limstrand and Rehrer (2008) present overall positive associations between children's physical activity and access to sports facilities. While Zakarian et al. (1994), Eime et al. (2013) and Prins et al. (2010) note this pattern also for adolescents.

4.2 Equity perspectives in spatial accessibility of sports facilities

As a second approach introduced here, the equity perspective noted in the previous section (3.5) is highlighted in the spatial accessibility of sports facilities research as well. Accessibility of sports facilities from an equity perspective often considers vertical spatial equity and socio economic factors. Firstly, studies such as Asefi and Nosrati (2020) use a more horizontal approach, in which spatial accessibility even without socioeconomic comparisons can be analyzed in several descriptive ways. For instance, in the case of outdoor sports facilities in Isfahan, Iran, Asefi and Nosrati (2020) find unfair distributions based on number of facilities, population distributions and spatial patterns, with results indicating clusters of sports facilities not locating in areas with largest populations, while using the methods of spatial autocorrelation (Moran I). Salarvandian et al. (2020) find similar results in Tehran using simple network analysis derived service area ratios.

Chen et al. (2021) notes how literature in public sports facility planning lacks effective methods to measure "spatial matching" in the case of facilities and population distribution. Therefore, they use a Gini coefficient, Lorenz curve and location entropy methods to quantify their results. These results reveal spatial inequalities in Hangzhou, China due to sports facility construction being behind of urban expansion and being more concentrated in the central regions of the city. Another Chinese study by Xiao et al. (2021) uses a more comprehensive approach of multi-preference Gaussian two-step floating catchment area method, including aspects of preferences of individuals of different ages and better inclusion of provider-to-population ratios. With these methods and a rare inclusion of different age groups and their preferred facilities, they find children to have the best accessibility to sports facilities compared with other population groups. Furthermore, in their multimodal approach, walking accessibility showed the greatest variations in spatial accessibility and driving the least.

4.2.1 Spatial accessibility of sports facilities and socioeconomic factors

As a continuity from the equity perspective, studies taking into account socioeconomic variables in the context of sports facilities have often considered availability or accessibility of sports facilities. Availability can for example be measured through the number of different kinds of facilities in geographical areas e.g. zip-code level (Cereijo et al. 2019). This simple calculation in relation to population count has been called the *container* approach (Langford et al. 2018). As this approach can be limited in its presentation of real-world possibilities, other accessibility and availability metrics have been developed. Although Jacobs et al. (2019) find a greater number of studies focusing on availability and only few on accessibility. In this context in addition to spatial accessibility, in some cases accessibility can be related to for example pricing of the sports (Estabrooks et al. 2003) as noted in the previous definitions of accessibility, while the main focus lies in spatial accessibility. More vertical notions of accessibility studies in physical activity environment research do consider different aspatial factors, by for example categorizing facilities to different types such as public or private facilities or considering other characteristics in their analyses (e.g. Billaudeau et al. 2011) and therefore elaborating on how readily available these facilities are for different socioeconomic populations. In this section key results from studies focusing on spatial accessibility of sports facilities in relation to socioeconomic factors, are discussed followed by availability and lastly possible implications and limitations of these results.

The study by Cereijo et al. (2019) of sports facilities in Madrid, Spain compares sports accessibility and availability in relation to area level socioeconomic factors. Different from many other studies, they identify different types of exercise facilities, public, private and low-cost geocoded from Google Maps and calculate a socioeconomic status index. Their regression analyses indicate lower average distances, particularly for public and low-cost facilities, but lower overall number of facilities in lower socioeconomic areas. The availability of exercise facilities was higher, particularly in the case of private and seasonal facilities, in higher socioeconomic areas. Similarly to Cereijo et al. (2019), in terms of proximity to exercise facilities Ogilvie et al. (2011) find the most affluent quintile to have significantly lower access by walking and cycling in Scotland even after adjusting for urbanity and local authority. They also note the pattern of more public facilities locating in less affluent areas as new public sector facilities have often deliberately been placed in these areas. In Wales, Higgs et al. (2015) find a similar pattern of better accessibility of deprived areas to public facilities and a reverse pattern for privately owned facilities. Higgs et al. (2015) and Billaudeau et al. (2011) ponder this pattern of different spatial accessibility of public and private facilities to be due to different policies in sports facility provision reflecting different planning or policy contexts.

Additionally, in terms of spatial accessibility to exercise facilities, New Zealand study by Pearce et al. (2007), Australian studies by Giles-Corti and Donovan (2002) in Perth and Mavoa et al. (2015) in Melbourne (in the case of public open space), find lower distances to be associated with lower socioeconomic areas. Giles-Corti and Donavan (2002) find this pattern in the case of sports centers, gyms and swimming pools, while discovering generally lower participation rates in the lower socioeconomic areas.

Contradicting findings have been made by for example Panter et al. (2008), in the English city of Norwich, finding road network distances to physical activity facilities to be longer for less affluent citizens. Other studies find different directions between the variables in question, based on travel mode or type of facility, similarly to the noted differences between public and private facilities. For example, a Scottish study by Lamb et al. (2012) find a pattern of less affluent areas having worse off spatial accessibility with private car, but reversed pattern of better accessibility of less affluent areas for other travel modes; bicycle, bus and walking, while dividing the facilities to places of light, moderate or vigorous physical activity. Furthermore, another Australian study by Cerin and Leslie (2008) categorized sports based on individuality and found higher household income to be connected to having better access to individual sports facilities and poorer access to team-sports facilities. In connection to the different sport types, a Paris study by Billaudeau et al. (2011) considered multiple different types of facilities in buffer areas of 500 meters and found differences according to the type of facility. For instance, tennis courts and sporting rooms were more abundant in advantaged neighborhoods, whereas less advantageous neighborhoods had a higher prevalence of athletic facilities and collective playgrounds. They ponder that the different typologies of physical activity facilities may reflect different preferences and financial means to participate in different kinds of physical activities.

When it comes to availability of physical activity facilities, similarly to Cereijo et al. (2019), higher densities of exercise facilities in areas of higher socioeconomic status have also been found by Hillsdon et al. (2007) and Macintyre (2000) in the U.K, Estrabrooks et al. (2003), Powell et al. (2006) and Moore et al. (2008) in the U.S. Notable from these, Powell et al. (2006) found this pattern on commercial pay-for-use physical-activity-related facilities, while Estrabrooks (2003) only for free-for-use activity facilities. On the other hand, others such as Ogilvie et al. (2011) in Scotland have found more facilities in lower socioeconomic areas or mixed results as noted in a review by Jacobs et al. (2019).

Powell et al. (2006) suggest that fewer facilities in lower socioeconomic areas may contribute to lower levels of physical activity observed in these populations, also discussed by Macintyre (2000) in the contexts of "deprivation amplification". Descriptively, Moore et al. (2008) find minority neighborhoods to be significantly less likely to have recreational facilities. On the other hand, as noted from above, others have not found evidence for this widely held notion of poorer spatial access to sports facilities of poorer areas and Pearce et al. (2006) even discuss better accessibility of less affluent areas to be a preventative factor of even larger inequalities in health outcomes. Although from a different point of view, Lee et al. (2005) find the quality of facilities and amenities to be poorer in lower income neighborhoods. Quality considerations can then be seen as needed aspects for more comprehensive understanding of potential health related deprivation outcomes, not visible from studies focusing only on spatial distances. Evidently, even though people of lower socioeconomic areas might have better spatial access to some facilities, more likely public facilities as noted in the mentioned studies, they can be more restricted in many other aspects relating to the features of the facilities as well as well other socioeconomic and individual factors as discussed in section 2.5.

Furthermore, potential disparity between the area facility availability and spatial accessibility is discussed in inequality context by Salarvandian et al. (2019) who note "unequal access to sports facilities comes from an unequal spatial distribution of these facilities and not necessarily from their smaller number" and areas with high amounts of facilities might still suffer from unequal facility distribution. Therefore, in the sense of equality, considering spatial accessibility or considering the spatial patterns of the facilities in relation to their user populations in more detail can give more accurate information on the opportunities of usage of the facilities in question.

Consequently, as the above-mentioned studies reveal conflicting findings, Moore et al. (2008), conclude the following notion "Data on the relationship between area socioeconomic status (SES) characteristics and physical activity resources remain sparse and inconsistent". Interestingly, a review by Jacobs et al. (2019) finds a marginally greater proportion of studies finding negative associations between socioeconomic position and recreational facilities and a high number of mixed and null results. In which case negative association refers to more facilities and a smaller proximity to physical activity facilities in areas of high socioeconomic position. Therefore, in their systematic review, clear socio-economic differences in physical activity environments of high-income countries were not found. Although, interestingly, United States based studies showed larger numbers of positive or null associations and outside US studies finding more mixed or negative associations.

As Jacobs et al. (2019) point out the differing methodologies and scales of these studies, more research is needed to understand these patterns and the lack of clear patterns in some cases. A related interest would be whether the results reflect different planning or policy contexts of different countries in locating public and private physical activity facilities as noted by Higgs et al. (2015) and Billaudeau et al. (2011). As countries or cities with strong public physical activity facility traditions may have different location considerations as those with more commercial physical activity facilities with more market-led locational motivations. Additionally, different scales of the analyses and cultural and geographical contexts in socioeconomic distributions, as noted in section 3.5, can result in differences in spatial accessibility or availability metrics. For example, Cereijo et al. (2019) ponder the higher number of exercise facilities in higher socioeconomic areas to be due to high concentrations of facilities in the center of Madrid where, which tend to belong to the group of higher socioeconomics and lower areas locating more in the peripheries of the city.

Furthermore, as the patterns of locating different types of sports facilities differ and different sports can have vastly differing needs for their facilities from proximity to potential users to the size of the facility, understanding the availability and accessibility of these different types of facilities needs more research input. Simple divisions such as public or private physical activity facilities does not necessarily tell much about the facilities, as physical activity facilities can include for example, outdoor or indoor facilities, team- or individual sports facilities or facilities popular to certain demographics in certain countries such as Langford et al. (2018) demonstration of lawn bowling greens in Wales. Cultural context should therefore be noted in international comparisons. Furthermore, in the myriad of physical activity locations, categorizing physical activity types according to their user demographics, for instance, could give better insight into overall accessibility of types of physical activity and understanding possible compensatory effects between different sports. Langford et al. (2018) note this need for understanding the demands of different demographic groups as user groups of different sports facility types.

Lastly, only few studies have focused on accessibility of sports facilities from young people's point of view, the ones focusing on spatial accessibility have focused on its relationship with other determinants such as overall activity levels as noted in previously mentioned studies. One example noting children's accessibility is Schneider et al. (2015) in Germany. Similarly to many others, they find lower socioeconomic area status to be connected to higher availability of physical activity facilities and conclude evidence not supporting the "deprivation amplification" hypothesis in the availability of these facilities.

4.3. Spatial Accessibility of sports facilities in Finland

A few Finnish studies have investigated spatial accessibility to sport facilities. For example, Kotavaara and Rusanen (2016) investigate the matter on a national level. In their LINDA project, the accessibility to the most focal sports facilities appeared to be good in contrast to the spatial distribution of the population, although significant differences between municipalities were found. The most accessible facilities were ballfields and inside sports halls and the spatial accessibility to swimming and ice halls were not as accessible with walking or biking. Another study by Lehtonen and Kauronen (2017) investigated spatial accessibility for physically inactive men, a risk group for worsened health conditions, in Kymenlaakso and found them to have in average poorer spatial accessibility to sports facilities in moderately populated areas. This pattern was found to be reflective of their clustering into smaller income population locations.

In recent years, the availability of small-scale travel time data with different travel modes, in addition to census data and national sports facility data (Heittola et al. 2020) has provided new research possibilities taken by several thesis such as Lehtonen (2021) and Keurulainen (2022) as well as Karvinen (2017), Pirttioja (2018) and Mäntyniemi (2015). Notable from these mostly HMA centered thesis using similar materials, Keurunen (2021) finds travel times to swimming facilities to be generally good and the best with biking or private car. In line with some of the previous studies mentioned, travel times were smaller for the most deprived population groups. For Lehtonen (2021) spatial accessibility analyzed with Moran's I in Helsinki and Jyväskylä revealed clusters of travel times and for instance disc golf courses with fewer facilities were more dispersed compared to more abundant football parks and fitness centers in the areas.

Notably different approach by Karvinen (2017) reveals important information for planning in her analyses on how the relatively well spatially accessible service network of sports facilities could be optimized reflective of the population forecasts of 2040. Pirttioja's (2018) approach of equitable service planning of sports facilities, reveals as well mostly good overall accessibility of public sports facilities with public transport and even with walking. Although, private car accessibility was seen as preponderant. Relevantly, Pirttioja includes young people, 7-20-year-olds in her analyses of sports facility accessibility in Helsinki, while also taking into account example locations and training times. In these analyses young people's home locations were found to be well equipped with reasonable spatial accessibility metrics. Still journey times longer than recommended were found for example in Northern Helsinki, Laajasalo and city center.

Appropriately, the thesis by Mäntyniemi (2015) chose Horse riding as well as ice hockey to analyze spatial accessibility on, and therefore pose interesting results in relation to this thesis. Notably, Mäntyniemi was able to relate the spatial accessibility analyses to data of the registered home locations of the hobbyist of the chosen sports. Interestingly, the results of Mäntyniemi's thesis indicate slightly longer travel times to horse riding facilities than ice hockey facilities, but relatively good overall accessibility. Although some spatial disparities in travel time were found for example in some more peripheral locations and car accessibility, which was noted as the fastest mode of transport and which can pose possible equality challenges.

5. Methods and Materials

5.1. Study area

The Helsinki metropolitan area consists of the cities of Helsinki, Espoo, Vantaa and Kauniainen and is home to around 1,2 million citizens (Statistics Finland, 2021). As the capital of the country Helsinki has the most people (around 650 000) and functions as the governmental center of the country. The surrounding municipalities of Vantaa and Espoo are independent but considered part of the functional capital region, with populations of under 300 000 inhabitants. Kauniainen, on the other hand, forms a small governmental anomaly inside Espoo consisting mainly of detached housing.

Figure 3. Transportation network and green areas.

The transportation connections in the region consist of public transportation routes and major roads visible in Figure 3. For private car transportation the ring roads one and three are the main motor ways serving the west to east routes, while other main roads are mainly rooted towards the center of Helsinki. The public transportation system on the other hand includes an extensive network of buslines with some bus rapid transit lines serving transverse movements. Rail based systems include the regional train system, the metro line and the tram network of central Helsinki. In addition, it is soon expected to expand with several light rail projects (City of Helsinki, 2015)

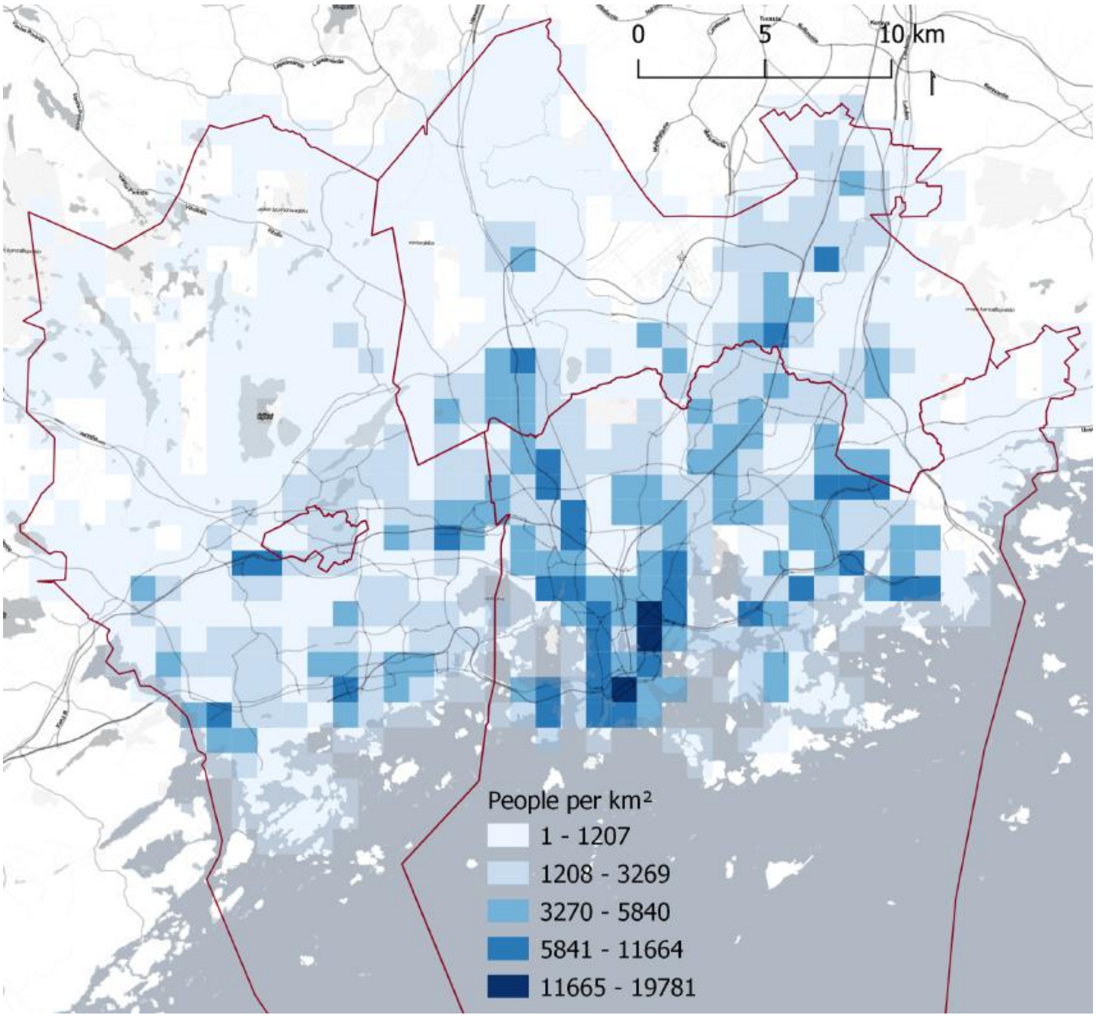


Figure 4. Population density per square kilometer. (data from Statistics Finland (2020)).

Figure 4 shows the distribution of population densities per square kilometer in the area, in which Helsinki emerges as the most populated area. In general central areas and areas with good transportation links can be identified as most populated. Descriptively, Helsinki has 3076 inhabitants per square kilometer, whereas these numbers are around 1000 in Vantaa, 952 in Espoo and 1766 in Kauniainen (Statistics Finland, 2021). The populations of these municipalities are furthermore growing and combined are expected to reach around two million in 2050 (City of Helsinki, 2015).

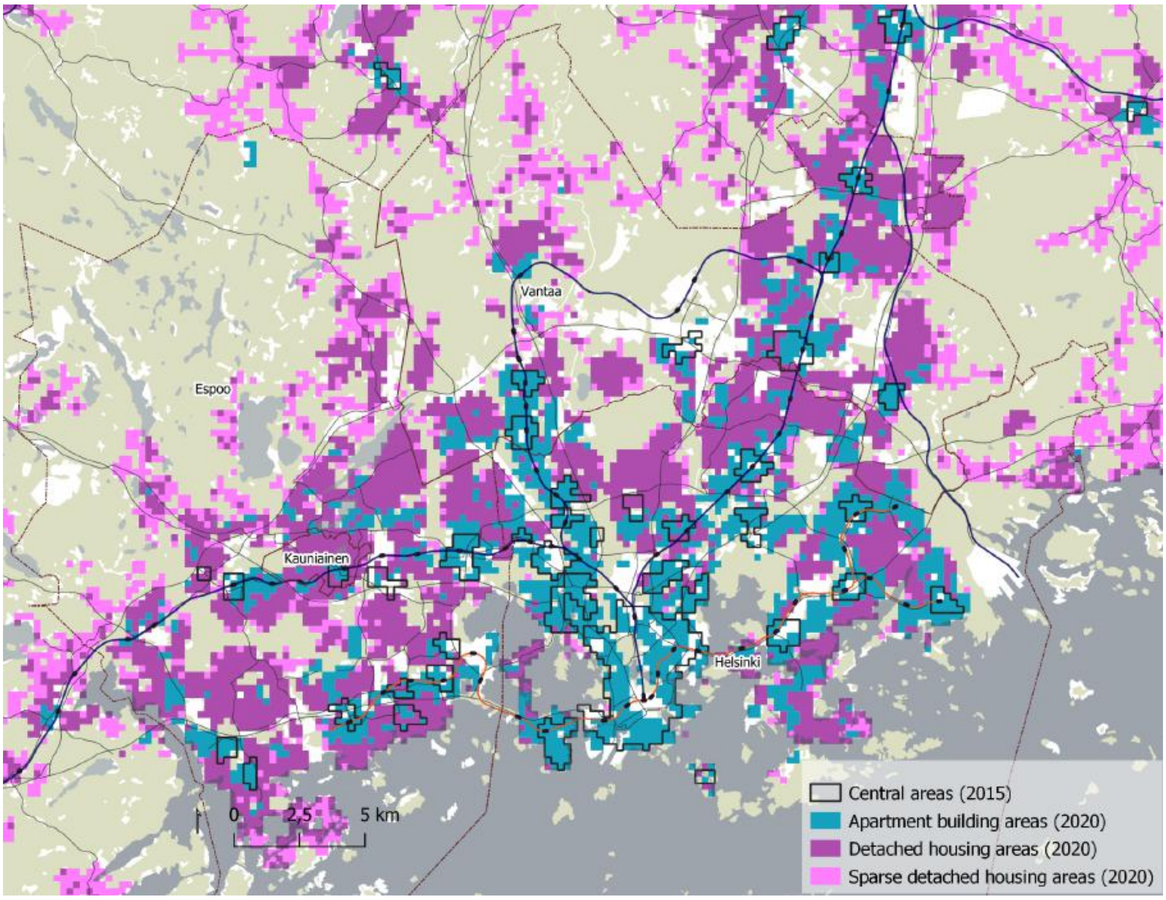


Figure 5. Detached housing-, apartment building- and central areas including smaller subcenters. (data from Finnish Environment Institute (2020))

Looking at the map of detached housing areas and apartment block housing areas (Figure 5) gives further information for explaining the patterns of population distribution in the area. More densely built apartment block areas are highlighted in the center of the city as well as in locations with good public transportation connections with the regional train and metro line. The formation of sub centers along these tracks is also visible in the region. Detached housing areas on the other hand fall in between these rail connected branches. Moreover, more sparsely built detached housing areas reach into the unbuilt and natural areas evident for example in Northern Espoo. Although the region is the most populated in the country, it still contains relatively large natural areas especially in the northern parts of Espoo and Vantaa. In Helsinki the central park forms a continuous natural area north from the center of the city.

5.1.1. Spatial distributions of 7- to 12-year-olds and socioeconomic patterns

The variables in the interest of this study are the age groups of 7- to 12-year-olds and socioeconomic factors. The distributions of these can be noted from Figures 6, 7 and 8, in which data have been aggregated from the population grid database (Statistics Finland, 2020).

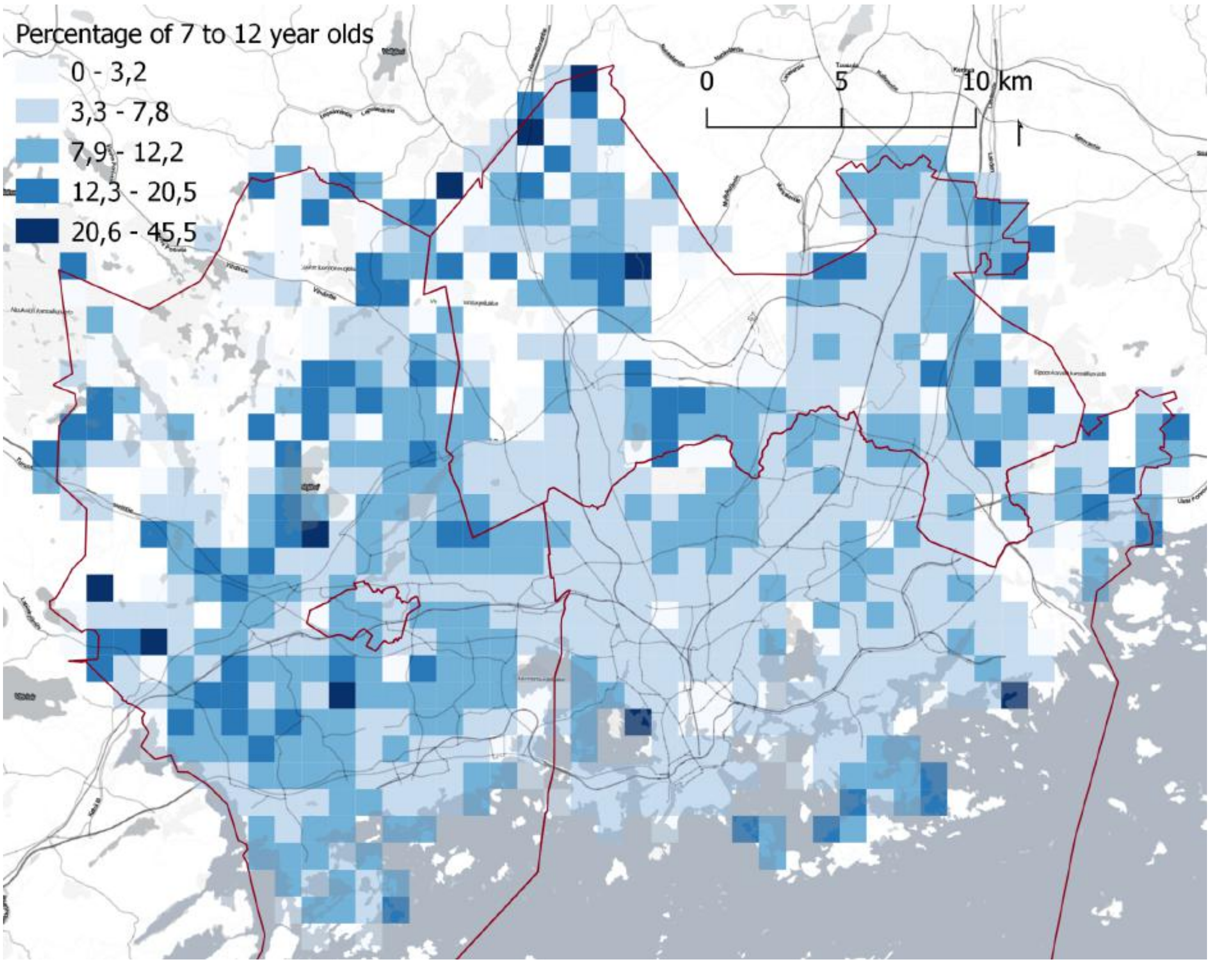


Figure 6. Percentage of 7- to 12-year-olds in relation to the whole population in 1 x 1 km grid cells.

Firstly, when looking at Figure 6 of the percentages of 7- to 12-year-olds in the region, the highest proportions of these children are mostly in Espoo and Vantaa and typically not in central locations. For example, the center of Helsinki seems to have relatively few children and proportions seem to be highest in detached housing areas as seen in Figure 5. Still on the other side of the coin, the pattern of absolute amounts of 7- to 12-year-olds looks very different. In Figure 7 the pattern of the amounts of children is not very clear, but significantly more concentrated on more central areas than when looking at proportions. High amounts of children can be found for example in the city center, in eastern Helsinki (e.g. Vuosaari and Kontula) and central and southern part of Vantaa (e.g. Kartanonkoski) and central parts of Espoo (e.g. Espoon keskus and Matinkylä). These are all quite populated and central apartment building areas as can be seen in Figures 4 and 5.

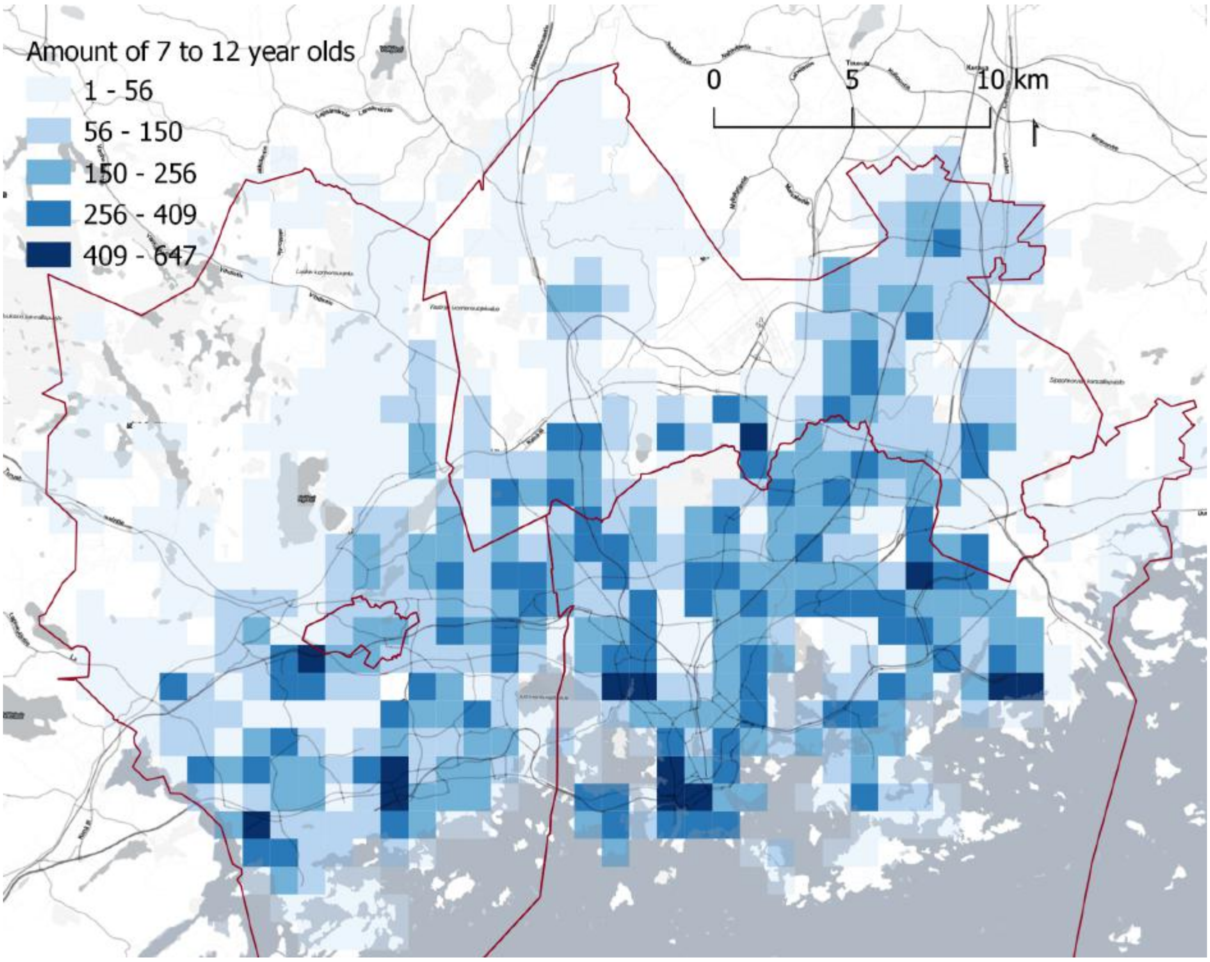


Figure 7. Absolute numbers of 7- to 12-year-olds in 1 x 1 km grid cells.

Regarding socioeconomic patterns, in recent years there has been ongoing discussions about the segregation development in the Helsinki metropolitan area. Although in international comparisons income differences are not very large, the largest income differences of the country can be found in Helsinki (Saikkonen et al. 2018). Saikkonen et al. (2018) concludes that particularly ethnicity based segregation has been slightly increasing in the 2000s and is more pronounced for children compared to the working age population. On another related note, children and socio-spatial segregation have been studied to be interlinked, as the residential choices of families with children feed into the segregation cycles as well as connect to the differentiation of school catchment areas (Bernelius &

Vilkama, 2019). Generally, the cities have attempted to relieve segregation developments by policies of social mixing of areas (Saikkonen et al. 2018).

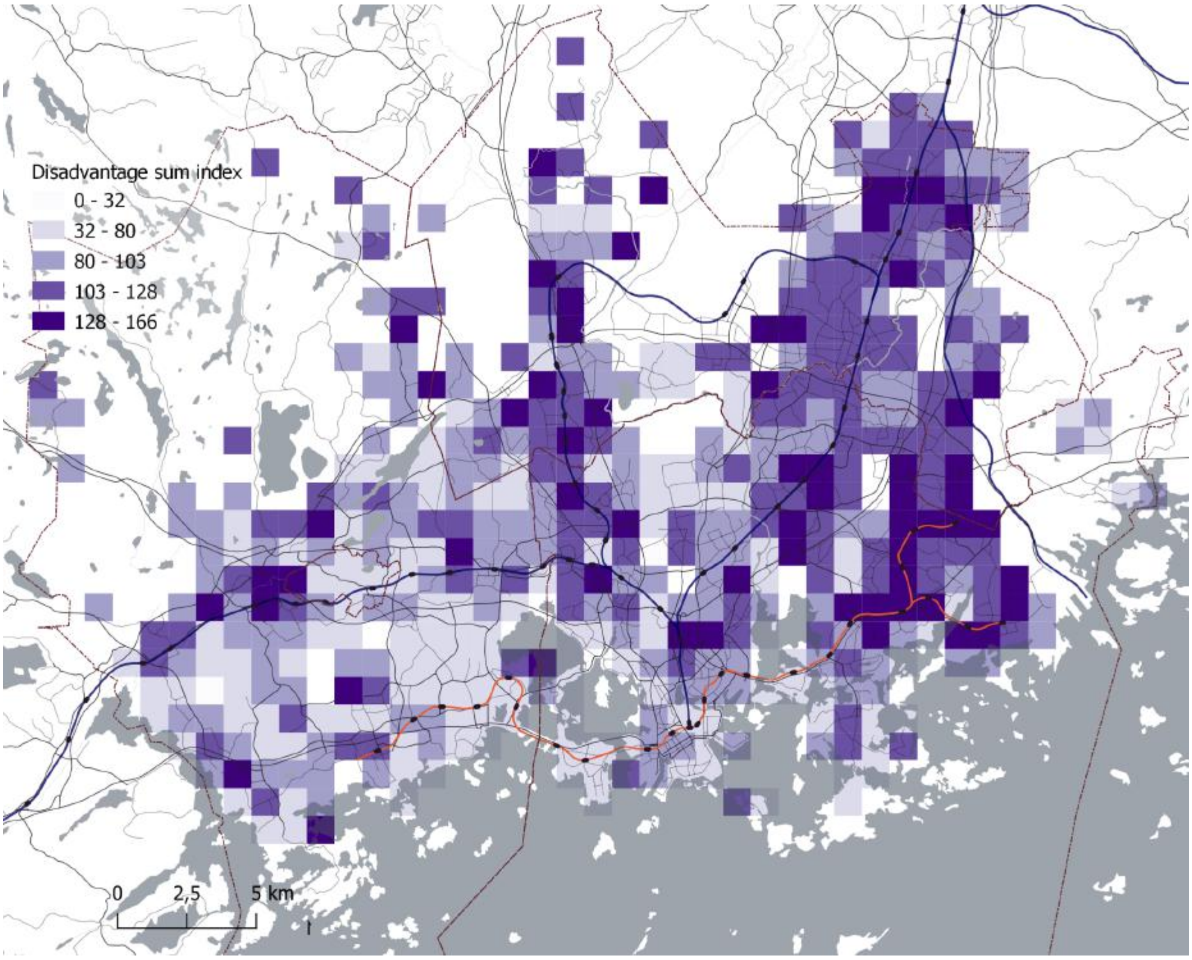


Figure 8. Disadvantage sum index presented in 1 x 1 km grid cells. Higher values indicate more disadvantage.

The patterns of socio economic differentiation can be seen from Figure 8. The disadvantage sum index visualized in the map includes variables of low-income households, unemployment rate and education level and the higher values indicate more disadvantages. The resulting patterns indicate higher values particularly in the northeastern parts of the region, although differences can be found within the whole region. Areas along rail lines and in central areas, although not including the Helsinki city center, can be identified as well as less advantaged areas. More affluent areas on the other hand are located more in the western side of the region in Espoo and more in detached housing areas. Coastal areas and the southern parts of Helsinki can be noted in this group as well.

5.2. Data

The datasets used include spatial geoinformation based data, which are mostly openly available, excluding the grid database, and can be downloaded directly from the web pages noted in the table 1. The following section describes these used datasets in more detail and table 1 furthermore presents these main datasets and their purposes in this study and other related key information of these datas.

The travel time matrix and population grid database of the 250 x 250 m resolution form the key databases of this study and are described below. In addition, an index of disadvantage was calculated based on the population grid and a process of identifying relevant sports facilities was undertaken based on national sports facility data (Lipas, 2020) and additional online sources. As such, more data was produced on top of the existing sources listed in Table 1. These data producing steps are described in the parts 5.2.2. and 5.2.3.

Table 1 furthermore notes the Helsinki region map (Helsinki Region Environmental services, 2016), which was used mainly for visualization purposes as well as for example through municipality borders aggregating data to the study area. This regional map includes several vector datasets relating to administrative divisions, land use, roads and names of sites and it is produced in cooperation with HSY and municipalities in the Uusimaa region (HSY / HRI, 2020) and maintained annually. The 2016 data was simply used due to it already being at hand.

5.2.1. Helsinki Region Travel Time Matrix

Firstly, an important dataset in the spatial accessibility analyses is the Helsinki region travel time Matrix. The travel time matrix in an openly available dataset containing precalculated travel times from 250 meters statistical grid centroids to each other grid centroid in the Helsinki Capital region (Tenkanen & Toivonen, 2020). Altogether, the around 10 000 grids cover the cities of Helsinki, Espoo, Vantaa and Kauniainen. The matrix has been calculated to the years of 2013, 2015 and 2018, from which the newest 2018 version is used in this study.

A door-to-door principle has been used to calculate travel times in the matrix. This means that the travel times include the whole travel chain; for example the changes between transportation modes and time it takes to park a car or lock a bike. This way the travel modes can be better compared with each other and represent more the actual door to door travel times. To count the travel times and distances between each grid cell, Tenkanen and Toivonen (2020) used openly available travel time data and developed tools such as MetropAccess-Reititin to count for public transportation values and intersection delay model for private car analyses. For biking the network was customized based on GPS locations of Strava sports application and for walking OpenStreetMap (OSM) provided a data source for the network and travel times. Tenkanen and Toivonen (2020) provide more detailed descriptions on how the travel times for each travel mode were calculated as well as for the technical validation and possible considerations for the data. Tenkanen and Toivonen (2020) highlight that the travel times produced in their analyses are simply estimations of reality, although the evolving methodology with algorithms and data availability has made these generalizations more accurate.

The transport modes in this dataset include walking, cycling, public transport and private car, which were all used in this study. In this data produced by University of Helsinki the public transport and private car travel times are calculated separately for morning rush hour (8.00 – 9.00) and midday (12.00 – 13.00) in a typical working day. In the analysis of this thesis, the travel times for private car were analyzed based on the rush hour and midday values separately, which both take into account the whole travel chain. For public transportation the times used were chosen as rush hour times and the times include the whole travel chain as well, although excluding the waiting times at home. Biking times in this dataset are calculated for a fast cyclist and a slower cyclist, cycling 12 km per hour – the average speed for the Helsinki bike sharing system user, including a 1 minute extra time for taking and returning the bike. The travel times for slow cyclist were used in this study. Walking time follows a simple logic as it presents the walking time from origin to destination.

To better understand the process of accessibility analyses, the format of the data should be noted. The data can be downloaded in compressed zip files which consist of 13231 text files, which have been organized into subfolders based on the first four digits in their filename. In addition, the metroaccess grid is a supporting dataset to the matrix. The grid contains grid-id’s to combine with the travel time information, hence making visualization of the travel time data possible. The grid is similar to the population grid used, which means that the travel time information can be easily used with statistical population data (Tenkanen & Toivonen, 2020).

Table 1. Datasets utilized in the thesis.

Data / material	Format	Open access	Data provider	Description	Used in this study
Helsinki Region Travel Time Matrix 2018	Vector	x	Accessibility Research Group, University of Helsinki (Tenkanen et al. 2018).	Consists of travel time text files and a metroaccess grid	Used in accessibility analyses
Population grid database 2020, 250m x 250m	Vector		Statistics Finland (2020)	Comprehensive Population grid for the whole Finland	Used in population related analyses and counting of disadvantage sum index.
Population grid database 2020, 1 km x 1 km	Vector	x	Statistics Finland (2020)	Information on total population with age groups in whole Finland	Used in visualizations
LIPAS data	Vector	x	University of Jyväskylä (2020)	Comprehensive Sports facility database of finland.	Used as a base of sports location finding
Helsinki region map	Vector	x	Helsinki Region Environmental Services (2016)	Background material such as municipality borders, roads, public transportation routes and waterbodies	Used in visualizations

5.2.2. Population grid database and Calculating of Sum index of disadvantage

The population grid database used in this study is produced in different resolutions, from which 250 x 250 meter and 1 km grids were used. The 250 x 250 population grid includes a large number of population related variables related to socioeconomics, household composition and demographics. Examples of the variables include age groups, total numbers of population, income and education levels which are thematically categorized into multiple data groups. The 250 x 250 meter grid is not publicly available, but can be used for example in research purposes. This more detailed data is used for the majority of analyses in this study. Notably, grids with under 10 persons are protected in the data and marked with -1 values. The data is produced yearly by Statistics Finland and this study uses the 2020 data sets (Statistics Finland, 2020). Notably, the age groups included in the grid database also directed the chosen age group used for this study as the 7- to 12-year-olds group was chosen.

Differently from the smaller scale grid database, the 1 x 1 kilometer population grid data can be openly downloaded from the Statistics Finland (2020) through WMS or WFS services. This dataset includes fewer variables with only demographic information and was mainly used in aggregating data and visualization of population distributions.

As for the data derived from the population grid, a sum index of disadvantage was counted based on the population grid database on 250 x 250 meter level in cooperation with Keurulainen (2021). The index includes variables relating to income, education and unemployment of the population living in the HMA. The particular information derived from the rttk includes information on the population and household amounts, lower and higher education, income groups, labor force and unemployed population. From these data sets Keurulainen (2021) notes the three key factors calculated in the index, which are: "*1) the relative proportion of low-income households (5th quintile of the data), 2) unemployment rate, and 3) share of people with no university-level degree of the labour force.".* In addition, the summed values of the previously mentioned rates were adjusted with the cities mean values to avoid distortion from the differing socioeconomic conditions of the cities.

The equation used:

(("ko_ika18y" - "ko_al_kork" - "ko_yl_kork") / "ko_ika18y" + ("pt_tyott" / "labour_force") + ("tr_pi_tul" / "tr_kuty")) / (grid cell-based citywide mean / 100

Further information on the equation and particular datasets included from the grid datasets can be found from Keurulainen (2021).

5.2.3. Supplementing and filtering the LIPAS database with web searches

The LIPAs database produced by the University of Jyväskylä (2020) acted as a base for finding the locations used by children in the looked at sports. The Lipas data provides a thorough listing of georeferenced sports facilities for the whole country, including point and line targets, such as indoor sports facilities and routes and including many descriptive variables of the features. This sports facility data has also been connected to the travel time matrix before (Heittola et al. 2020). As the research group was founded in collaboration with the LIPAS database producing University of Jyväskylä, the preliminary aim was to use this data already available. However, the iterative process of this thesis led to the initial complementation of LIPAs data of the chosen sports facilities and subsequently to the more comprehensive search of the locations used by children in the chosen sports.

The need for more detailed and accurate information on where these sports can be practiced became clear once the limitations of the Lipas data were understood. Firstly, the Lipas data provided a good first look into the possible facilities where many of these sports were undertaken. It furthermore, provided a good base for finding out about the locations of facilities, from which many were providing accurate information on the locations used by children. Nevertheless, as the first major downfall, the Lipas data does not include information on the usage of these facilities by different demographics. Therefore, the main agenda became to through web searches to look for facilities where there are organized sports activities organized for the age group of 7- to 12-year-olds in the four chosen sports.

As for the limitations of the Lipas data, although it is a dataset updated on regular bases, in some occasions the facility was not found to provide services for example due to changes in the private facilities, especially in the case of the population group in the focus of the study. Moreover, the Lipas data base generally provides information on the more distinguished sports facilities such as larger sports centers but for example many school building halls generally used by many children's hobbies are left out. Including all schools is not representative either since only some school halls are used in the sports clubs used by children. Furthermore, for example in the case of riding facilities the data sets are not usable before cleaning up since often separate buildings and fields are marked separately, when only one point is needed if there is only one riding school in these multiple buildings. Another issue is seen in the case of ball fields, which in the LIPAS database include over 700 points in the HMA, including the smallest of fields, in which small-scale football practice is possible. These small fields do not present the actual places where the organized football practices are held. Due to these issues, which would have included some form of data cleaning anyway, the identification process of children's sports locations was undertaken. Furthermore, too large numbers of point features would have posed issues in the later phases of accessibility analyses as more automated approaches would have been needed.

In addition to Lipas, the locations were mainly identified based on simple Google searching and web pages of the service providers. Google map tools and national sports associations also provided insightful information of the locations and sports clubs. The searches were done in spring 2021 and represent the situation in that time period. The approach of this search attempted to follow a similar process for each sport. Due to the differences of the sports, the process was slightly different for each and the methodology also developed in the process as better practices were found such as making use of geocoding. The following briefly describes the process and particularities for each sport.

Firstly on dance locations, the Lipas database originally identified around 70 specifically dance facilities in the study area. Some of these facilities included sports spaces used for example for yoga by adults, as dance can be done in these places as well and activities in these spaces are changing based on the service providers. To find out the places where children's organized dance lessons were organized for the chosen age group, Google- searches such as dance Helsinki or Espoo were used to find out dance schools and their locations. Larger dance schools generally had listings of places, in which the ones having classes in the chosen age group were confirmed as point features in a map. Many of the facilities were manually located or confirmed from the already existing Lipas points. Few points were even downloadable as google maps features. Consequently, 40 Lipas points were confirmed as offering children's dance classes and altogether 155 points were identified, while only including one facility per grid square.

Football facilities in the Lipas database included some football halls and artificial turf fields and a large number of different types of fields starting from small patches of gravel fields. Altogether these fields, including a couple of football stadiums, were 745 fields in the capital region. To find out which ones were used in football by children, the fields listed by FAF (Football association of finland, n.d.a. & n.d.b) were first investigated. These fields had listed street addresses for the three cities and were copied to a spreadsheet and geocoded with qgis tools to point features on a map (98 points). As the geocoding of the features did not in all cases result in correct locations, some points were manually moved or removed and new ones added since these points did not include all the locations used by the studied age group in their practices and included some extra locations. In this process FAF's listings of football clubs (Football association of finland, n.d.c.) were used to find the correct locations. This included checking the web-pages of the sports clubs to find out the fields used by the chosen age group. All in all, this process led to 155 identified locations (after cleaning up the features to maximum one facility per grid cell).

The Lipas database had marked 10 locations particularly noted as floorball arenas, but the majority of other locations where floorball can be practiced were left unmarked. Salibandy liitto (Finnish floorball federation, n.d.) had a listing of each floorball club in Uusimaa area, which I went through and selected the ones providing services for children. The locations of these sports facilities were then listed as addresses in a spreadsheet which were later geocoded in Qgis. This process furthermore included some Google searches to check that most floorball clubs were noted. As of limitations some clubs did not disclose all the practice locations of some of some groups on their websites and therefore it is possible that some locations in Espoo particularly are not included. All in all 114 grid cells were identified to contain floorball activities.

Horse riding facilities were quite well covered by lipas and due to fewer facilities were significantly less laborious to identify. This process included mainly cleaning up the Lipas data to include just one point feature per grid and per stable. Furthermore, the riding schools locations were checked to see if they offered their services to the chosen age group and Google searches were undertaken to confirm any additional locations not listed in the Lipas database. Therefore, few locations were cleaned for not operating as a riding school due to different reasons such as private use or not being operational at the time of the search. Eventually 26 facilities were identified.

5.3. Methods

The methods and data used were largely inspired by the availability of the data itself. Notably the openly available travel time matrix by University of Helsinki (Tenkanen et al. 2018) in combination with the available small scale census data (Statistics Finland, 2020) for research purposes give researchers numerous opportunities for different spatial analyses. As this thesis is written as part of the research group “*Equality in suburban physical activity environments*” the special interest lies in opportunities for physical activity and in this case children’s sports. Therefore, after the phase of finding locations of children’s physical activity in the chosen sports, the next task was to form spatial accessibility data layers containing travel time information of the closest facility for each grid cell. The steps included in this process are explained next. After that the steps undertaken for other analyses based on the formed accessibility layers and the population grid are explained.

5.3.1. Spatial Accessibility analyses

The workflow for performing the spatial accessibility analyses is visualized in Figure 9. Based on the Helsinki region travel time matrix 2018, the workflow included first data cleaning and merging of files and then using Qgis tools to find the minimum distances and finally visualizing the data. Finding travel times for the closest facilities is a technique used in accessibility studies as noted in section 3.3 and comes with certain limitations as it is simply finding travel times to closest facilities as discussed previously. Still due to its simplicity this approach was relatively easy to apply to the data used here with simple statistical and geospatial tools.

As a first step to perform the closest facility minimum travel time calculations, the data needed to be prepared. Firstly, the identified locations which were close to each other were cleaned to contain only one location per square and points in contact with each other were reduced to the one in the most centered location. This ensured that there were no overlapping grids chosen or too many grids to indicate essentially the same location. As the sports facility datasets were cleaned, the corresponding grid cell codes were found with a choose by location tool. The resulting lists of grid codes was formed and the following task was to find the corresponding travel files from the around 10 000 files categorized in the matrix database. This task included some use of a file searching tool and copying and pasting of text files to form folders with the right files, in which more automated techniques could have been useful. The next step was to combine the text files to be able to use the tool for counting the minimum values. To form these large files Qgis tools ran into different issues and therefore a simple command prompt command was used to combine the text files. These text files were then easily movable to qgis where the data was cleaned from headlines for instance.

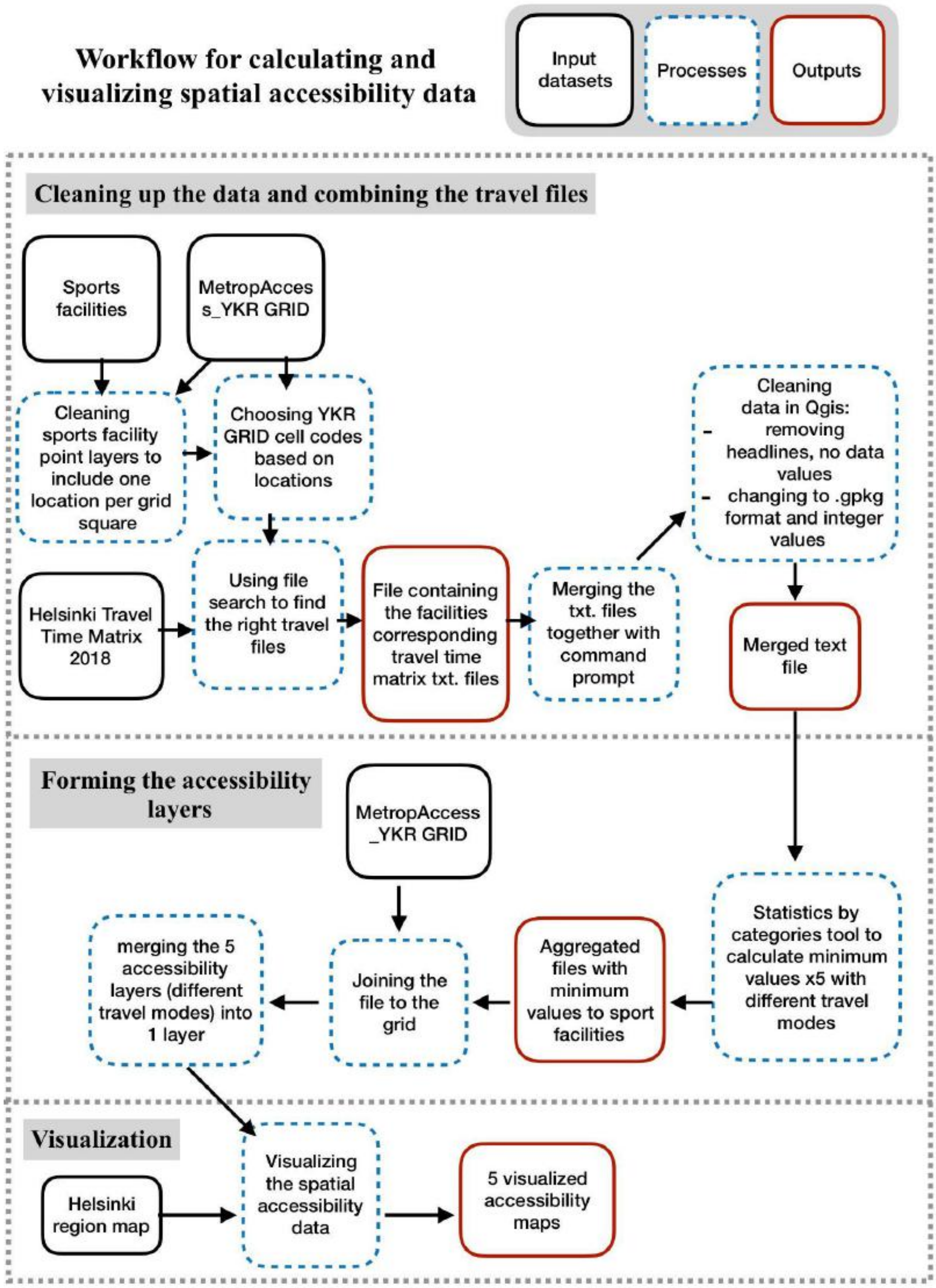


Figure 9. Phases of forming the spatial accessibility layers done for each sport separately

The following step to carry out the task of forming the accessibility layers was to use a statistics by categories tool to calculate the minimum travel time distances, which aggregates the datasets to include the smallest travel time from the large text files. This was done separately for each travel mode and sports facility type. Lastly, these files were joined to the accessibility grid and merged together to form accessibility layers which were then visualized with the Helsinki region map data.

5.3.2. Analyses with census data

Figure 10 visualizes the steps undertaken to analyze the spatial accessibility layers further and in combination with population grid data to form the final outputs of this thesis. Essentially, the methods and analyzes chosen were formed through testing of different methods in an attempt to quantify the results. As such the material collected enabled many different approaches to analyze the data from which many still could be investigated further. However, similarly to Keurulainen (2021) the method of using an index of disadvantage and a t-test proved to be a reasonable approach here. In terms of the population grid, many variables were investigated, but in the end combining the variables into one index was the most useful approach also to maintain simplicity as there were many variables already present from the spatial accessibility datas. For the independent sample's t-test, the disadvantage sum index was divided into quintiles and joined with the spatial accessibility data for the purpose of comparing the mean values between the two areas with each travel mode and sport chosen.

In addition to the t-test approach, other descriptive results were derived from the datasets. These results are presented on the right side of Figure 10. For example, amounts of sports facilities in relation to children and cumulative shares of children in spatial accessibility areas were counted. The mean travel times of all grid cells and travel modes were as well counted. Furthermore, the population grid provided data to understand the spatial distributions of the variables as important background information.

Lastly, bivariate relationships among the sum index of disadvantage and travel times were investigated through ArgGIS Pro tools. This provided information on the spatial patterns of the relationships between these variables and therefore potentially additional and explanatory information on the results of the t-test. For this approach the travel times were combined to mean values of all travel modes in each sport. This was done to simplify the analyses as well as to find potential spatial patterns encompassing all travel modes.

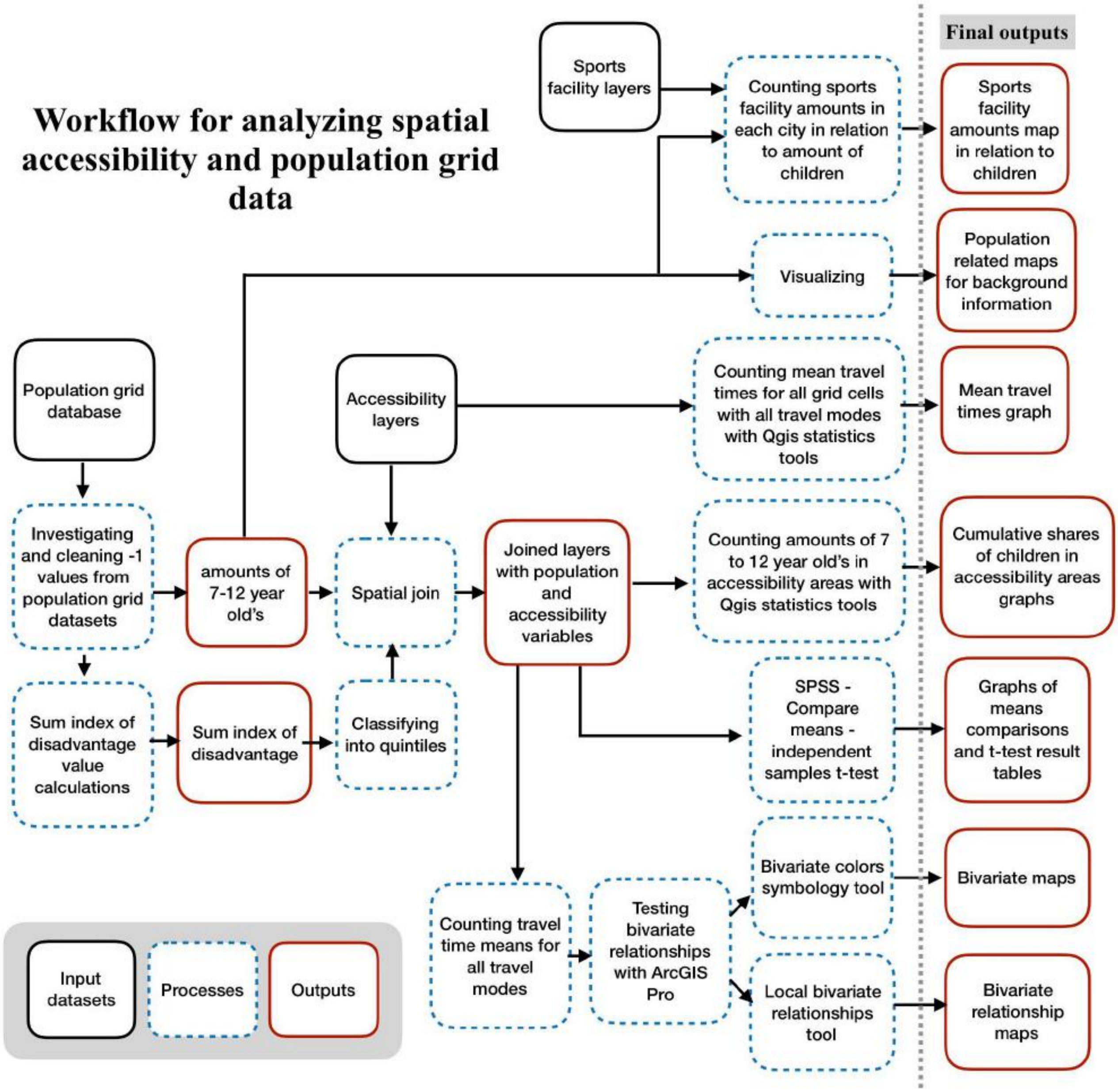


Figure 10. Workflow for forming the rest of the graphs and maps of the results section.

6. Results

6.1. Spatial patterns of the studied sports facilities

The locations of the chosen sports facilities form differentiating patterns across the study region. As the amounts of facilities in football, floorball and dance are quite high, these facilities form a quite thorough coverage in the region, while horse riding facilities are fewer and more dispersed in less central areas as can be seen from maps below. Additional information on these facilities is listed in the Appendix 25. In the following amounts of identified facilities, the spatial patterns and few key features of each chosen sport in the area are introduced.

When looking at the amount of these sports facilities in the cities of Helsinki, Vantaa, Espoo and Kauniainen (Figure 11 A), Helsinki clearly has the most football and dance facilities. Although the amounts of these facilities in relation to the amounts of 7- to 12-year-olds (Figure 11 B) are quite similar in the three large municipalities. Floorball facilities in Helsinki on the other hand are slightly fewer per child than in the other municipalities, while Espoo has more. Furthermore, dance and football facilities are quite evenly abundant in all municipalities. In the comparisons of the big three, Helsinki has the fewest horse riding facilities per child.

With its few facilities Kauniainen contrasts the other municipalities in the amounts of facilities per child. Although horse riding facilities are not found in the area, they are close by in Espoo. Due to the small nature of the municipality, the sports facility services can be considered to be intertwined with the facilities of Espoo, as the facilities can be used by residents of both municipalities regardless of municipality borders. Still the numbers can indicate good levels especially of football and floorball possibilities in Kauniainen.

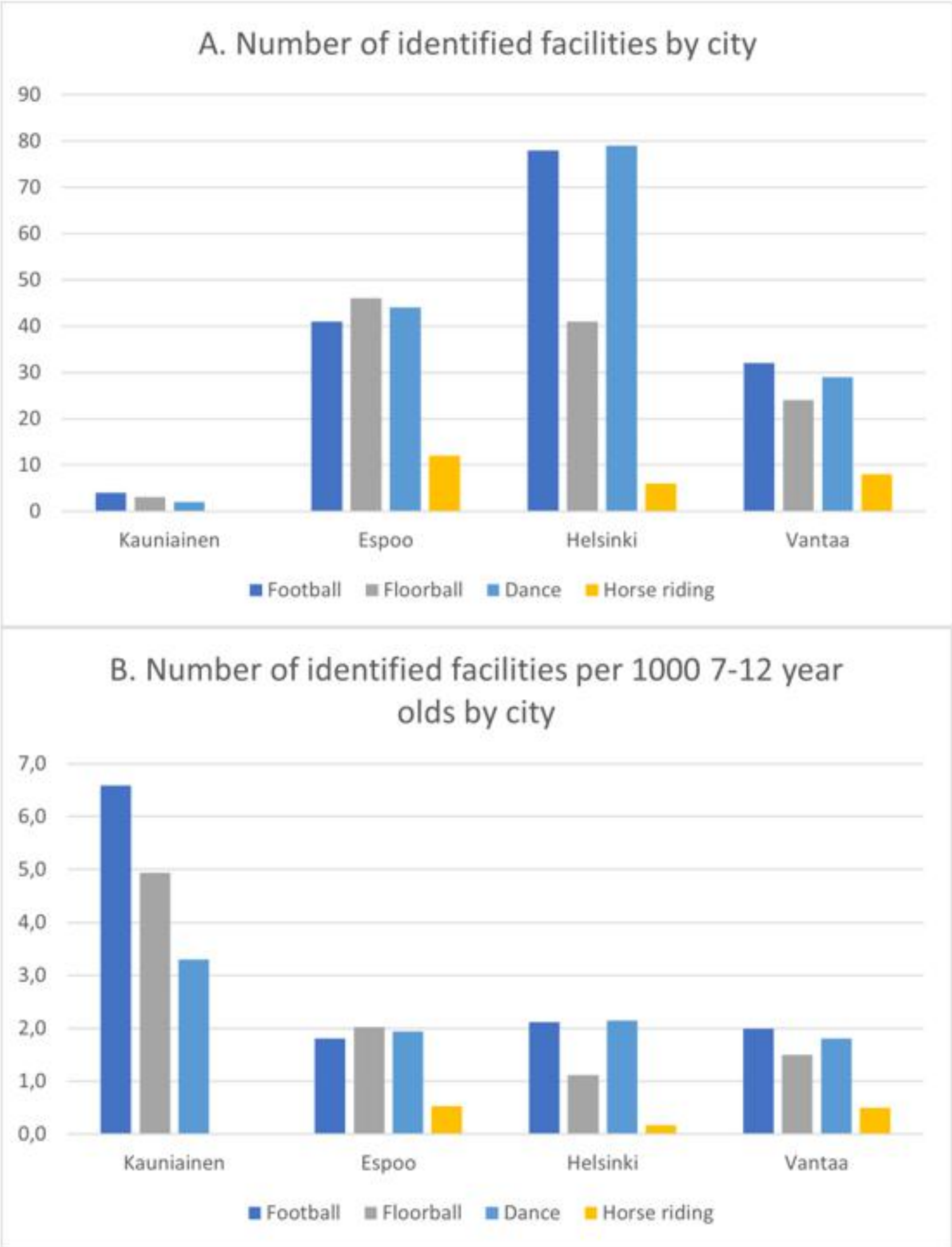


Figure 11. Amounts of identified sports facilities (or practice locations) in the studied cities in absolute numbers and in relation to amounts of children

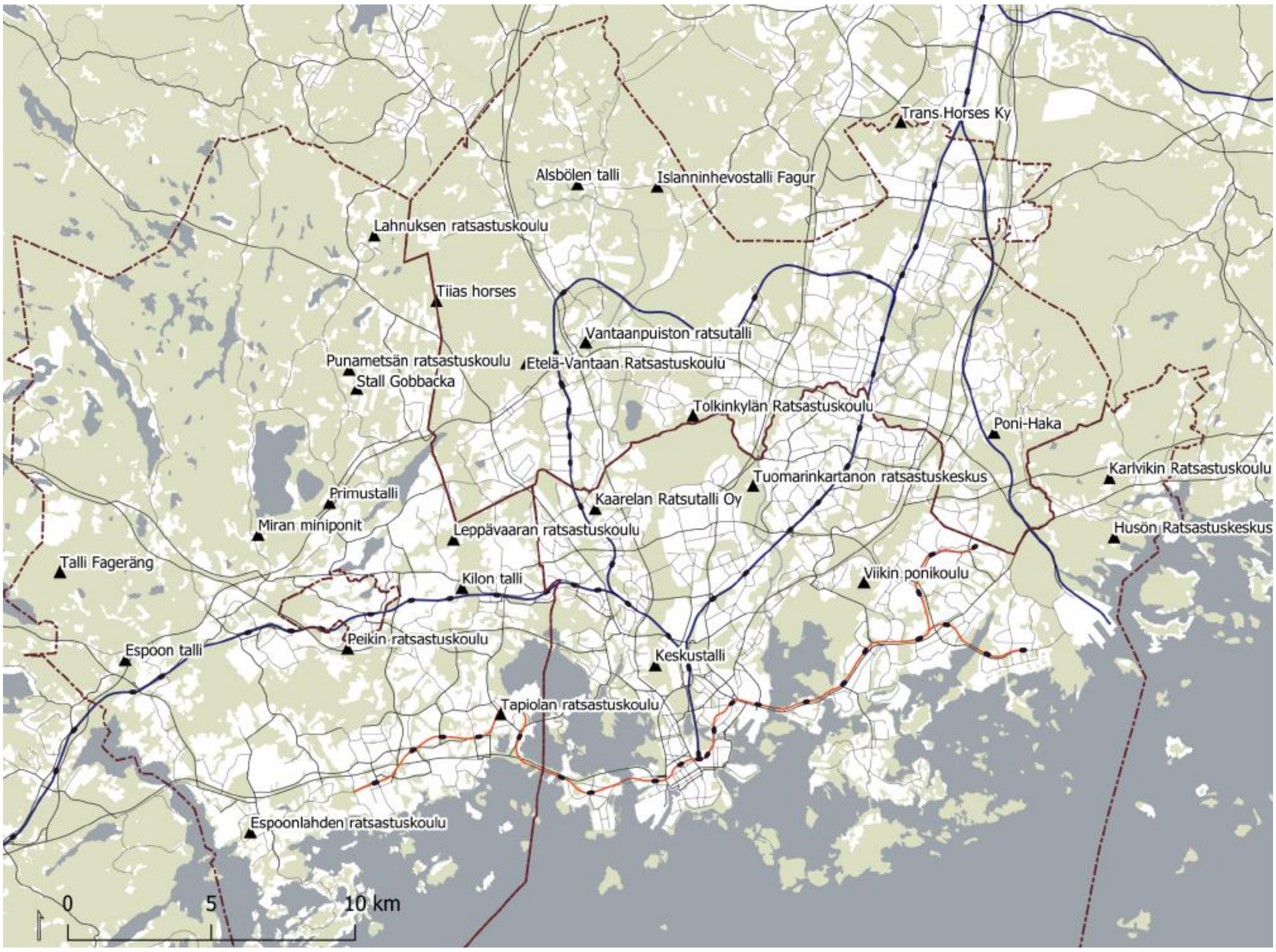


Figure 12. Horse riding facilities offering riding lessons in the Helsinki metropolitan area.

Overall, horse riding facilities are fewer compared to the other sport looked at with the most facilities being located in Espoo. The facilities required by this hobby differ significantly from the other sports looked at. The large animals need a considerable amount of land and amenities such as stables, indoor and outdoor arenas and trails. Therefore, locating these facilities in modern urban structures can be challenging and many stables are better equipped to locate in more peri urban settings, which can distinguishably be less accessible by large crowds compared to more central areas. As an example, Elgåker et al. (2012) note how even in peri urban settings scarcity of land creates conflicts between riders and landowners in the Swedish context of growing equine field. As urbanization continues, these conflicts can be noted also in Helsinki for example in the case of city-led infill developments in Tuomarinkylä and Pro Tuomarinkylä citizen movement (n.d.).

In Figure 12 the horse riding facilities, in comparison to other facilities studied, are located in less central areas with longer distances to major roads or public transportation lines and smaller proximities to natural areas. Although, especially in Helsinki and Espoo few facilities do locate in more central areas, while some facilities especially in Northern Espoo and Vantaa and the most eastern Helsinki may be more difficult to reach due to longer distances from population centers. Many of these riding facilities in close proximity to urban areas have historical roots to stay in their locations, for example the central stables of the central park built for the Helsinki Olympics (Paloheimo, 2004) and several other stables located near historical manor grounds such as the Tuomarinkylä stables (Tuomarinkylä n.d.).

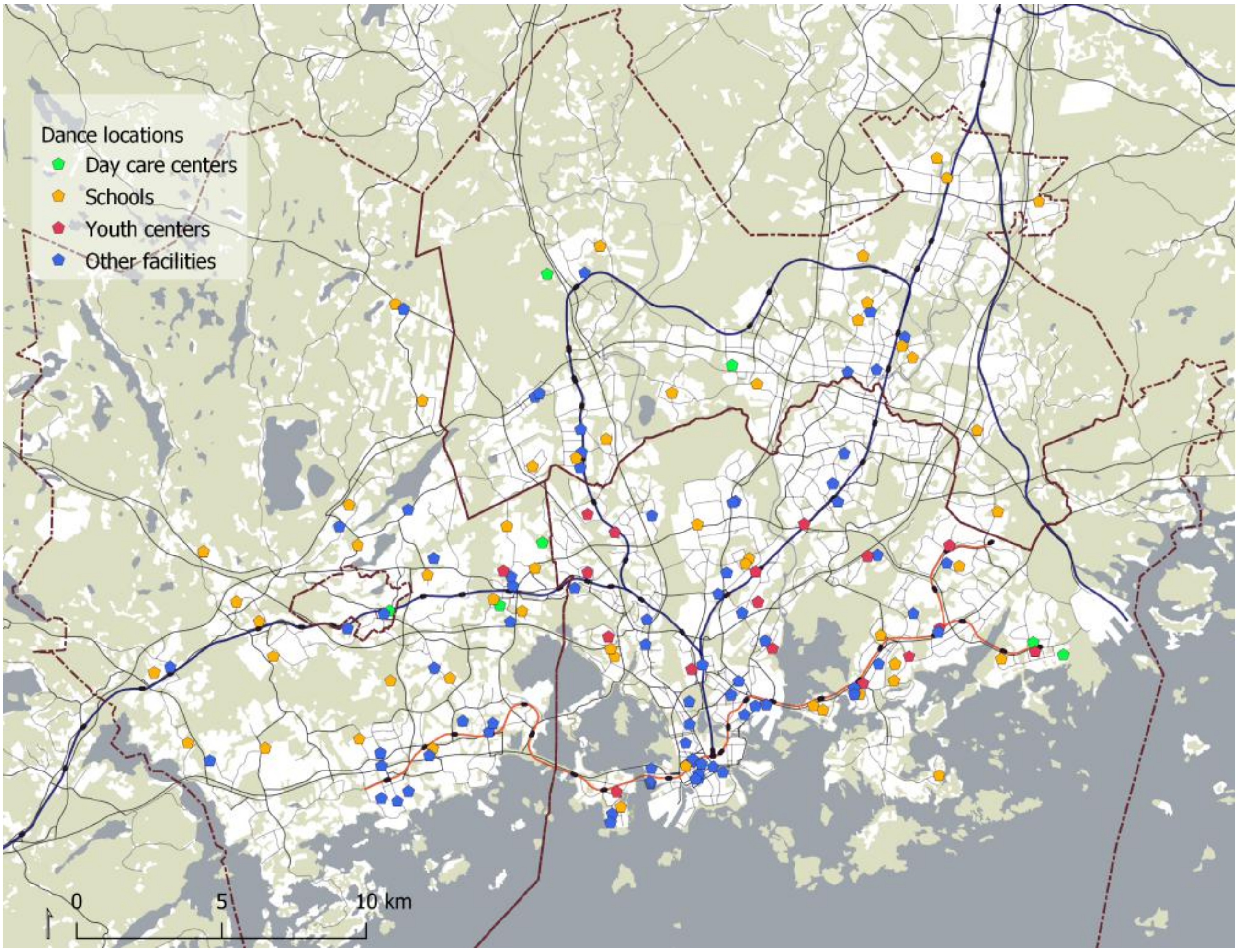


Figure 13. Dance locations according to type of facility

The searched dance locations visible in Figure 13 are especially gathered around major transportation routes such as the train lines and in the city center. Generally, dance practices do not need very large sports halls and smaller spaces in the city center or local school's halls are often sufficient, although larger more dance specific facilities exist as well. The types of spaces used by dance schools or other dance class providers, in the chosen age group, are listed in more detail in the Appendix 25. Notable from Figure 13 is the significant use of local schools and sometimes daycare centers or youth centers for dance practices especially in more suburban locations. Other facilities visible in the map include different kinds of buildings such as community or culture related buildings or other types of multifunctional sports facilities or fitness centers. These other types of facility spaces and perhaps more traditional dance facilities are located more in the city center as for example old industrial buildings such as the bread and cable factories in Helsinki have been converted to be used by dance schools.

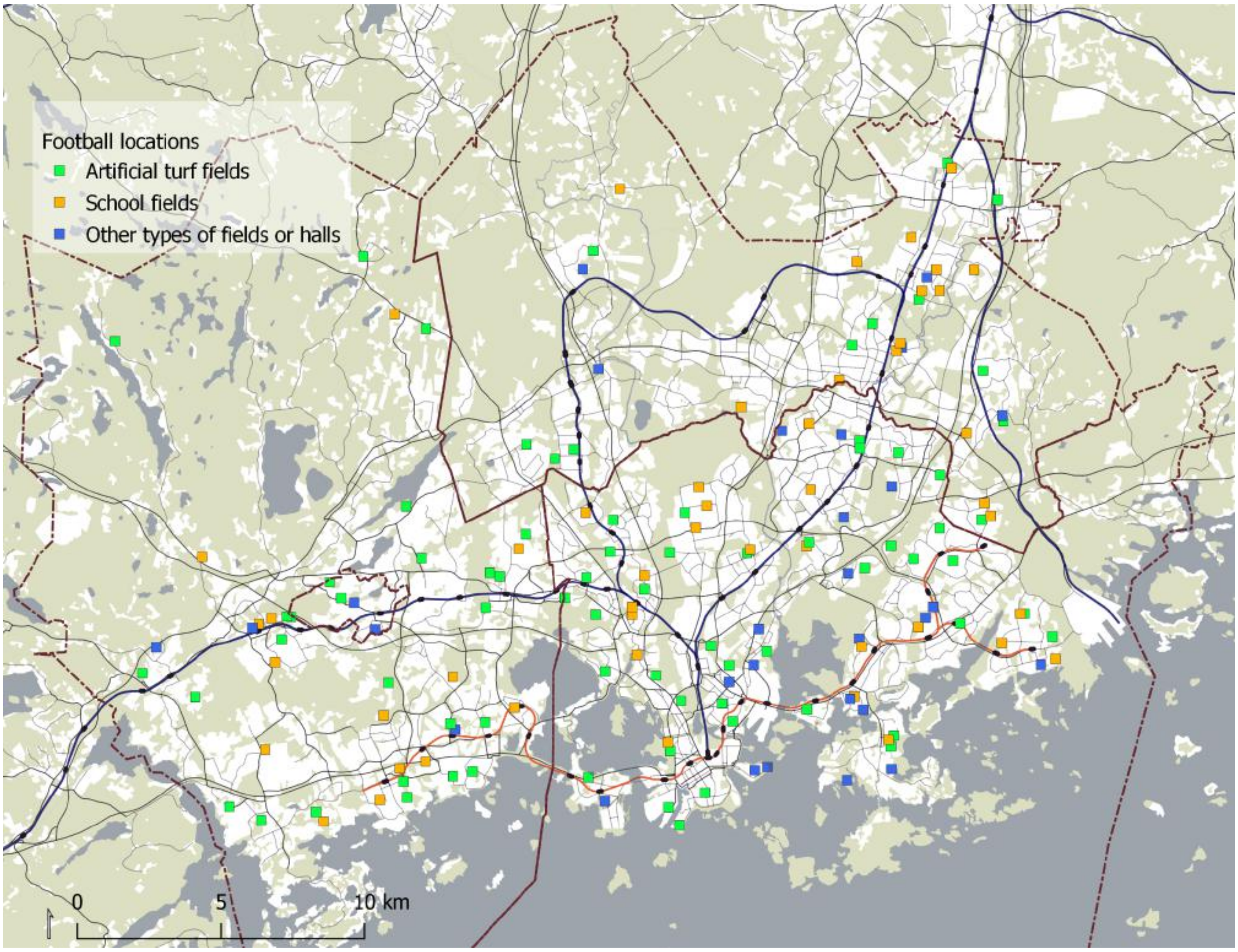


Figure 14. Identified football training locations. Many locations include multiple different types of fields or halls and only one type is marked per grid square.

Football facilities are quite well dispersed along the whole populated region, with many facilities being located inside the neighborhoods or suburbia. In comparison to floorball or dance facilities, football fields are larger and need more outdoor space. Different types of fields can be used for football practices but artificial turf fields are special conditions increasingly built for the sport and enable longer periods of outdoor practices and even year round outdoor practices. The building of turf fields has been noted also in the 'home field' program by Football Association of Finland (2011), in which sports club's home field's spatial accessibility conditions have been highlighted as well as the improved practice conditions that follow the updating of turf fields.

In the region a few halls are also used especially in winter times. Other types of fields such as ones adjacent to schools are also used as notable from Figure 14. Although, as turf fields are increasingly being built, they are now covering almost every district and are widely dispersed across the region. Larger centers of clusters of fields such as in Töölö or Käpylä are not visible from this map, due to data aggregation reasons for grid squares, although distinctive central locations for football exist in the region. Football clubs rehearsing in these locations can be viewed from Appendix 25.

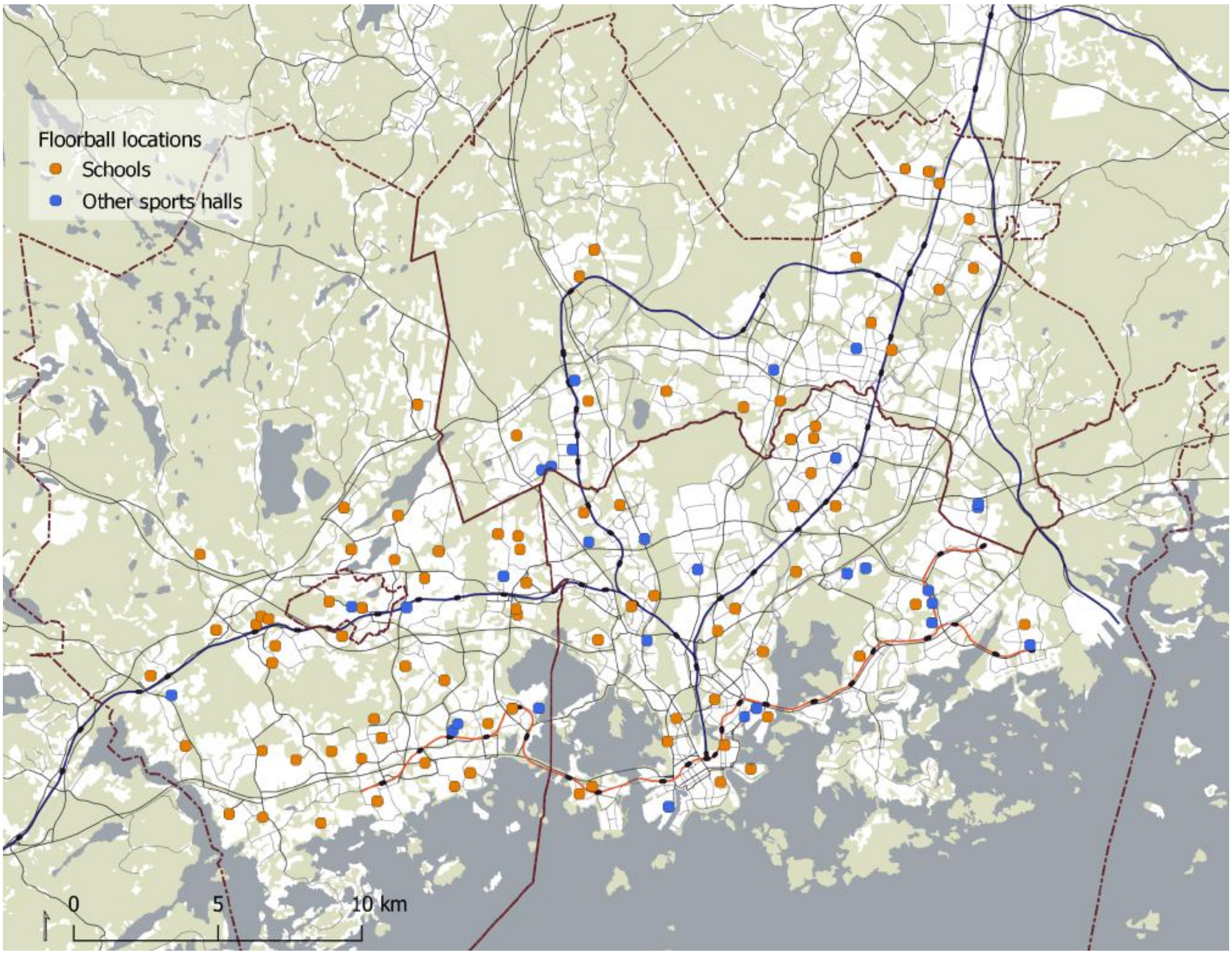


Figure 15. Floorball facilities according to school or other location type.

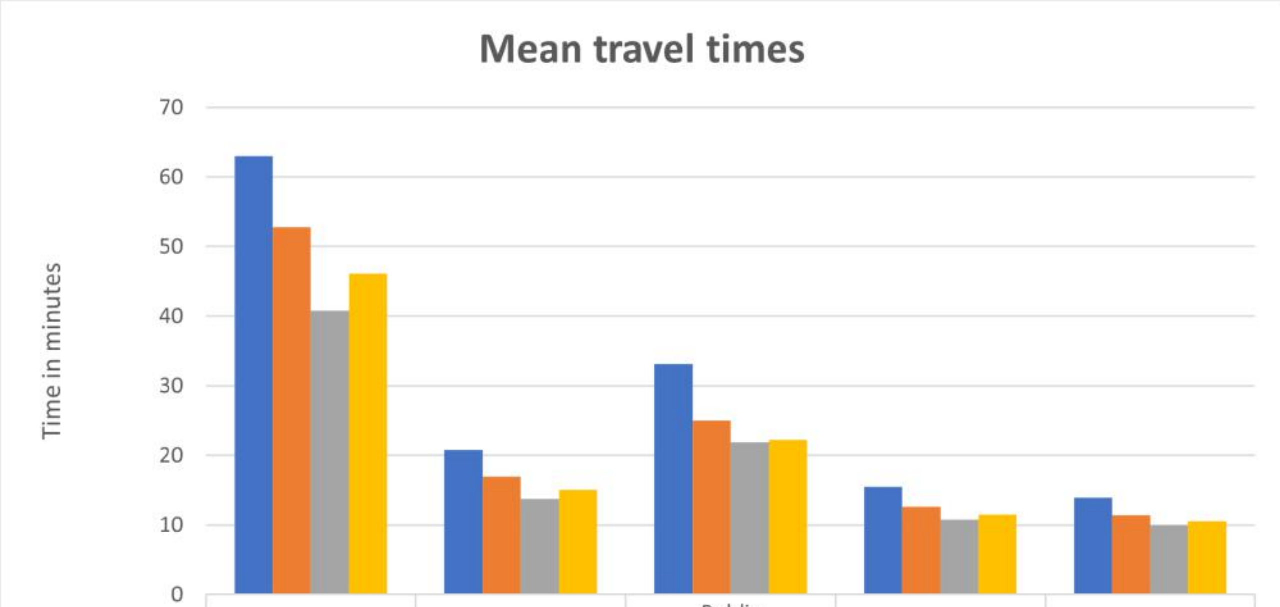
In contrast to football fields, floorball as a slightly smaller sport has slightly fewer facilities. But for example in Espoo floorball is played in more places than football. Similarly to dance, floorball does not generally require considerably large facilities and can be played in general sports halls such as school halls. Specific halls for floorball have still been built, for example in Ruskeasuo in Helsinki. In fact, this research on the facilities reveals that floorball is quite exclusively rehearsed in school halls and sports centers (Figure 15 & Appendix 25). These sports centers include different more or less multifunctional ball sport oriented centers. In Figure 15 these centers (other sports halls) are located a bit more in central locations reachable by major public transportation lines, whereas school's sports halls are located more in the suburban areas. As a curiosity some facilities such as Arena center in Helsinki and Rajatorpan kalliosuoja are built into bomb shelters and hidden vertically in the underground city structures.

6.2. Spatial accessibility and travel time comparisons

6.2.1. Comparing spatial accessibility patterns through travel time

Generally comparisons between mean travel times to closest facilities from all grid cells (Figure 16) logically indicate longest travel times for walking. In all the chosen sports, the second longest travel times are for public transportation with travel times exceeding those of biking, even though the travel times used for biking are counted for the slower biker (12 km per hour). The biking travel times are on average quite short as values are generally less than 20 minutes compared to more than 20 minutes for public transportation. Travel times with private car on the other hand indicate the lowest travel times which are similar although slightly smaller for midday compared to rush hour travel times.

When comparing the chosen sports between each other, a general pattern can be observed. In this pattern the travel times are longest for horse riding locations and second longest for floorball. Football locations have the shortest travel times and dance locations the second shortest travel times. For the three latter mentioned sports the differences are not very large especially when it comes to accessibility with a private car. Horse riding on the other hand has a larger time difference compared to the other three sports. Spatial accessibility by walking shows larger differences as well as the travel times are significantly longer. As the amounts of football and dance facilities were the largest and quite dispersed through the region, having smaller travel times can be seen as logical as well. The similar travel times between dance and floorball locations with public transportation could as well reflect the more central location patterns in the nodes of the public transportation network compared to football facilities.



	Walking	Biking	Public transportation	Car (rush hour)	Car (midday)
Horse Riding	63,02	20,81	33,16	15,47	13,91
Floorball	52,8	16,97	24,98	12,63	11,49
Football	40,83	13,73	21,88	10,81	9,95
Dance	46,136	15,023	22,284	11,50	10,53

Figure 16. Mean travel times from all grid cells to closest facilities in the Helsinki Metropolitan Area.

How the travel times vary spatially between the grids and different travel modes and sports locations can be observed from Figures 17 to 21 (all found in appendix 1-20). Generally the locational patterns (observed in section 6.1) of the chosen sports facilities locations reflect their spatial accessibility conditions as well. The fewer horse riding facilities form a differentiating pattern of spatial accessibility from the rest of the locations which form more similar spatial accessibility conditions. In general, the network of spatial accessibility of the horse riding facilities is more sparse with more areas having longer travel times, while the other chosen physical activities form a more thorough network of more accessible locations along the populated region. These better spatial accessibility conditions quite similarly reflect the travel mode chosen as can be noted when comparing the accessibility maps visible in the appendix 1-20.

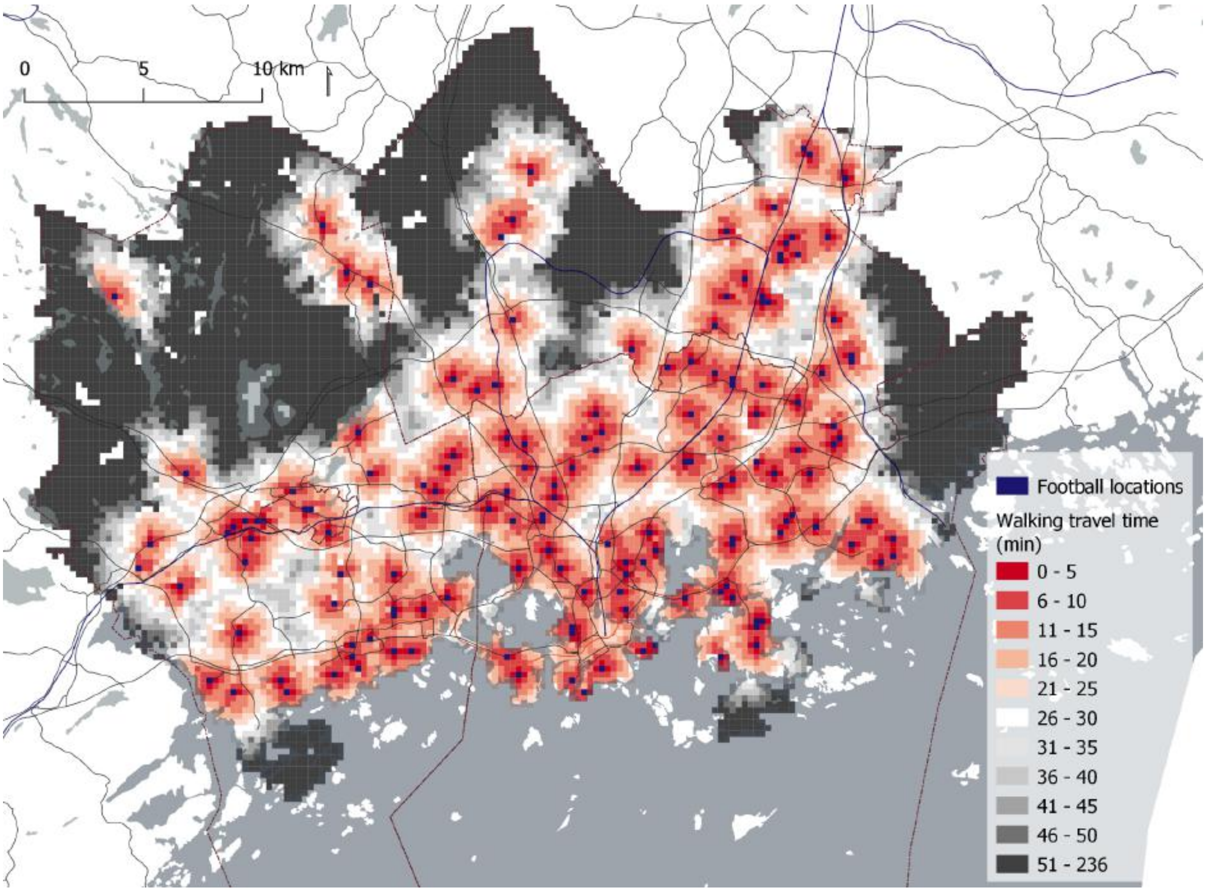


Figure 17. Walking travel times to closest football location.

The different travel modes presented here; walking, biking, public transportation and private car form differentiating patterns as well. In Figure 17 travel times to closest football locations are presented by walking. This map indicates reasonably good walking travel times for large parts of the most populated areas as most of these areas enjoy travel times not exceeding 10 or 15 minutes. Longer walking travel times exceeding 30 minutes can be found in more remote or peripheral locations such as the some coastal areas and the most eastern parts of Helsinki and the most northern parts of Espoo and Vantaa. As these areas include large parts of inhabited areas such as natural areas and the Helsinki-Vantaa Airport, many enclaves where travel times are longer within the populated urban structures can not be found. Although in these areas some small spatial differences can be found in the figure 17 as well. When it comes to the other sports locations chosen, the pattern for floorball and dance look quite similar (Appendix 2 & 4). However, for example in the case of floorball and dance absence of facilities in the most northern parts as well as in Laajasalo (large island east of the city center) indicates longer travel times in these areas. For horse riding the few facilities indicate that large areas of long walking travel times (over 50 minutes of walking time) are present, especially noting north eastern parts of the region (Appendix 3).

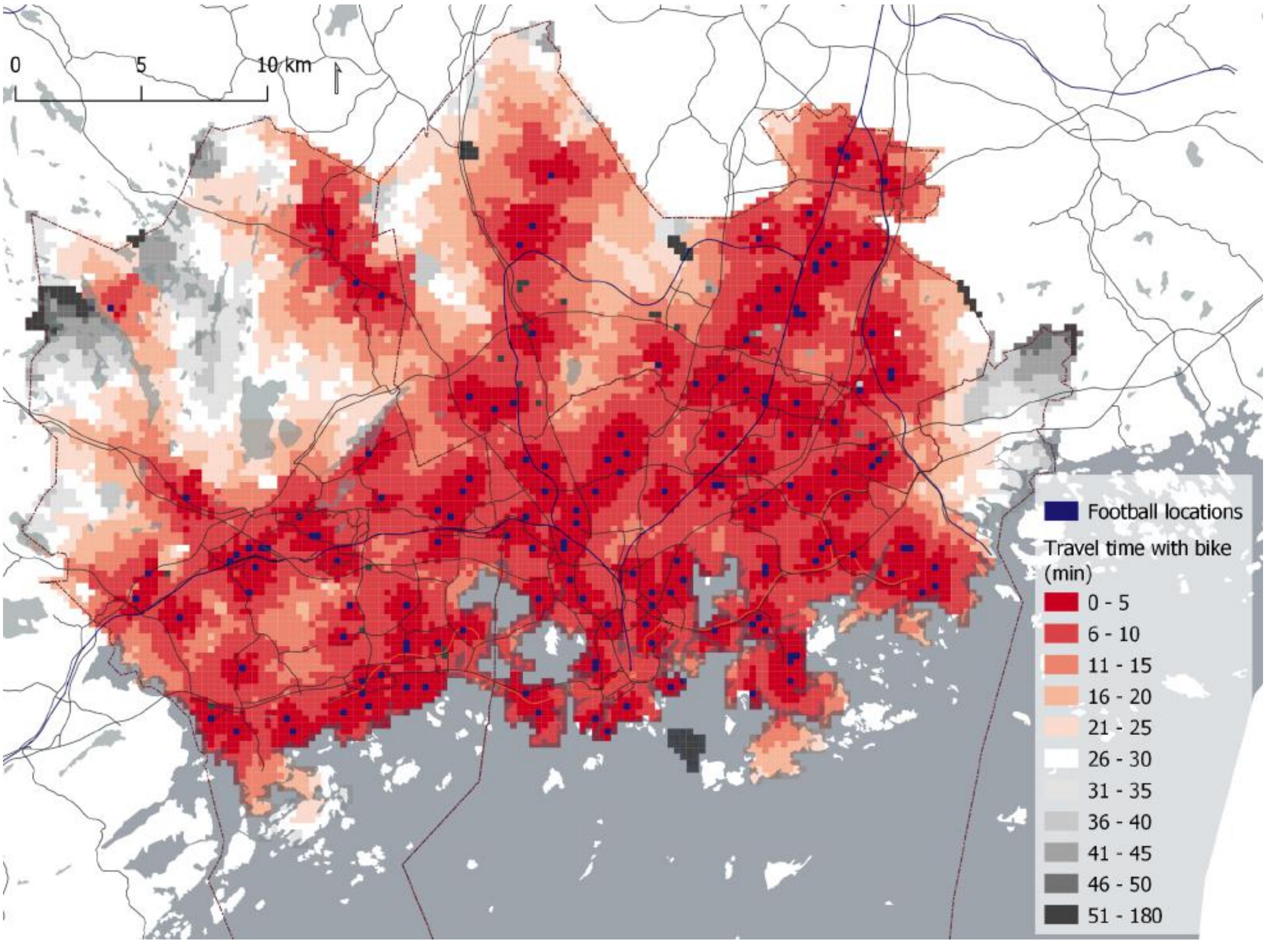


Figure 18. Biking travel times to closest football location

Compared to walking, biking travel times form different spatial accessibility conditions as visible from Figures 18 and 19. As noted before, the mean travel times highlight reasonably low travel times for biking, which can be seen in figure 18 presenting the travel times to closest football facilities by biking. Accordingly, a significant portion of the populated areas reach the closest facilities in less than 5 or 10 minutes. Compared to walking travel times in Figure 17 this is a significant improvement in travel times and biking can be noted as a competitive travel mode with other faster travel modes. Again, floorball and dance locations indicate similar spatial accessibility conditions (Appendix 6 & 8), with only small changes with more peripheric locations having slightly longer travel times. Furthermore, in the case of horse riding facilities (Figure 19) most of the study area can be reached in 30 minutes and especially good spatial accessibility conditions by biking can be found in the central and more western parts of the whole region, while coastal areas, north eastern and north western parts have longer travel times.

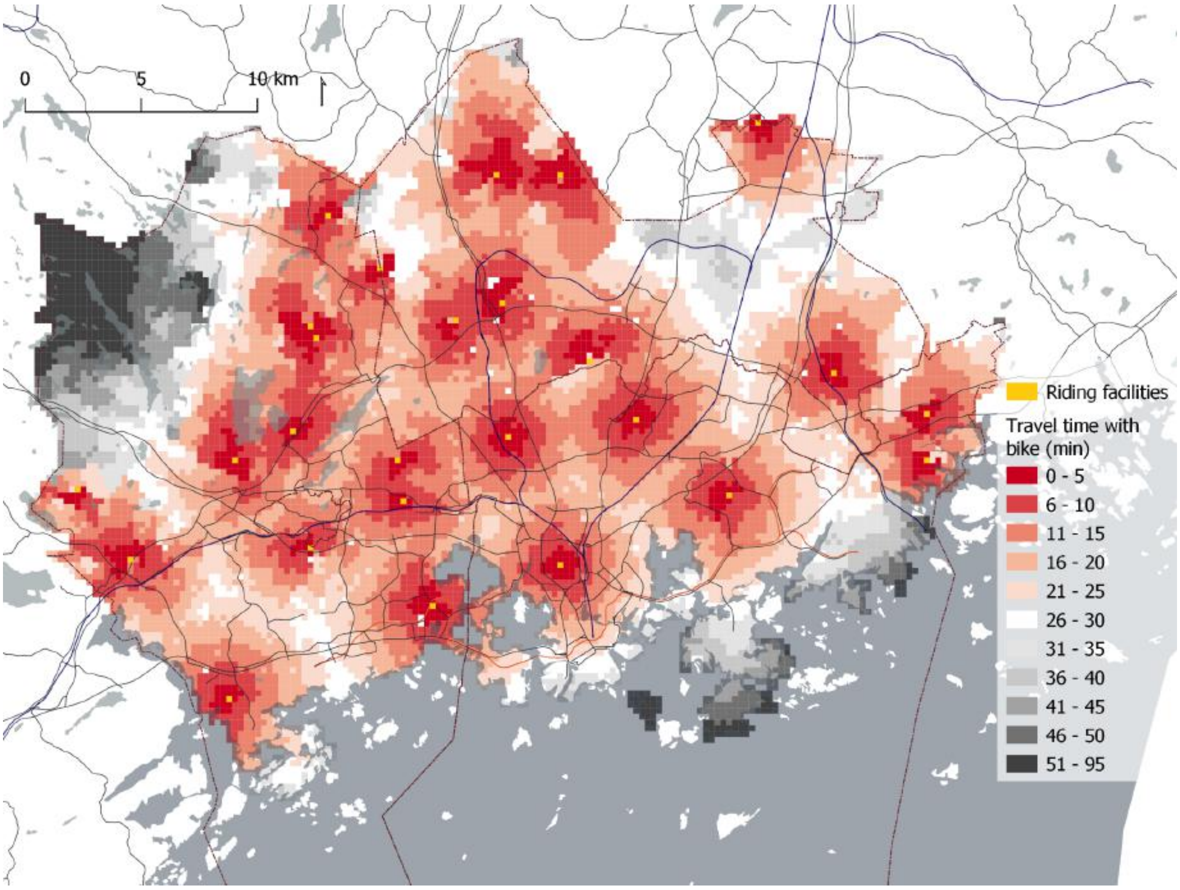


Figure 19. Biking travel times to closest horse riding location.

Public transportation accessibility forms again differentiating patterns of spatial accessibility. In these patterns branches of lower travel times can be observed along the transportation network, which are also visible in the case of dance facilities (Figure 20). In this case most of the populated areas reach their closest facility in less than 20 minutes and longer travel times of more than 30 minutes can be found mostly in unpopulated areas. This pattern is similar for football and floorball (Appendix 9 & 10). For horse riding (Appendix 12) the travel times with public transportation are longer and longer travel times of more than 30 minutes can be found in many enclaves as well as travel times longer than 50 minutes for example in southwestern Helsinki. These longer travel times can be considered to reflect the locations of horse riding facilities further away from major public transportation routes in comparison with the other sports in question.

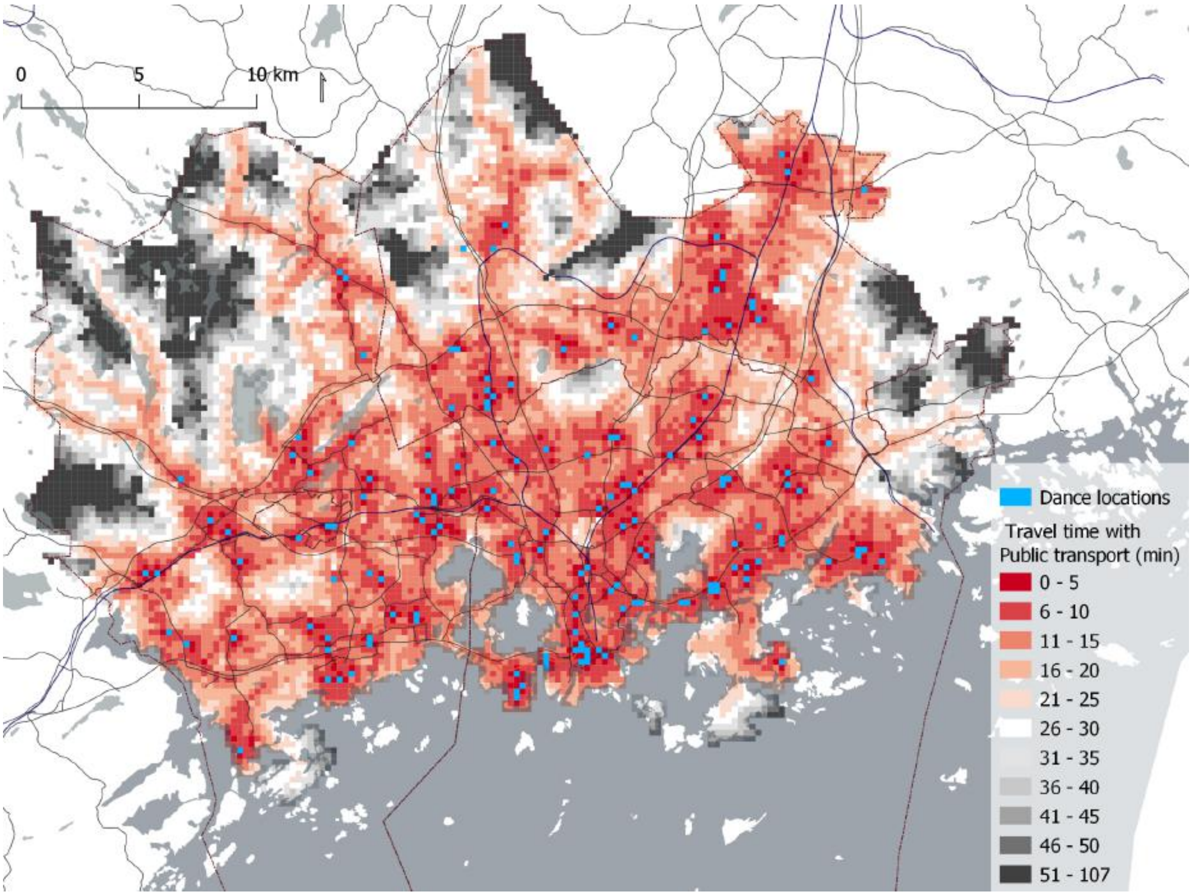


Figure 20. Public transport travel times to closest dance location.

Travel times by private car form by far the best spatial accessibility conditions. As visible from Figure 21, presenting travel times to closest floorball locations, large areas are reached within 10 minutes of driving and by 20 minutes almost all populated areas can be reached and even the most peripheral locations of the region can be reached within 36 minutes. Travel times in rush hour and midday are quite similar indicating only slightly smaller travel times for midday (Appendix 13-20). In these figures, the differences between floorball, dance and football are small as well. Even for horse riding locations travel times with car longer than 25 minutes are only present in few populated areas mainly in the most southern and southeastern Helsinki.

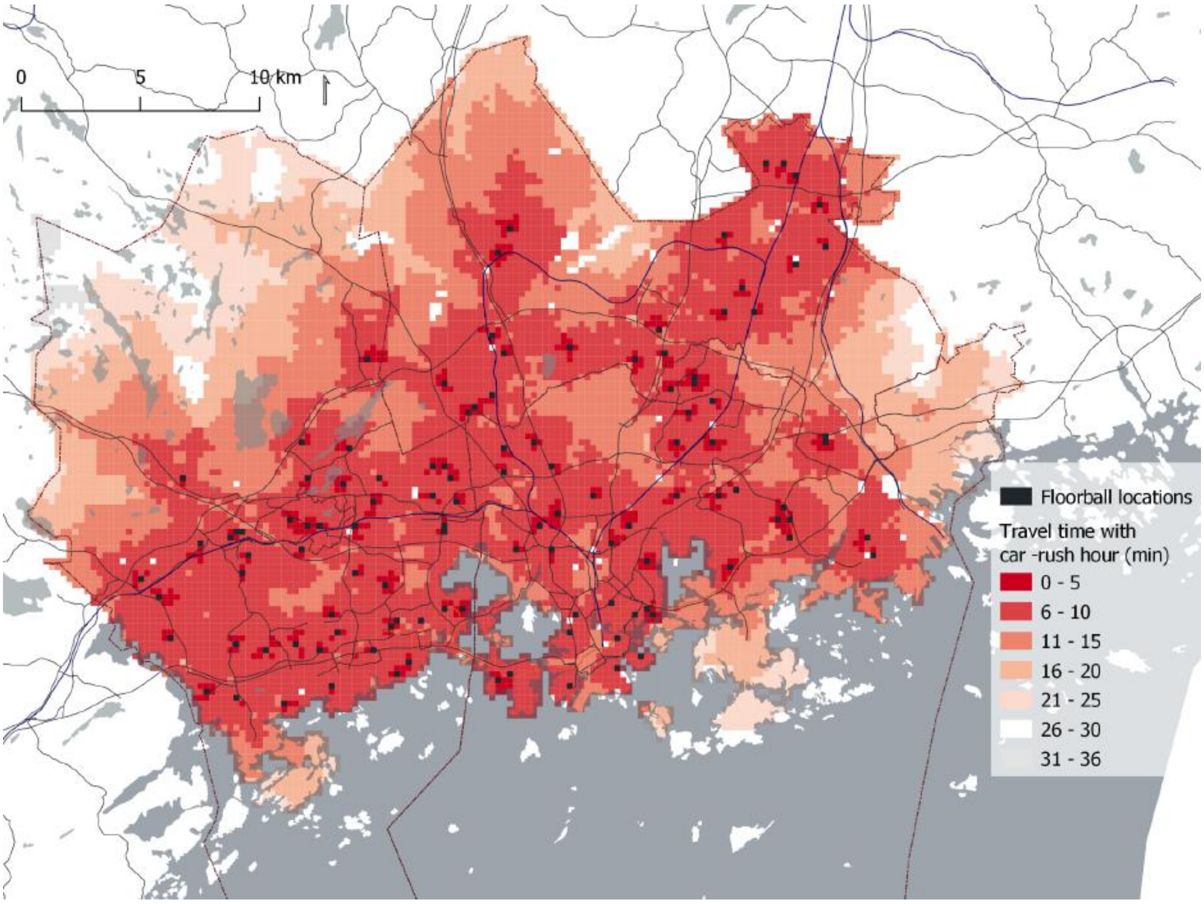


Figure 21. Private car (rush hour) travel times to closest floorball location.

6.2.2. Travel time comparisons in relation to children reached

To find out how the travel times presented above are connected to the amounts of children (7- to 12-year-olds particularly) living in the study area, cumulative amounts (percentages) of children were counted for each travel time interval of 10 minutes starting from the 5 minute time point. Figure 22 presents these shares of children living in these zones by the type of facility and for easier comparison between different facility types Figure 23 presents these numbers separated by travel mode.

First to compare the travel modes, Figure 22 indicates a similar sequence as observed before with walking as a travel mode reaching the least amount of children in shorter travel times and public transportation placing as the following travel mode. Traveling by bike on the other hand reaches the most children at first as around 50 percent of children live within five minute biking time of the nearest dance, football and floorball facility. Subsequently, the shares of children living within more than 15 minutes of biking travel time are similar to car accessibility as nearly 100% of children are being reached past the 15 minute mark. This pattern of steeply rising shares of children is similar for these three sports of floorball, football and dance, with only slightly smaller values for floorball.

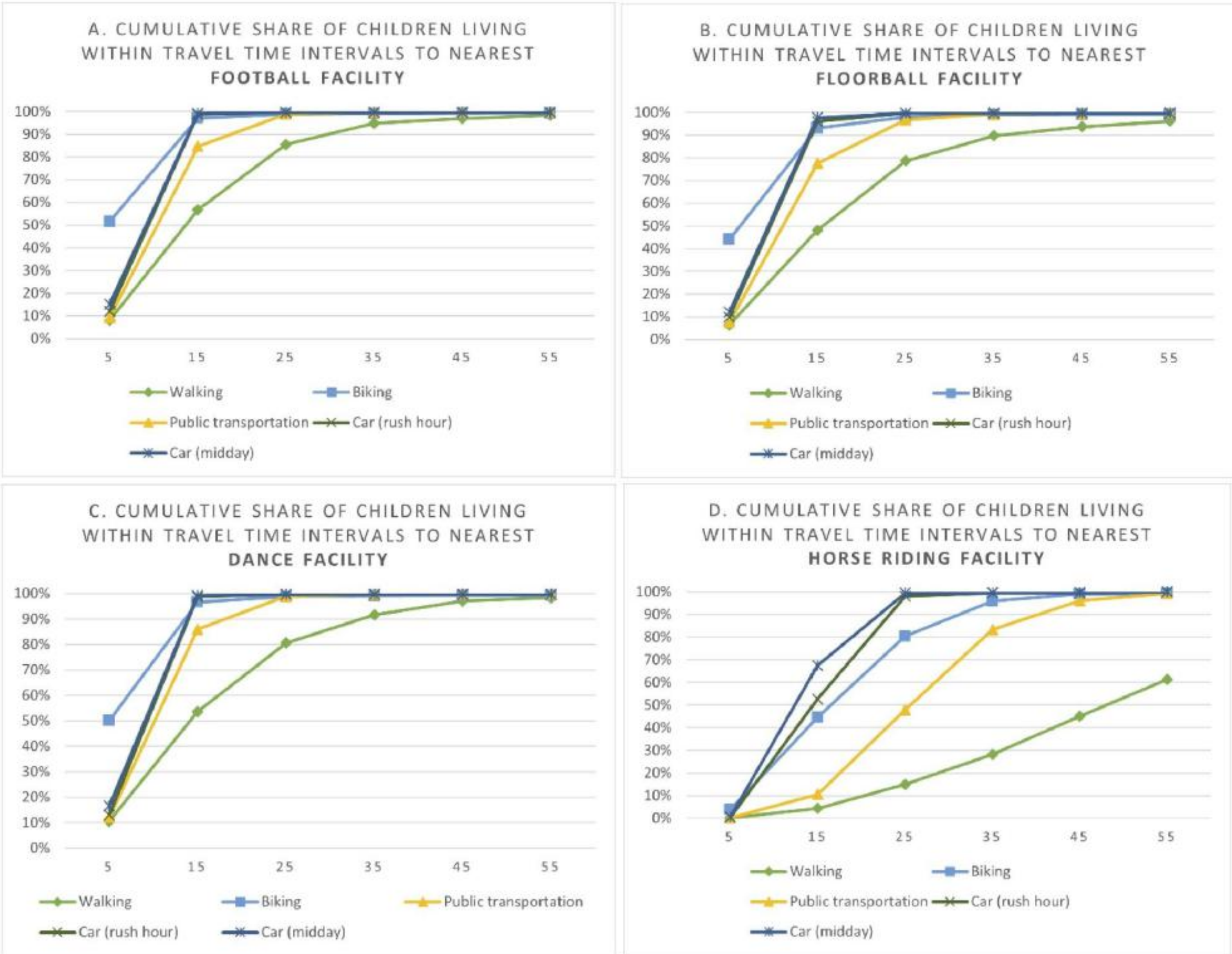


Figure 22. Cumulative shares of children (7- to 12-year-olds) living within travel time intervals of the chosen sports facilities

For horse riding the pattern is different as less children live within especially the shorter travel time areas. For example with private car nearly all children are reached in 25 minutes whereas this number is 15 minutes for the other sports. As another example, more than 80 percent of children live within 15 minutes of closest dance facility by public transport, whereas within the same travel time to horse riding facility only around 10 percent of children live in these areas and a similar level of 80 percent of children is only reached after 35 minutes of travel time with public transport. This difference between the sports is better illustrated in Figure 23, in which the figures A, B, C and D indicate smaller shares of children living within the travel times intervals to the closest horse riding facility. This difference is largest for walking and public transportation. The rest of the sports on the other hand, again follow remarkably similar patterns with car and bike travel modes reaching the most children with smallest travel times.

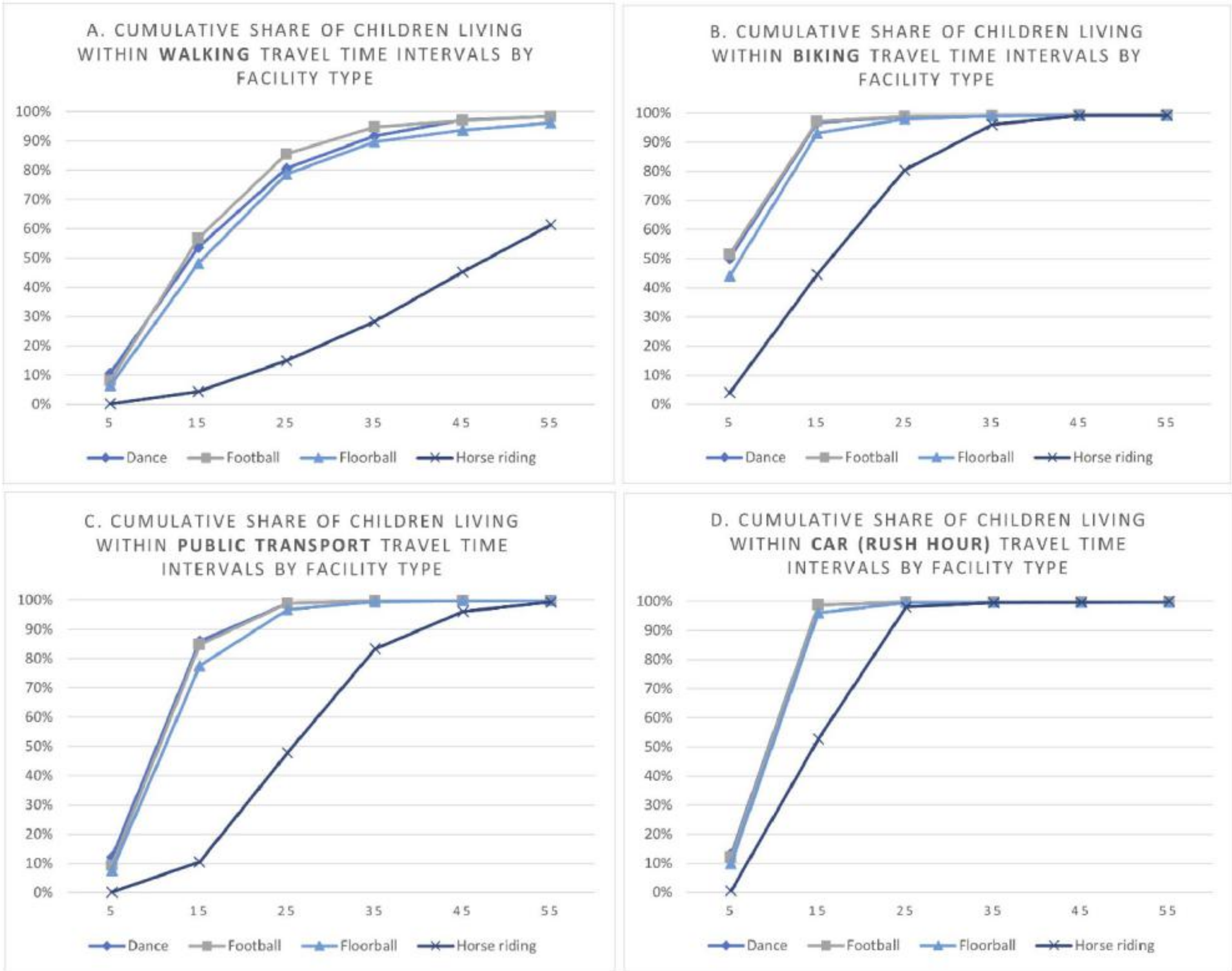


Figure 23. Cumulative shares of children (7- to 12-year-olds) living within travel time intervals of the chosen sports divided by transportation mode.

6.3. Comparisons of spatial accessibility in relation to the disadvantage index

To research the connection between the spatial accessibility conditions and socioeconomic factors an independent samples t-test (student's t-test) to compare mean values between travel times in two different areas was performed. These two areas are the first and the fifth quintile of the disadvantage sum index (all sum index values are presented in Figure 8 and quintiles in Figure 24). The quintile values are formed through dividing the sum index of disadvantage into 5 equally numbered classes. The first quintile presents smaller values of the disadvantage sum index, which indicate less disadvantage and therefore more advantaged areas socioeconomically. Larger values (the fifth quintile) on the other hand indicate more disadvantage.

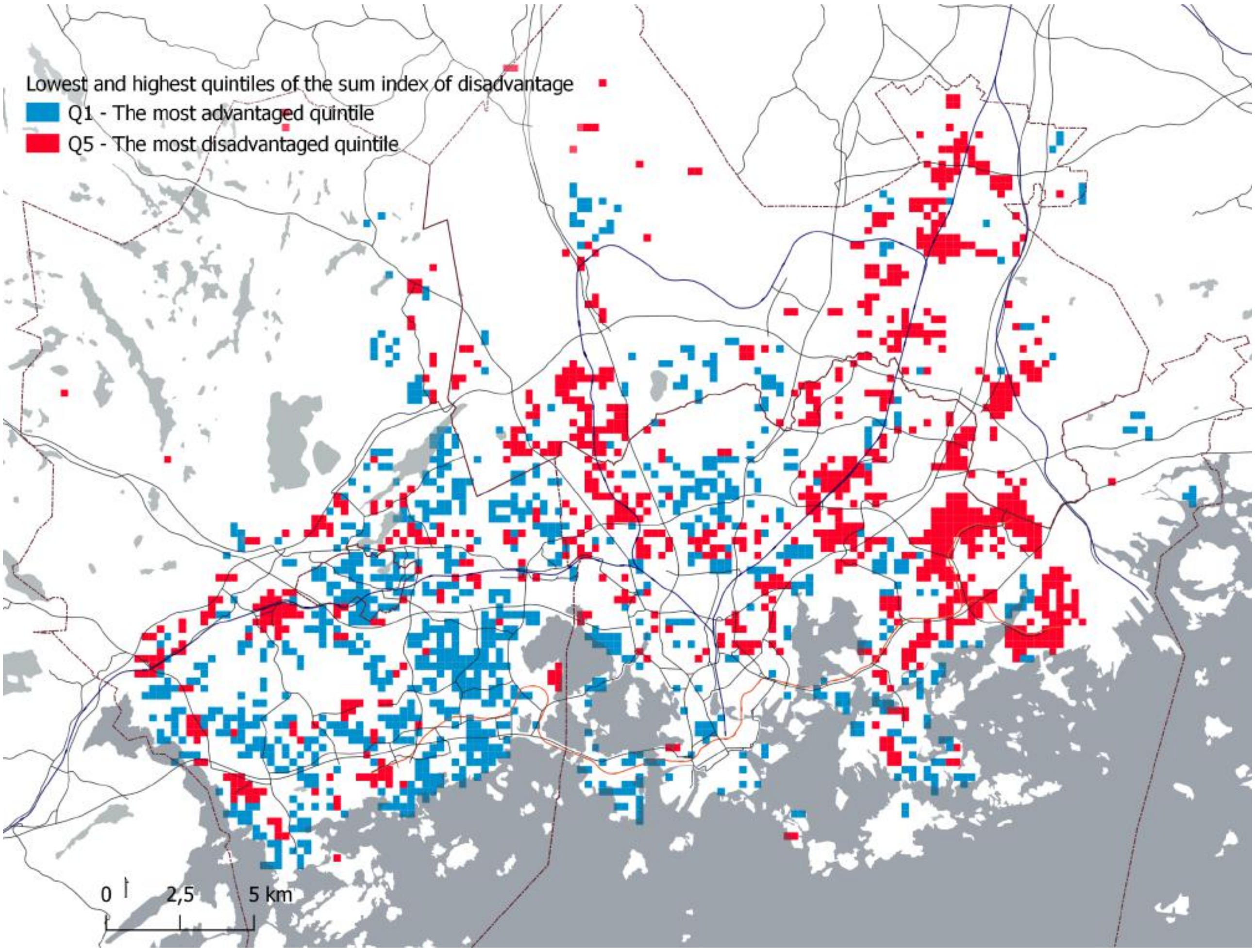


Figure 24. The least disadvantaged (quintile 1) and the most disadvantaged (quintile 5) of the disadvantage index presented on the grid cells.

Table 2. Results from the independent samples t-test.

				Q1 n = 987		Q5 n = 989		(Q1-Q5)
Football	t	df	p-value	mean (minutes)	SD	mean (minutes)	SD	Difference (minutes)
Walking	7.96	1853	<0.001	21.09	15.4	16.16	11.9	4.93
Biking	2.45	1974	0.014	7.52	6.9	6.58	9.9	0.94
Public transportation	11.36	1923	<0.001	13.62	5.7	10.90	4.9	2.72
Car (rush hour)	8.27	1974	<0.001	8.81	2.8	7.78	2.8	1.04
Car (midday)	8.72	1974	<0.001	8.13	2.5	7.17	2.4	0.96
Horse riding								
Walking	-3.89	1972	<0.001	48.06	24.7	52.45	25.5	-4.39
Biking	-3.30	1967	<0.001	16.62	8.6	17.94	9.1	-1.31
Public transportation	0.26	1974	0.794	26.78	10.3	26.67	9.2	0.12
Car (rush hour)	-2.64	1974	0.008	14.62	4.9	15.18	4.7	-0.56
Car (midday)	-2.39	1974	0.017	13.04	4.1	13.47	3.9	-0.43
Dance								
Walking	2.29	1973	0.022	19.74	14.2	18.28	14.2	1.46
Biking	2.03	1972	0.042	7.06	5.1	6.59	5.2	0.47
Public transportation	8.73	1974	<0.001	12.82	5.5	10.71	5.2	2.11
Car (rush hour)	4.03	1946	<0.001	8.55	2.7	8.03	3.1	0.52
Car (midday)	4.62	1947	<0.001	7.90	2.4	7.37	2.7	0.52
Floorball								
Walking	2.37	1974	0.018	22.27	19.2	20.22	17.1	1.94
Biking	1.91	1974	0.056	7.92	6.5	7.38	6.5	0.54
Public transportation	6.43	1861	<0.001	14.06	7.4	12.14	5.8	1.93
Car (rush hour)	1.81	1974	0.071	8.96	3.8	8.67	3.4	0.29
Car (midday)	2.33	1950	0.02	8.22	3.2	7.90	2.9	0.32

Table 2 presents the results from the independent samples t-test. In these results many statistically significant differences were found. This means that the mean travel time values significantly differed between the most advantaged and least advantaged quintiles. The mean travel times observed here differ from the mean travel times in Figure 16 as the travel times are counted only for the grid cells of least and most advantaged index values which are nearly 1000 cells for both index quintiles.

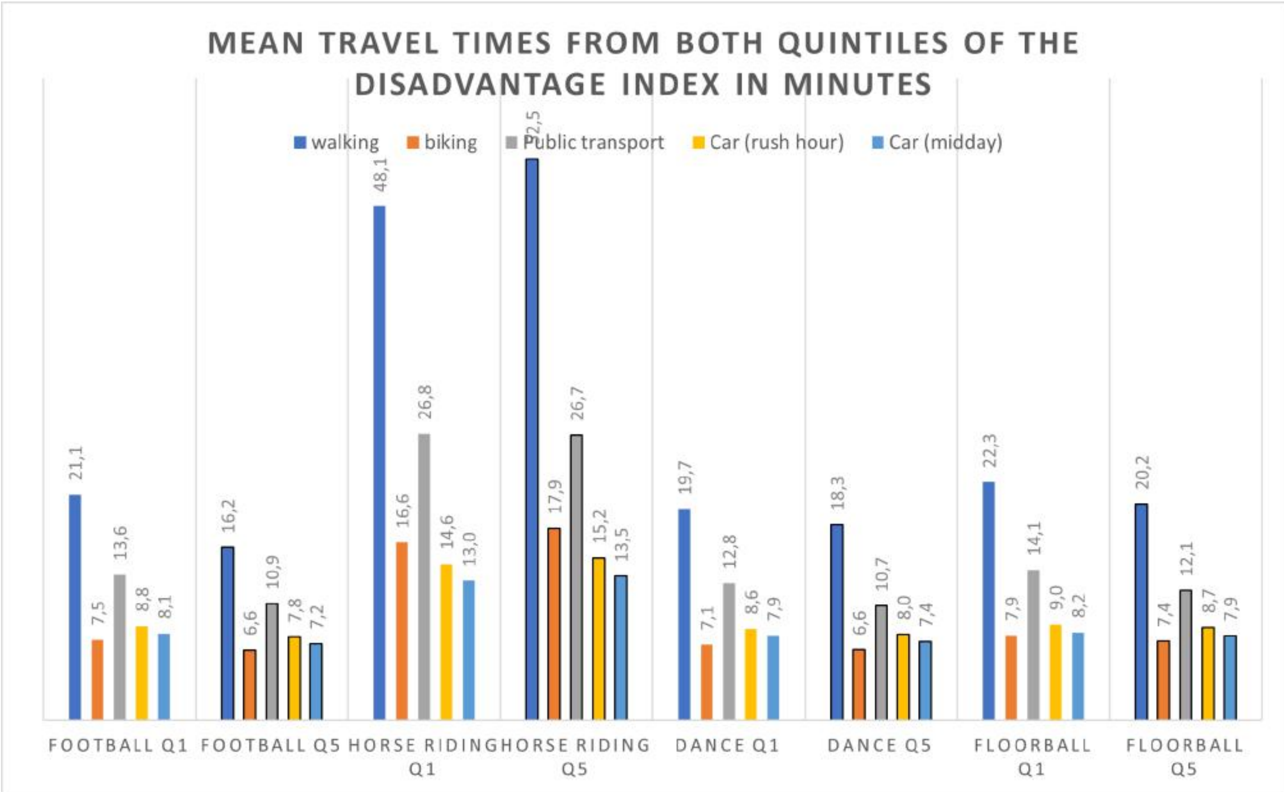


Figure 25. All mean travel times from quintiles 1 and 5 of the disadvantage index.

Figure 25 presents all of the mean travel times from the most advantaged and disadvantaged quintiles and moreover Figure 26 illustrates the travel time difference between these means, in which larger values indicate shorter travel times for the more disadvantaged quintile. In the first Figure 25 differences between the quintile areas are seemingly small, but small differences do appear and are better visualized as a difference in Figure 26. Still notable from Figure 25, for all types of facilities overall the mean travel time values to closest facilities are under (or over for horse riding) 10 minutes with private car and biking travel modes from both quintiles. In the case of public transport the mean times are between 10 and 27 minutes and walking travel times are generally around 20 minutes with an exception of travel times to horse riding facilities, which are longer.

When looking at the differences between these means in the most advantaged and disadvantaged quintiles, Figure 26 highlights a few values, which indicate a larger travel time difference. The most difference in mean travel times are found in walking travel times towards football and horse riding facilities. In addition to walking travel times, travel times by public transportation have a larger time difference although not for horse riding. As for the direction of the differences, football, floorball and dance facilities all indicate a general direction of shorter travel times from the more disadvantaged quintile areas. Horse riding travel times however, indicate shorter travel times for the more advantaged quintile areas.

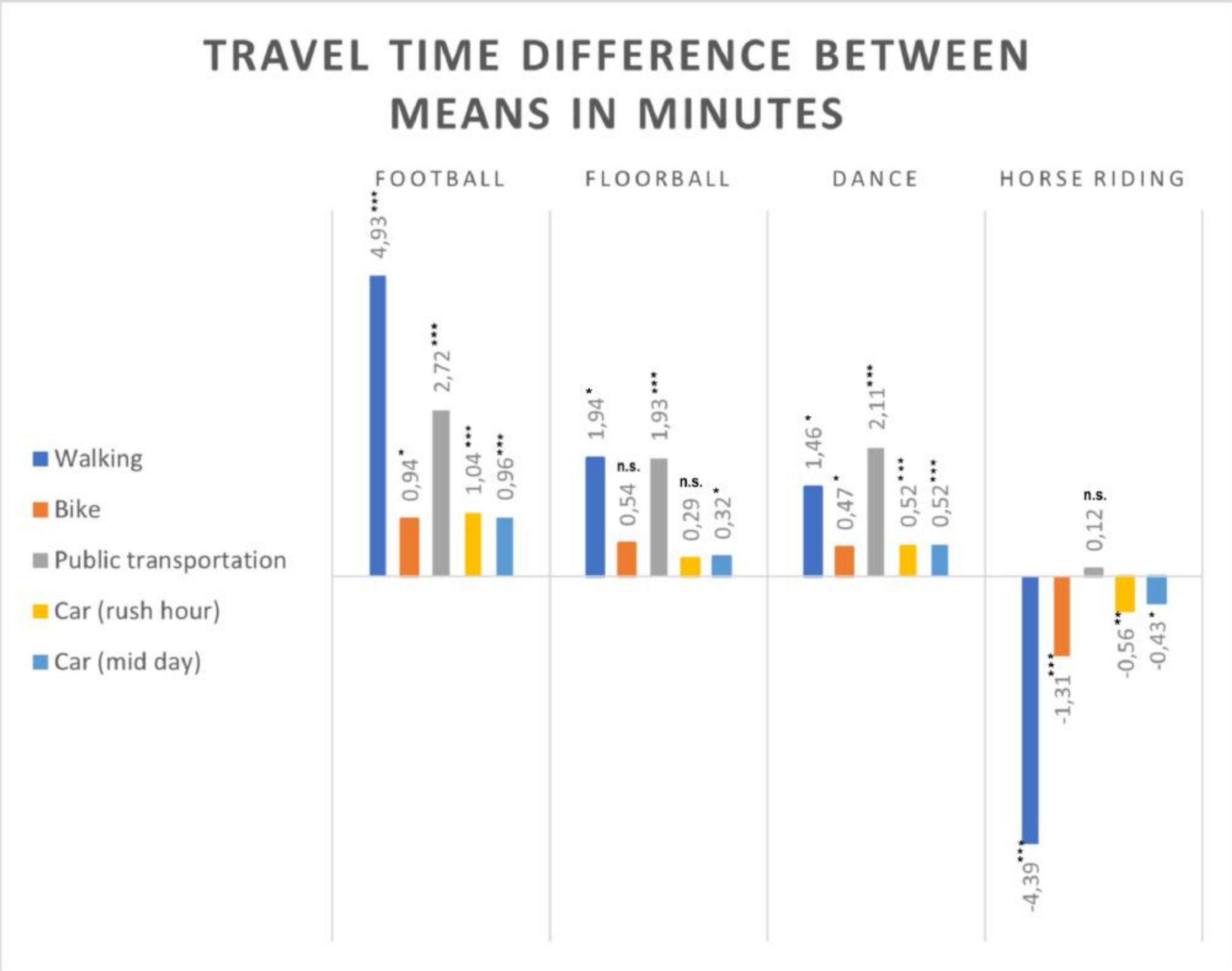


Figure 26. Travel time difference between the most advantaged (Q1) and the most disadvantaged (Q5) quintiles (Q1-Q5). Higher numbers indicate shorter travel time for less affluent quintiles. ($p < 0,001$ ***, $p < 0,01$**, $p < 0,05$*, not significant (n.s.))

Importantly, the t-values in Table 2 tell about the amount of difference between the travel times of the two quintile groups. In these t-scores highest values are found with public transportation in dance, football and floorball. In football high numbers are found also for walking and car travel modes. The p-values, indicated in Table 2 and Figure 26, highlight the likelihood of the relationship between the values to be due to random change. Based on these values the best statistical significances (not indicating random chance) of the chosen sports were found for football where only biking travel times are slightly less significant ($p < 0.01$). Travel times for floorball and dance by using public transportation resulted in a difference between least and most disadvantaged living areas that is very significant ($p < 0.001$). In dance also the travel times by car in rush hour and midday resulted in very significant difference ($p < 0.001$). Similarly, differences in the areas of the most and least disadvantaged quintiles with walking and biking travel modes for horse riding are very significant too ($p < 0.001$). Other travel modes for the sports have slightly less significant p-values, which are still statistically significant with p-values smaller than 0.05. Not significant differences are found only in the cases of horse riding and public transportation and floorball and biking and car (rush hour) travel times.

6.4. Bivariate spatial patterns and relationships

To find out about the spatial patterns of the relationship between the variables of travel time and the sum index of disadvantage, bivariate relationships were investigated through visualizing areas of high and low values in the two variables (Figures 27-30) and through finding local bivariate relationships (Figure 31 & Appendix 21-23). These methods provide additional information on the spatial patterns of the relationship between variables and potential insights into the results of the t-test presented above.

6.4.1. Potential clustering of socioeconomic disadvantage and travel times

Firstly in Figures 27 to 30 the travel times to closest facilities of the sports are combined to mean values of all travel modes to investigate potential areas where travel times in all travel modes together form patterns in relation to the disadvantage index. These travel times are divided into three classes together with the disadvantage index. Therefore these values do not present the quintiles presented above, but provide information on places where high and low values in these variables overlap. The high high values indicate higher disadvantage and travel time and therefore especially these areas are potential enclaves of the multiple disadvantages. Although noting that in these areas travel times presented are long only in comparison and might still be reasonably short.

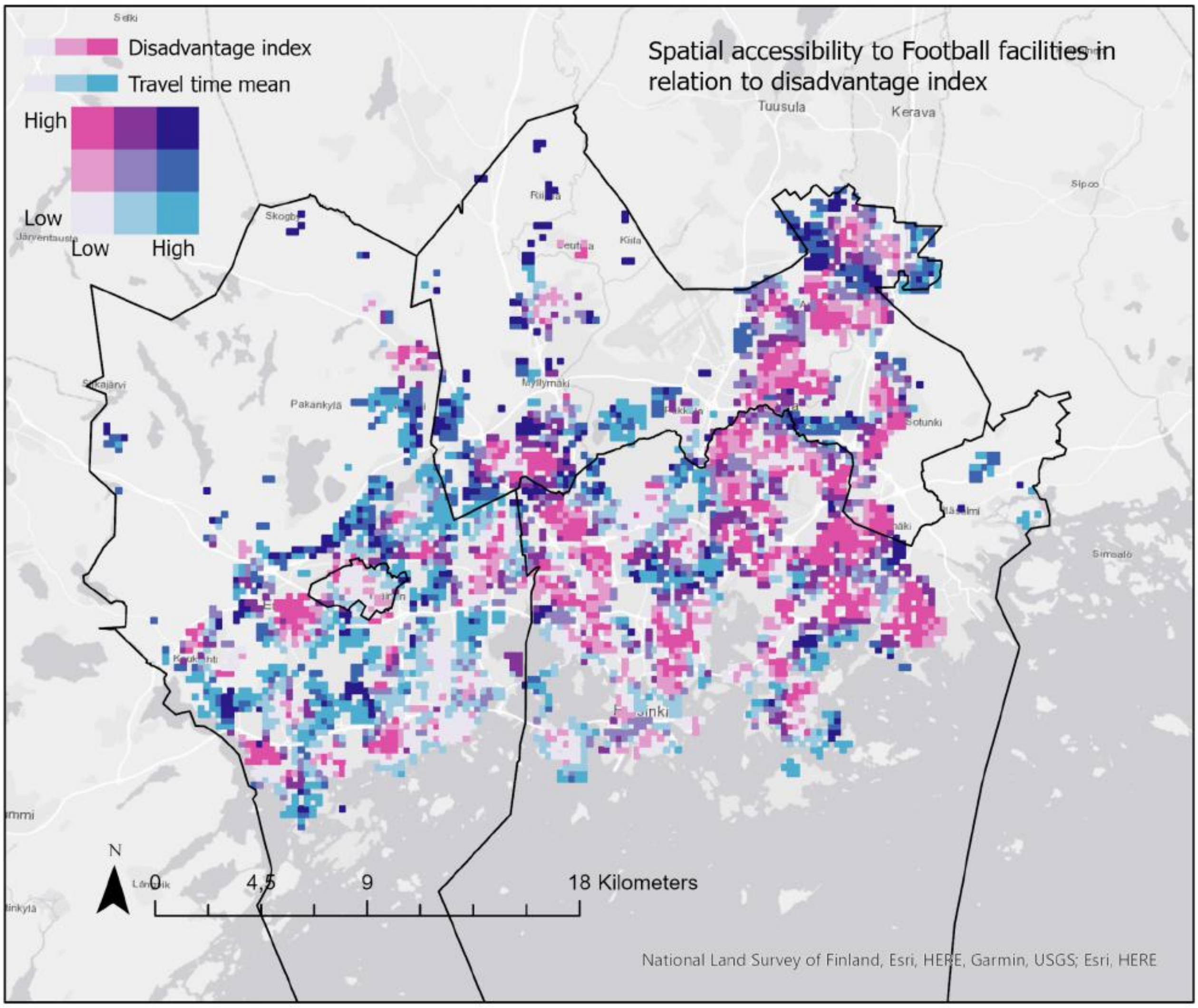


Figure 27. Travel time (mean values of all travel modes) to closest football location and the disadvantage index presented with bivariate symbology.

When comparing figures 27 to 30, common patterns emerge as well as differences between the sports. High high values of long travel times and more disadvantages emerge in eastern and north eastern parts of the region, although different values are also scattered around the region. This pattern is most evident in the case of horse riding and notable also in floorball and dance. In football, the same areas are more highlighted as areas of higher disadvantage but low travel times.

When looking at the pattern of spatial accessibility to horse riding facilities (Figure 28) in more detail, coastal areas and eastern areas of Helsinki emerge as having longer travel times as well as the eastern and central areas of Vantaa and central southern areas of Espoo. However, in combination of the disadvantage index the higher travel times in Espoo are not combined with the higher values of the disadvantage index as much as in the eastern parts of the region. In the eastern parts areas such as Vuosaari (the most eastern coastal cluster in Helsinki) and areas alongside the main train tracks in Vantaa (eg. Tikkurila and Koivukylä) are highlighted as the most disadvantaged in both travel time and the socioeconomic variables of the index.

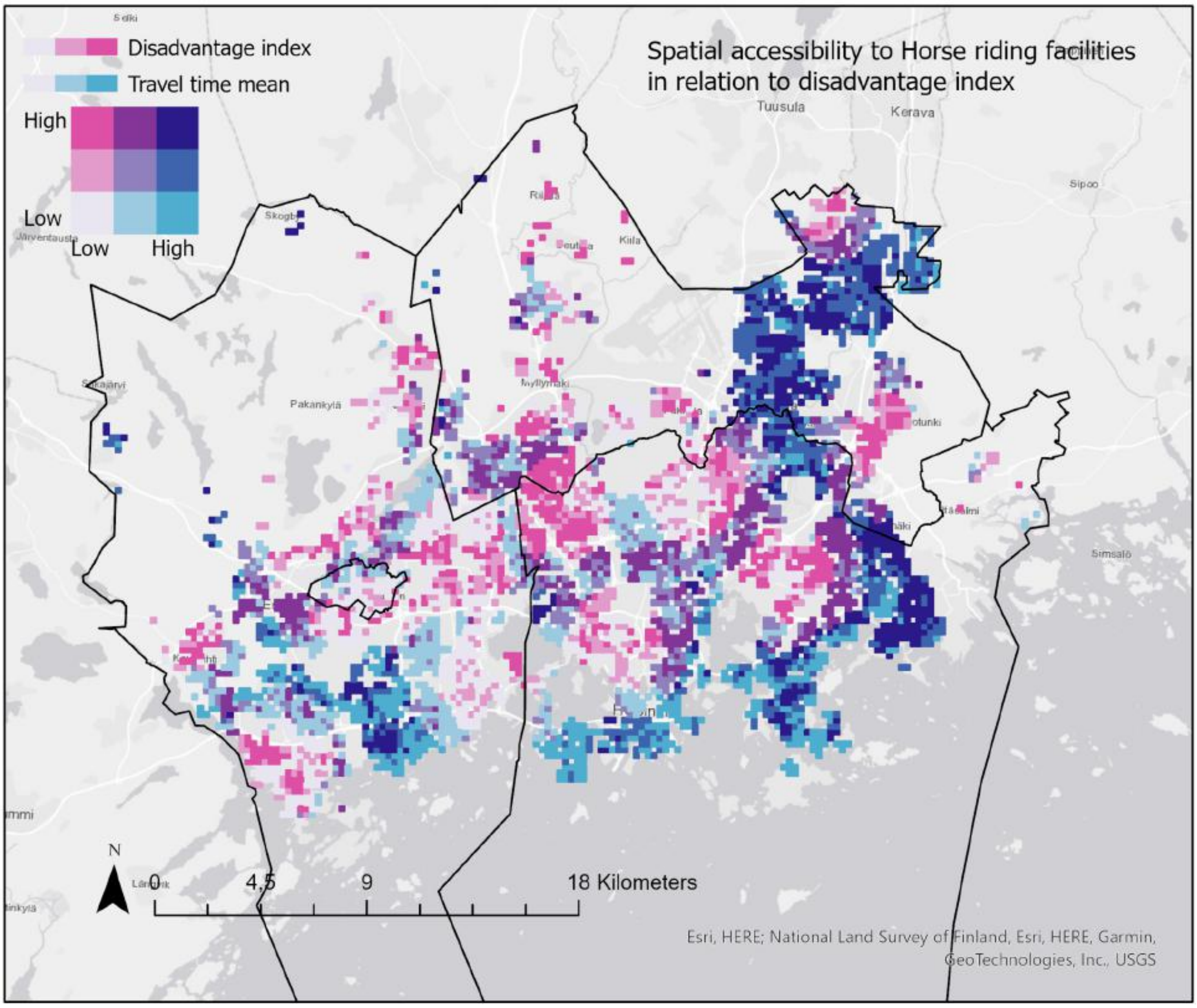


Figure 28. Travel time (mean values of all travel modes) to closest horse riding location and the disadvantage index presented with bivariate symbology.

When looking at floorball (Figure 29) not quite the same areas are highlighted and the patterns overall are lighter especially in Espoo. In this case one area clustered as having more socioeconomic disadvantage and higher travel times is the Kontula - Jakomäki - Hakunila axis in the north eastern parts of Helsinki and eastern parts of Vantaa. Somewhat similar pattern can be found in the case of dance locations (Figure 30). Although slightly different areas are again highlighted as the most disadvantaged in the both variables in question. Smaller enclaves are present for example in the most western Espoo, in Laajasalo (east of city center) and in Vantaa. Lastly, these patterns of clustering of high high values are not as evident for football (Figure 27) as these areas are more scattered. Still seemingly these small enclaves of disadvantage seem to be located more in the outskirts of the areas as opposed to more central areas.

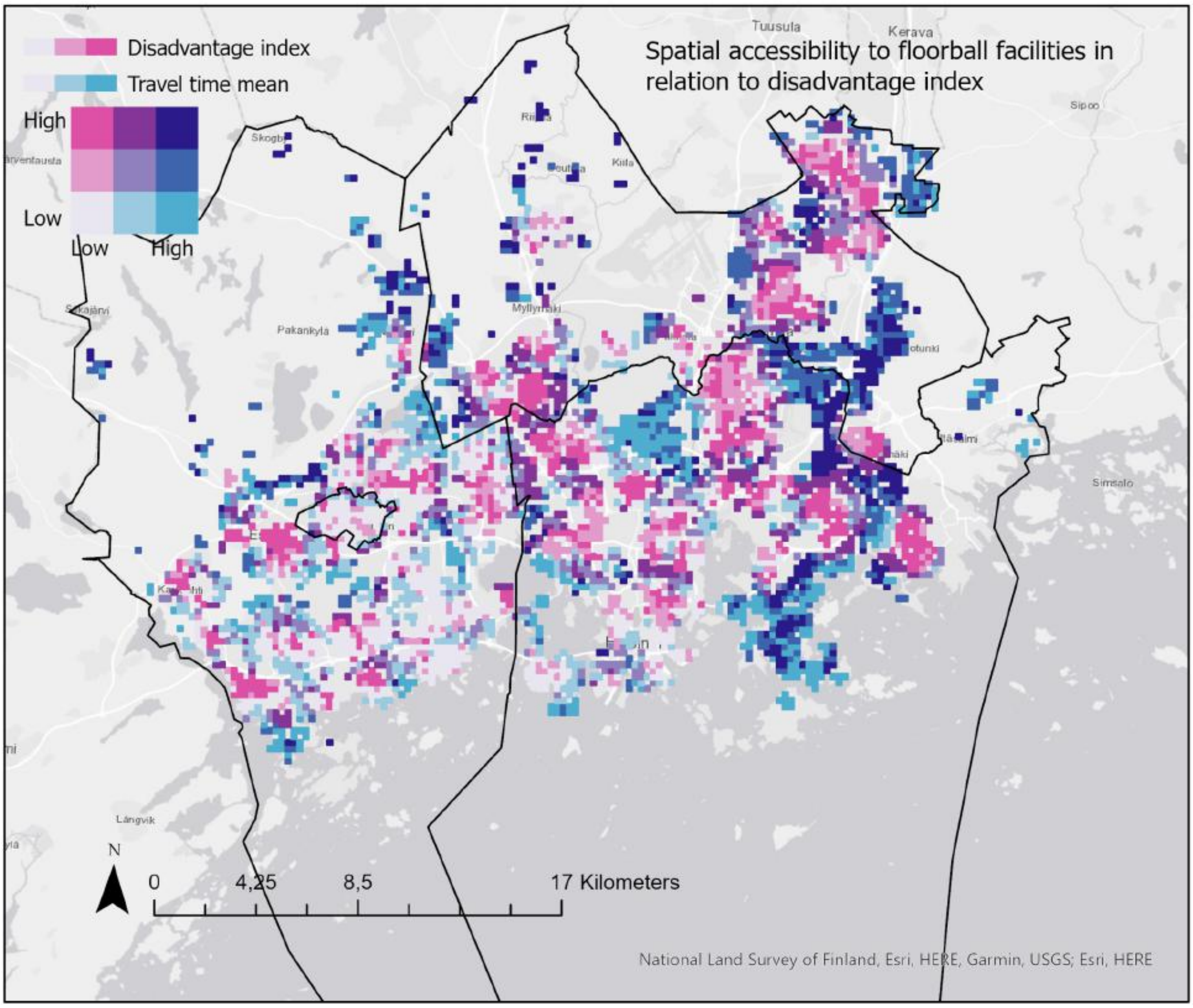


Figure 29. Travel time (mean values of all travel modes) to closest floorball location and the disadvantage index presented with bivariate symbology.

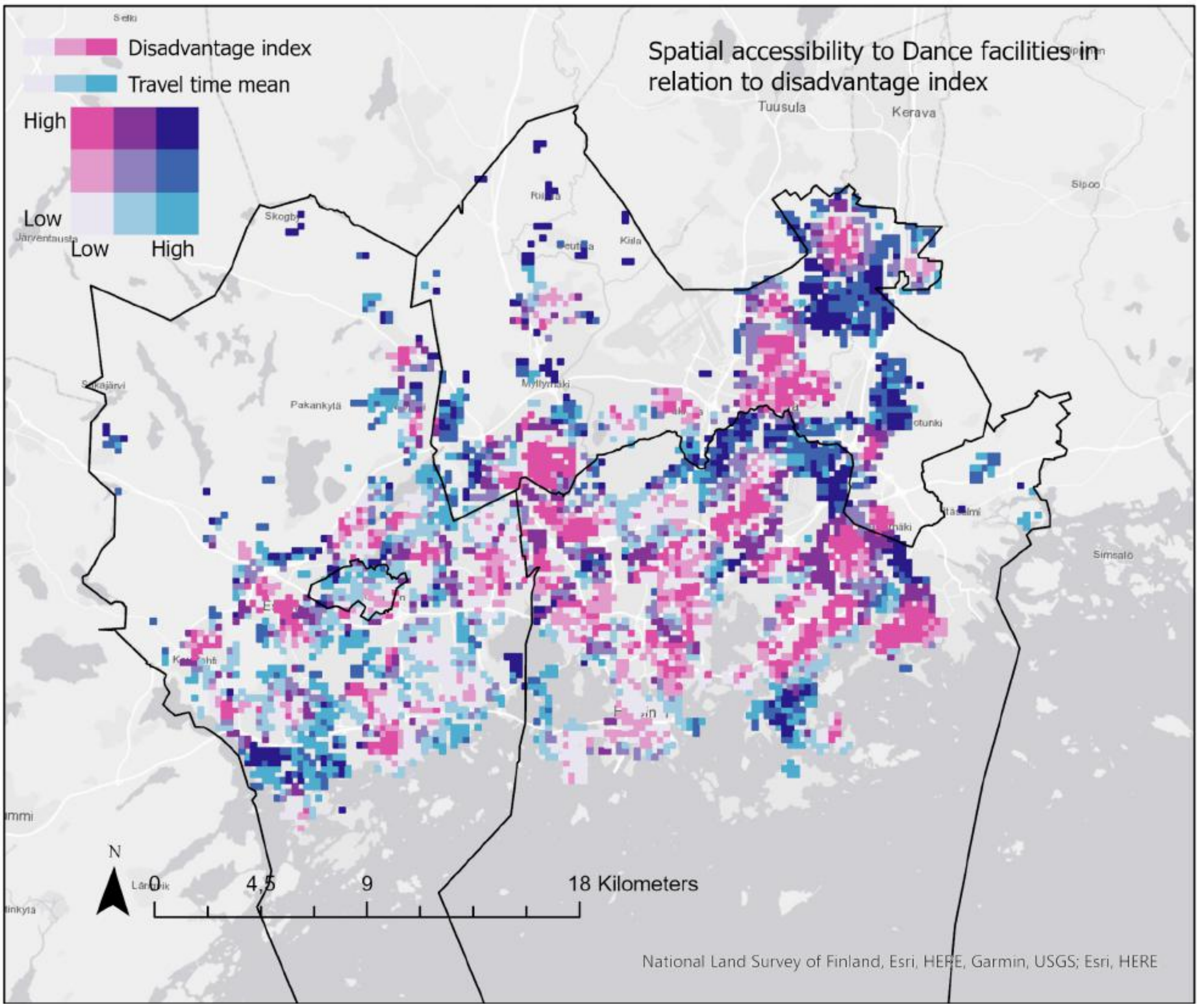


Figure 30. Travel time (mean values of all travel modes) to closest dance location and the disadvantage index presented with bivariate symbology.

6.4.2. Local bivariate relationships

To further continue the investigation of the spatial patterns in the relationship between travel times and the disadvantage index, local bivariate relationships were tested (Figure 31 & Appendix 21-23). In this tool used the the two variables are analyzed by using local entropy and classified into six categories based on the relationship type of how well the explanatory variable parameter (sum index of disadvantage) can predict the dependent variable (combined mean travel time to closest facility) (Esri, n.d.). The number of neighbors used around each feature to detect relationships was 30 which is the default option, so relationships on quite small areas were investigated. Other values used to run the analyses were the default permutations of 199 and a 90 % confidence level.

The different relationships highlighted in the maps (Figures 31 & Appendix 21-23) indicate either statistically not significant relationships, positive or negative linear relationships, concave or convex relationships or undefined complex relationships. The positive linear relationship indicates that the travel time variable increases linearly as the disadvantage sum index variable increases. Negative linear relationship however indicates that when the travel time variable decreases the disadvantage sum index variable increases. In the case of the concave relationship the travel time variable changes in a concave curve as the disadvantage sum index increases and in convex relationship this curve is simply a convex curve. In an undefined complex relationship on the other hand the variables are significantly related but the relationship does not belong to the other mentioned groups. (Esri, n.d.).

As visible in Figures 31 and Appendix 21-23 most of the grid cells in the study area resulted with no significant relationships. For football no significant relationships were found with the combined mean travel times and as some relationships were found for walking travel times those were visualized in a map (Figure 23). Overall in these Figures (31 & Appendix 21-23) somewhat similar but also differing patterns can be found. For instance green areas indicating negative linear relationships were found in a limited area in eastern part of Helsinki especially in the cases of horse riding and floorball. This means that the more affluent the citizens are, the longer travel time they have. As these relationship indicate local relationships of the variables in the area, the local conditions align with these results as in this case in eastern Helsinki (in the Itäkeskus, Marjaniemi and Puotila area) there is a pattern of more socioeconomically disadvantaged individuals living in high rises closer to the metro line and more advantaged individuals living in detached housing closer to the seafront (as visible in the Figure 24 of the quintiles presented before). The local conditions of smaller scale socioeconomic patterning related to the urban structures can then emerge in the background of these relationships. Further analyzing the reasoning behind these results would require further investigations of these local conditions. For example, understanding some of the interesting convex relationships indicating longer travel times for the most and least advantaged populations of some areas would require more analyses of the local conditions. For instance one enclave of convex relationships can be noted in the cases of floorball and horse riding (Appendix 21 and Figure 31) in north eastern Vantaa. Reasons such as the social mixing policies or new development for instance could impact the socioeconomic patterning of these regions.

Other highlights notable from these figures is that the few cells in northwestern Vantaa are indicated as having positive linear relationships for all other sports types except for horse riding in which negative linear relationship is presented. This indicates increased travel time for the more disadvantaged individuals in the sports of football, dance and floorball but decreased travel times for horse riding in the area. However, commonly a reverse relationship was indicated by the t-test. In line with the t-test results, an example of an area where travel times to horse riding are longer for more disadvantaged populations (or shorter for the more advantaged populations) is found in the city center and in few more enclaves visible in Figure 31. Overall, in line with the t-test results these positive linear relationships seem slightly more abundant in horse riding in comparison to the other sports, where more negative relationships are found. In addition, all of the relationships investigated here are a bit more abundant in horse riding which could reflect the travel time conditions which were more drastically increasing compared to the other sports having a better coverage of locations throughout the region.

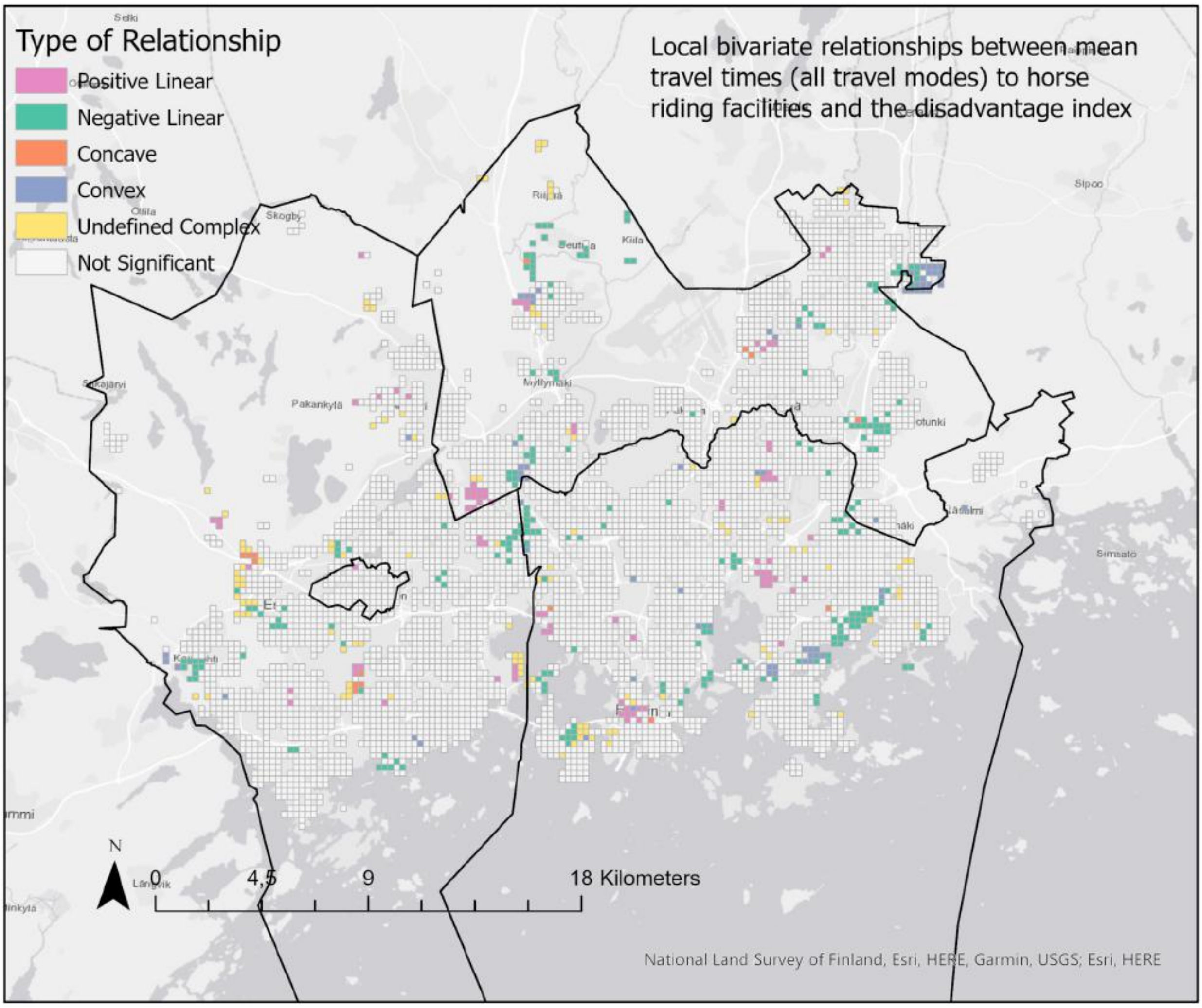


Figure 31. Spatial patterns of the local bivariate relationships between combined travel times to closest horse riding facilities and the disadvantage index.

7. Discussion

7.1. Spatial patterns and general spatial accessibility conditions of the chosen sports

The studied sports facilities revealed differing and also somewhat similar spatial patterns throughout the region, which resulted in aligning spatial accessibility conditions through travel times with different modes of transport. In light of travel times and thresholds indicating good accessibility conditions in previous studies, my results indicate reasonably good spatial accessibility conditions. For instance HSL (2016) found under 1 km (around 10 minutes of walking) journeys to be commonly walked to hobbies, and in my study I noticed that around half of 7- to 12-year-olds were found to live in under 15 minute walking journeys from the closest dance, football or floorball facility. For horse riding facilities this number was around 5% of the children. On another note common travel thresholds found by Spinney and Milward (2013) indicated 15 to 30 minute journeys to sports activities. In my study, with the travel modes of biking and car (rush hour), almost all children were found to live within 15 minutes of their closest football, floorball or dance facility. For horse riding however almost all children were reached in 35 minutes of biking and 25 minutes by car travel time in rush hour. The competitiveness of biking as one of the fastest travel modes even in comparison to public transport has been noted before for example by Ogilvie (2011) and Tenkanen and Toivonen (2020). In my study area, with public transportation almost all children were reached within 45 minutes in horse riding and in other sports within 25 minutes of travel time. Moreover, in the mean travel times observed from all grid cells, as well as from the most disadvantaged and least disadvantaged quintile areas, all indicate mean travel times well below 30 minute mark in all travel modes except for some mean walking times as well as travel times for horse riding.

In conclusion, most of the children (7- to 12-year-olds) reach their closest floorball, football or dance locations in reasonable travel times and even a significant portion of the children live within walking distances of their closest facility. However, when comparing the sports chosen to each other, the different nature of the locational pattern and density of horse riding facilities has been pointed out before. Accordingly, the spatial accessibility conditions of horse riding were found to be most different compared to the other sports which were found to follow more similar patterns in all of the results indicated. Based on the different nature of the studied horse riding locations, this result was to be expected. In terms of the other sports chosen, the vast supply and even somewhat similar coverage of the whole populated region in dance, football and floorball was more surprising as quite as similar patterns were not expected. In consequence of these results, the vast supply of the locations providing services in these hobbies can be considered as a good indication of the spatial accessibility conditions observed. Many of the facilities are located inside the urban and suburban structures or are located close to existing public transportation links. Locating near public transport routes can be considered important for avoiding transportation disadvantages and excessive private car use as discussed in section 2.7.

In another notion, the thorough spatial network and diverse locational characteristics of the facilities studied indicated that much of multiuse of facilities does exist in the study area and sports facilities adapt to the developing urban conditions. As developments of suburbanization and mono functionality of sports centers was discussed before in section 2.6, the locations identified reflect varied conditions, which have not for example abandoned the city center but have repurposed old factory spaces with dance facilities. In the suburbs on the other hand the large role of schools or other public buildings which are often used for dance or floorball practices was an interesting finding as well. This reflects the usefulness of publicly owned facilities and multipurpose halls for different physical activities, in which more publicly or privately funded sports services can even coexist. Horse riding facilities and turf fields in football are examples of facilities used in more monofunctional manner compared to dance and floorball training locations.

7.2. Are the spatial accessibility conditions inequitable?

The results indicate that the most and least disadvantaged quintiles of the disadvantage sum index have certain statistically significant relationships with the travel times which revealed some interesting connections. As noted before, spatial accessibility conditions in connection to socioeconomic variables have in previous studies resulted in conflicting results. For example, some previous studies such as Cereijo et al. (2019) and Higgs et al. (2015) have observed shorter travel times for public or low-cost facilities in lower socioeconomic areas. With similar methods as I have used Keurulainen (2021) also found shorter travel times for the most disadvantaged quintiles in the case of swimming halls. In line with these aforementioned studies, the quintiles compared here with a t-test revealed shorter travel times for the most disadvantaged quintiles for football, floorball and dance, with the most significant difference in travel times found in football. As for horse riding the direction of the finding was contrary with especially walking and biking being connected to shorter travel times for more affluent quintiles. As horse riding is exclusively done in more remote private facilities and dance and floorball practices use in large part public spaces such as schools in their practices these results could indicate similar divisions of public and private facilities as observed by Cereijo et al. (2019) and Higgs et al. (2015). As for football there seems to be activity stressing local practice conditions within accessible reach which shows in building of new turf fields for example (Football Association of Finland, 2011). This can be one of the reasons behind the good accessibility conditions of football throughout the different neighborhoods of the area. How for example the welfare state and planning regimes are affecting the investments in sports facilities for example in more deprived areas is a subject of further research.

As noted before by Dadashpoor et al. (2016) differences in spatial accessibility are inevitable and only too impractical or long travel times should be considered as inequitable. As the travel times overall seem to fall into reasonable timescapes, it could be argued that there is not, at least in the cases of floorball, football and dance, reasonable enough differences to indicate inequalities in spatial accessibility alone. Especially when noting the fact that the travel times in the most deprived quintile were actually shorter in these sports.

As the travel times were longer for horse riding overall and in the most disadvantaged quintiles as well as in some of the local conditions of the bivariate relationships, this is the one sport where inequities of the spatial accessibility conditions could be considered to be evident. As horse riding is considered to be one of the more expensive physical activities this brings a question whether the observed conditions are reasonable since the ones engaging in this sport would anyway be living more in the more affluent areas. This is a reasonable question, but on the other hand it has been indicated that horse riding hobbyists are not particularly affluent when it comes to income (Puronaho, 2014). On another note the longer travel times for the people coming from the most advantaged living areas in football, floorball and dance is another type of inequality as well. However, the more advantaged individuals more likely have the advantage of other factors such as monetary advantages or possibilities of car rides. Consequently, the more advantaged individuals do not have a similar risk of having multiple disadvantages, meaning that they lack all kinds of other resources (discussed in section 2.5) in addition to longer travel times. It is therefore these areas in which individuals are more likely to have multiple disadvantages where so-called deprivation amplification (Macintyre, 2007) might occur and which are potentially important to identify for example to allocate additional resources.

To identify these locations, the bivariate symbology maps (Figures 27-30) provided some insights. When looking at these maps, especially in the case of horse riding, some areas in the east and northwest of the study area were highlighted as having higher travel times as well as more disadvantage. Interestingly, these are the same areas that have been highlighted as more disadvantaged in segregation developments (discussed in section 5.1.1). Some of these areas were as well highlighted in the travel times for dance and floorball, but not as much in football. Therefore, there is some indication that areas of longer travel times and more deprivation do exist especially in horse riding and in floorball and dance, but as these values were divided in three equal parts, these areas do not represent the most deprived quintile nor travel times that can be considered too long.

The results from analyzing the local bivariate relationships provided some additional information on the local conditions between the disadvantage index and travel times. Perhaps an interesting finding was that there were not that many clear patterns observable, although some local patterns did emerge. Mostly, these emerging patterns supported the already found relationships and patterns, but confirmed that the relationships vary spatially. Therefore, observing these local relationships can provide crucial information for example planning purposes as the t-test for example only indicated results for the whole study area not including possible enclaves or outliers where the variables behave in different manners.

7.3. Validity and representativity of the data and results

Although this study attempted to find accurate information on the sport facilities used in the chosen age group and study the accessibility conditions related to them there are still many potential limitations. These limitations are mostly related to the process of finding out the physical activity locations and to the general approach of only studying the travel times to the closest facilities and treating these facilities as equally weighted entities. With this approach the potential of using the facilities can be studied but not for instance the actual user amounts of the facilities.

Firstly, the process of finding out the facilities used in the chosen sports in the age group of 7- to 12-year-olds was quite thorough, but was also prone to errors due to being limited to information openly available online. In some cases the information found might not have been up to date or information on practice locations were not in few cases enclosed. As some of the sports locations and providers were identified through searches that included the city name and the chosen sport for example, it is possible that some sports clubs identifying themselves more locally could have been left out.

Moreover, noting the fact that the facilities used by children are constantly evolving for example due to seasonal changes or changes of the sports clubs or businesses providing these services. Therefore these facilities only draw a picture of a certain time point in spring 2021. Due to the Covid pandemic many sport hobbies have faced restrictions, although children's hobbies have in many occasions been permitted to stay open, compared to adult sports. Nevertheless, the epidemic has shown diminishing participation rates in children's sports, particularly in more indoor sports such as floorball (HS/Virtanen, 17.1.2022). These changing conditions could be seen as a factor affecting the provision of these services as well.

Moreover, some facilities might consist of for instance multiple large football fields used by many different clubs in the area of many different grids. In these cases the facility was aggregated to include only one facility. Consequently, this approach disregards the size of the facility as small school halls and large sports centers for instance are treated equally in the analyses. It also does not tell about the availability of the hobbies themselves for example including information on how many people are practicing, for which specific age inside the chosen age group or skill level these sports hobbies are in a particular location or what is the use level of these facilities. Although overall this method gave a good overall look into where these organized sports can be done for the specific age group in a specific time of the collection of this data.

Another issue related to the spatial accessibility analyzes themselves is the simple considerations of only closest facilities. This approach has been criticized by for example McCormack et al. (2006)

who find their respondents to use facilities in different distances from their homes even though facilities would have been available in their immediate neighborhood. Furthermore, in the case of children many different practice locations even in the same sport can be used on weekly bases, which have been noted for example in the growing number of practice locations of basketball players further away from home neighborhoods as a child grows older in Helsinki (HSL, 2016). On another note, the starting points for many childrens hobby journeys might actually be schools, which is another angle not considered in these analyses as only home locations were considered in the census data used.

In the spatial accessibility analyses and analyses with the census data, some small errors are possible, but overall the results present reasonable data quality. Future research considerations pondered in the following section shed light to further analyses which could improve the representativeness of data as well to better portray real world spatial accessibility conditions. Additional limitations would be for instance the simplifying of bivariate relationships in the Figures 27-30 to only include equal classes of the variables and in testing local bivariate relationships many different parameters were not tested.

7.4. Future considerations

To better include different viewpoints and improve the validity of the data as well as representativeness of real world spatial accessibility conditions, several different research directions could be studied further. Many of the topical research directions in spatial accessibility studies (noted in section 3.4) seem reasonable also in the light of the results and limitations of this study. These include for example better inclusion of temporal changes and diverse mobility patterns of different user groups. To better understand the individual spatial accessibility conditions, understanding travel behavior and the everyday travel conditions as well as general characteristics of children's sports are key factors.

However, obtaining information on individual usage of sports can pose additional challenges. Fortunately, to study some of these metrics new opportunities have risen due to for instance developments in computational and geoinformation technologies and smaller scale data availability. It is how these new data sources and technologies are used that require further development to be able to communicate results as well as better represent real world spatial accessibility conditions in a meaningful way in the point of view of the user groups studied. In these developments compromises between the interpretability and complexity of the analyses will most likely have to be made as can be noted in the case of more complex spatial accessibility models discussed in section 3.3.2. Moreover, for example Langford et al. (2018) notes how there is potential in moving away from desktop spatial analyses towards more accessible and browser interfaces, enabling more efficient and publicly available analyzing techniques. Needs for developing easy to use approaches to the analyzing of big data sets without extensive programming skills were noticed in the methodological phases of this study as well.

When it comes to the inequalities it was highlighted in section 2.5 that inequalities are not limited to spatial accessibility conditions. Therefore more comprehensive approaches to accessibility conditions not limited to spatial conditions could provide more insights into the barriers of physical activity environments. For example, Macintyre (2007) notes that some more disadvantaged areas might be more disadvantaged in terms of quality not quantity of the physical activity environments. This can show for example in less attractive, less equipped or repaired facilities in poorer areas. How these conditions are related to segregation and segmentation of leisure activities, as studied by Kukk et al. (2019), is an interesting direction to study further as well. Furthermore, investigating subjective experiences of traveling to sports locations could provide more insights into the inequalities in sports accessibility. For example, it could be interesting to understand certain polarizations in children's physical activities in relation to the socioeconomic conditions and their implications to the realities of everyday accessibility conditions. As socioeconomic differences in physical activities have been noted in previous studies (e.g. Voss et al. 2008), it could be interesting to see how these differences manifest in travel behavior and potential travel disadvantages in accessing sports locations as well.

To better overcome the limitations of considering only the facilities themselves, this study used the so-called service approach to consider the spatial accessibility conditions to the actual services provided as opposed to fixed locations. This approach takes into account the barrier of whether suitable services are provided to the studied group in the facilities looked at. This approach has certain limitations since sports services are constantly changing and other factors such as full sports groups, timetables or knowledge of the services for example might limit the opportunities of participation. Therefore better inclusion of these different variables in spatial accessibility analyses could be developed. Including different weighted analysis such as gravity measures and 2SFCA approaches noted in section 3.3.2 could also take into account the different capacities of sports facilities. Moreover, different data based solutions including accessibility analyses could even help the service users to navigate to their closest services, as in the myriad of different service providers, available physical activity opportunities within reasonable travel times can be difficult to pinpoint.

In addition, there are many opportunities to focus on different user groups or demographics in spatial accessibility to physical activities. For example, focusing on adolescents who are at greater risk of dropping out from physical activities (Kokko & Martin, 2019), could provide interesting results as it has been indicated that the practice locations often locate further away for older children (HSL, 2016). In fact, as the user group around the ages of 7- to 12-year-olds has been noted to be the most actively engaging in organized sports practices out of other age groups (Hakanen and Myllyniemi, 2018), it is this group that can be expected to have the best spatial accessibility conditions as well. Therefore considering other demographics such as adults would be interesting. As gender generally continues to be an important determinant of the physical activities practiced, it is another important factor to take into account in spatial accessibility analyses and equality considerations.

Additionally, distinguishing between different types of physical activity locations in relation to spatial accessibility could be useful as well. As this study only focused on locations where guided activities take place, taking into account the different types of locations where sports are done more independently would provide more comprehensive outlooks on physical activity environments also important in the case of children's sports. Additionally, considering different sports could provide better understanding of the opportunities available in different physical activity environments. As there is a growing number of different sports practiced (Hakanen & Myllyniemi, 2018), it is probable that children engaging in more niche sports activities have to travel further to their particular locations where that physical activity can be practiced. Consequently, as there is better understanding of the differences between physical activity environments and facilities, different cultural and spatial conditions and the spatial accessibility metrics for instance, there is also potential in understanding the inconsistent findings of spatial accessibility of physical activity facilities in relation to socioeconomic variables.

8. Conclusions

The main research objectives of the thesis was to study the spatial accessibility conditions of sports facilities used by 7- to 12-year old children and how these conditions serve children through travel time and whether inequalities can be observed in these travel times especially in relation to the different socioeconomic conditions found in the area. As the research also included some data gathering on the locations where the children in the sports of dance, floorball, football and horse riding practice, some information can also be concluded from these identified hobby locations and spatial distributions of the service levels provided in these physical activities chosen.

Firstly looking at the general spatial conditions of the sports facilities identified and the travel times in connection to the living locations of children, generally good, and surprisingly similar levels of spatial accessibility were found in dance, floorball and football as these facilities form a quite thorough coverage of the whole populated region. When it comes to the facilities themselves, notable findings from the practice locations in floorball and dance were the significant use of schools and other public buildings and in football the important role of artificial turf fields. Horse riding with significantly fewer facilities formed differentiating patterns of spatial accessibility with considerably longer travel times.

Generally, when it comes to the amounts of children reached in different travel time distances from their closest facilities with different travel modes, in football, floorball and dance almost all children live within 15 minutes from their closest facilities with biking and car travel modes. In horse riding the children reached in similar time intervals are fewer. Generally, car travel was the fastest transportation mode with travel times in rush hour being only slightly smaller than midday travel times. Biking turned out to be a competitive travel mode with faster travel times than public transportation. Even though walking was the slowest travel mode, in smaller distances good amounts of children are still reached in floorball, football and dance.

The methodologies used, including a t-test and testing of some bivariate tools, indicated some interesting connections between the travel times and socioeconomic variables (studied through a sum index of disadvantage). These results reveal information about the equality and equity of the spatial accessibility conditions in areas of the most disadvantaged and least disadvantaged quintiles.

From the t-test, the results revealed generally shorter travel times in the living areas of the most disadvantaged quintile in football, floorball and dance. However, in horse riding travel times to most disadvantaged quintiles were longer. These differences in the most and least advantaged areas were the most significant in football, with mostly significant values found in other chosen sports and travel modes as well. In addition, the bivariate patterns and local relationships revealed some spatially varying enclaves of differing patterns in connections between the travel times and the disadvantage sum index.

When it comes to the equality of the spatial accessibility conditions, the most potential disparities of longer travel times in connection to the most disadvantaged areas were found in horse riding. As in football, floorball and dance the travel times were generally shorter in the areas of the most disadvantaged quintile, the results do not indicate inequalities for these areas in these sports. Although, the most socioeconomically advantaged areas with longer travel times in these sports can be considered as less advantaged in this matter respectively. Further research would be needed to investigate additional factors involved.

In terms of gender, one of the most popular sports for girls, horse riding, indicated worse spatial accessibility conditions compared to the other sports looked at. This result can be seen as confirming some gender difference in spatial accessibility conditions of children's sports. Still, as dance proved to indicate similar spatial accessibility conditions as floorball and football popular for boys, similar gender division in spatial accessibility conditions could not be observed in the other sports chosen. As the spatial accessibility conditions are heavily linked into the particularities of the particular sports chosen, looking at different sports for instance could indicate different patterns.

In general, when it comes to spatial accessibility and service levels in the chosen sports, representing some of the most popular children's sports for each gender, relatively good conditions were observed in this study, which do not indicate large differences in inequality in these conditions.

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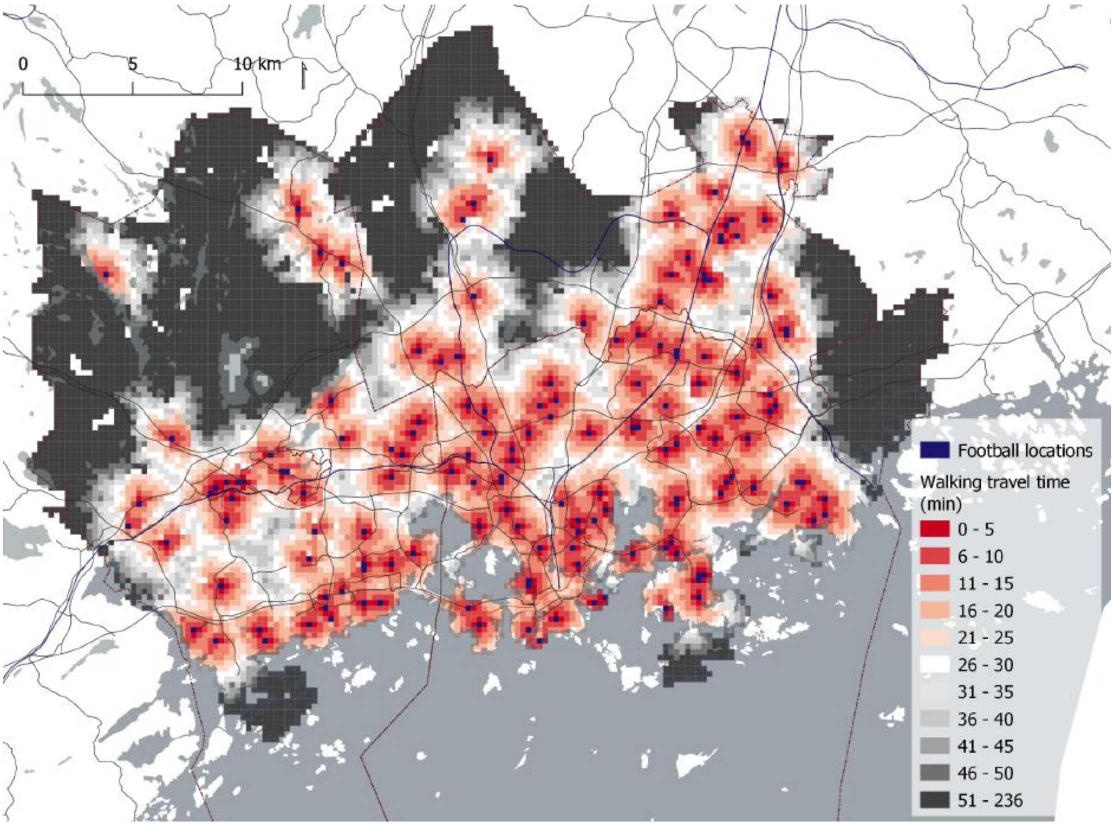
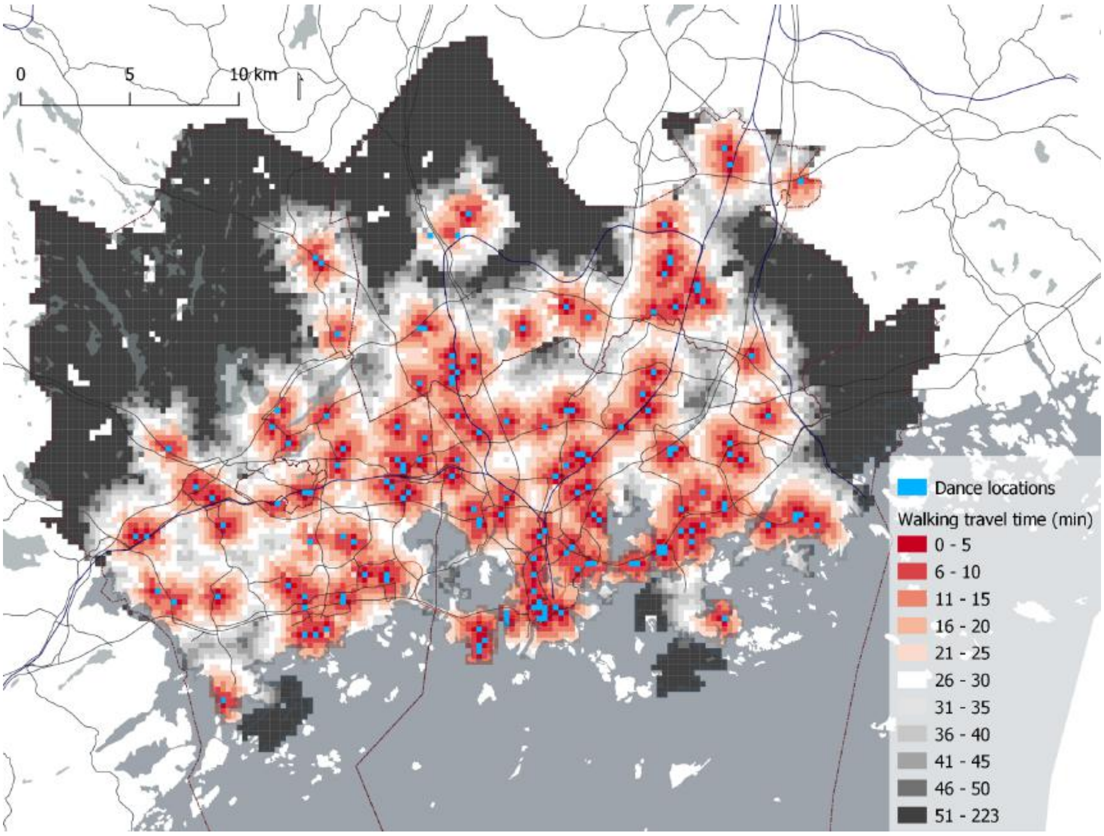
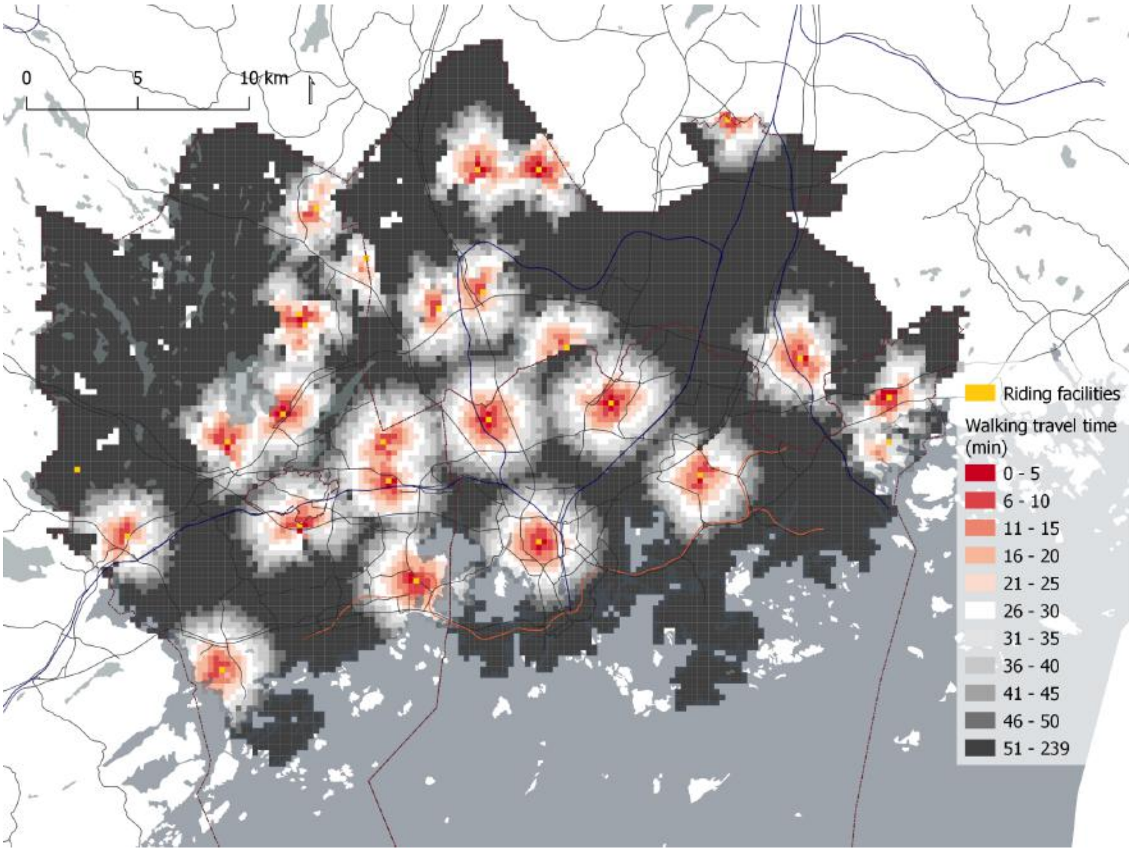


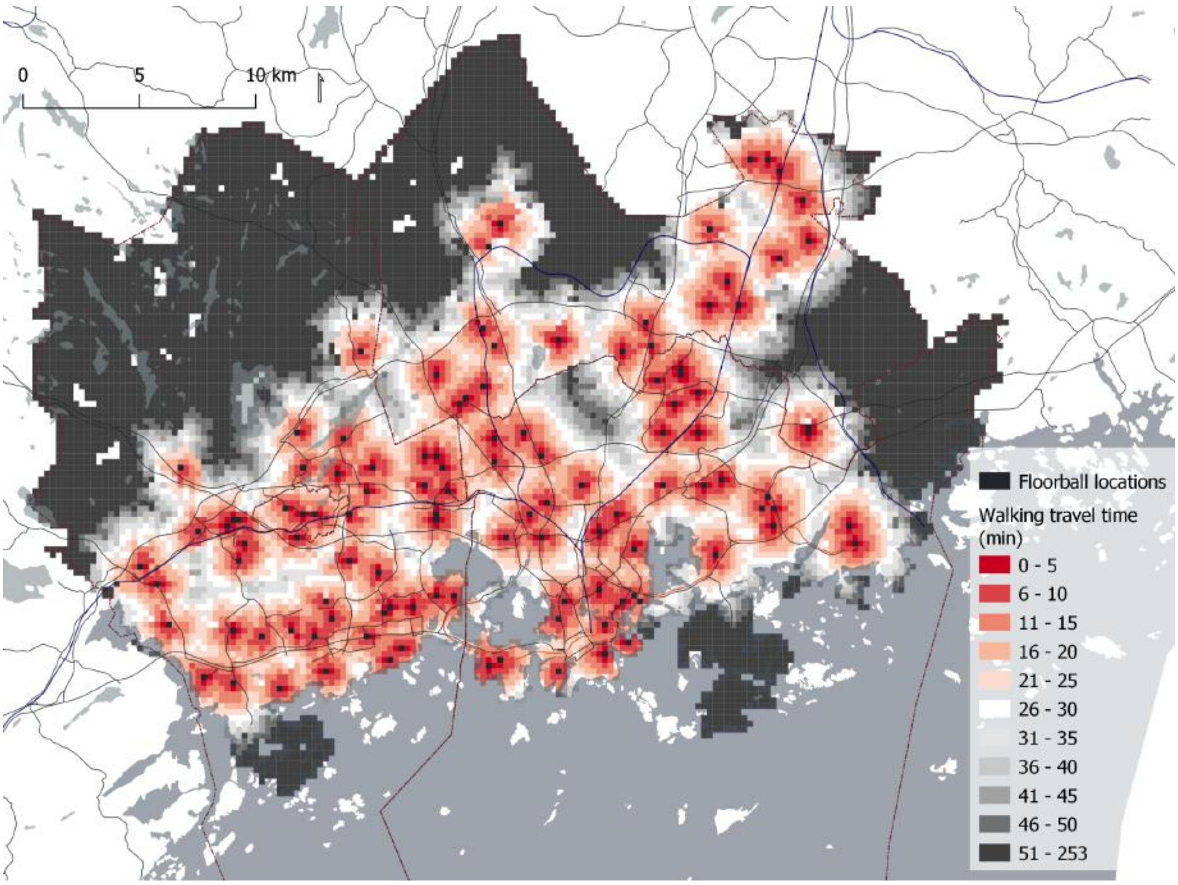
Appendix 1. Walking travel times to closest football location.



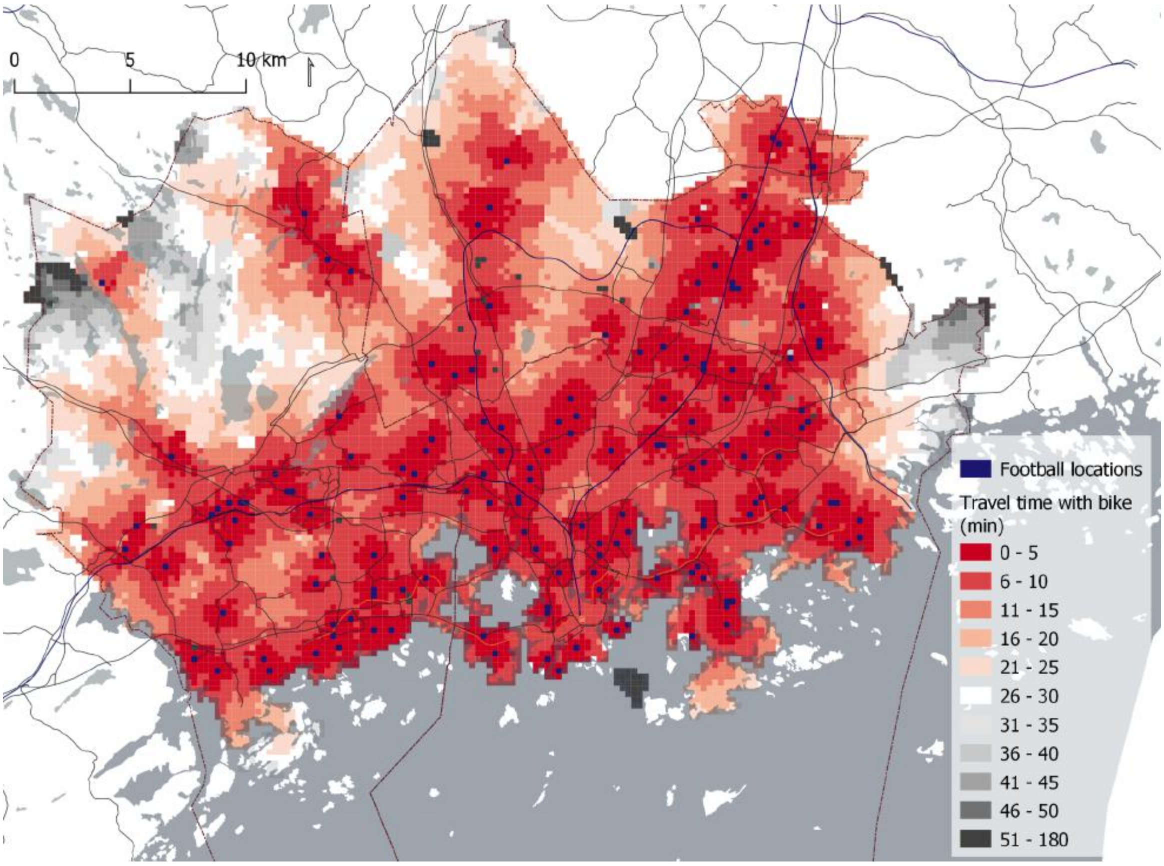
Appendix 2. Walking travel times to closest dance location.



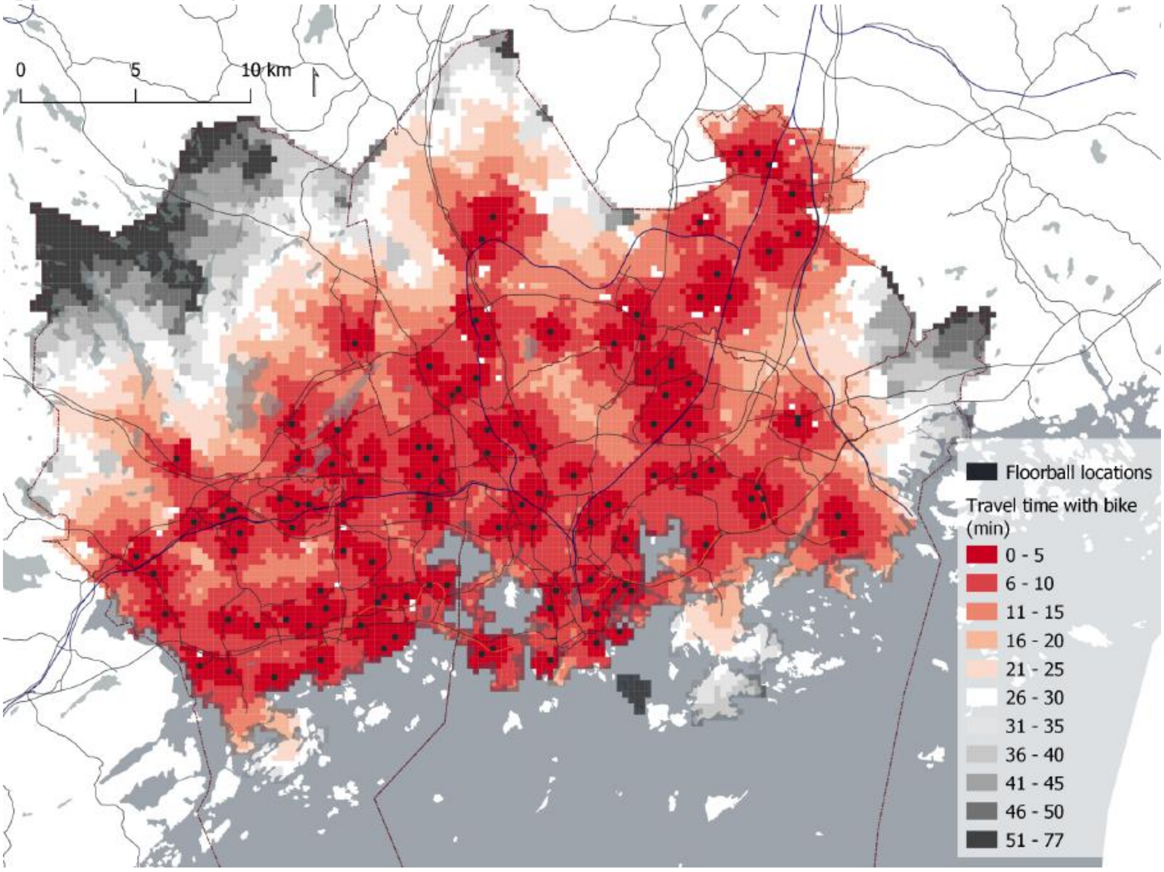
Appendix 3. Walking travel times to closest horse riding location.



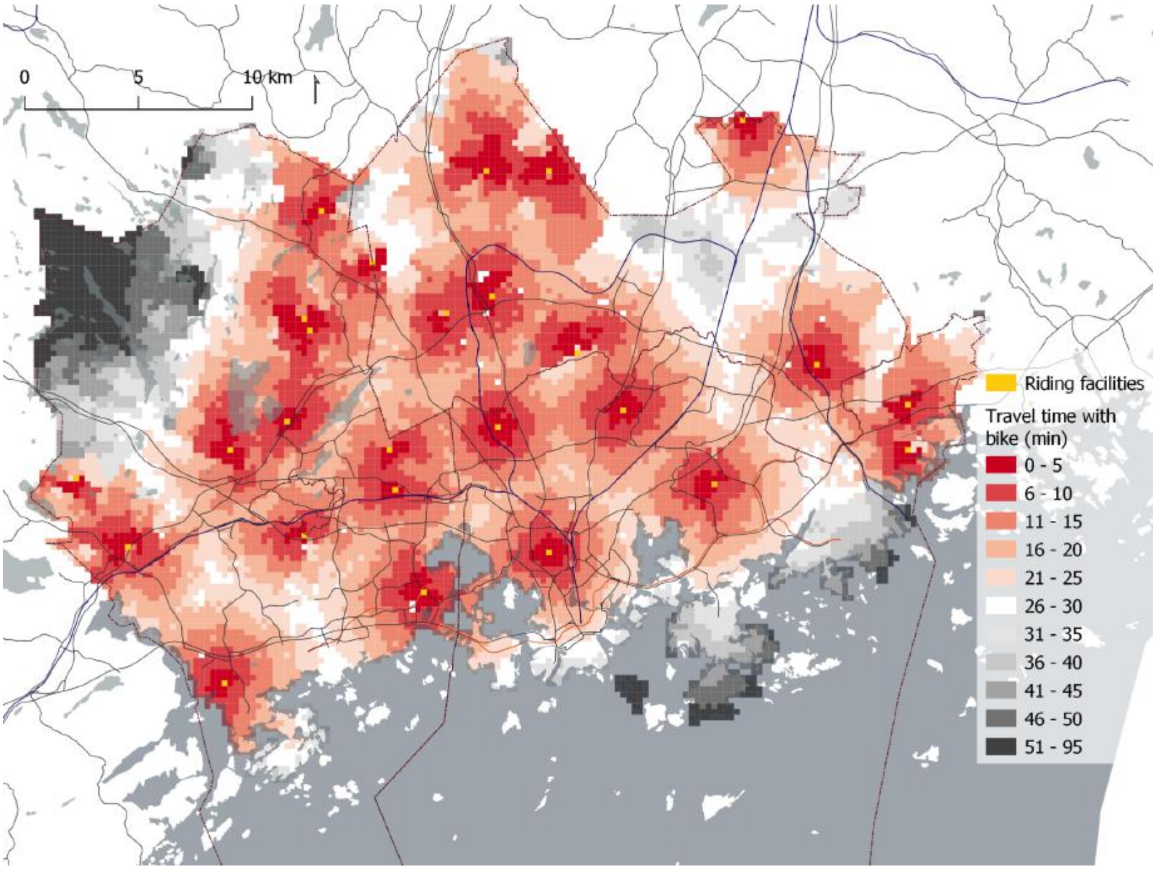
Appendix 4. Walking travel times to closest floorball location.



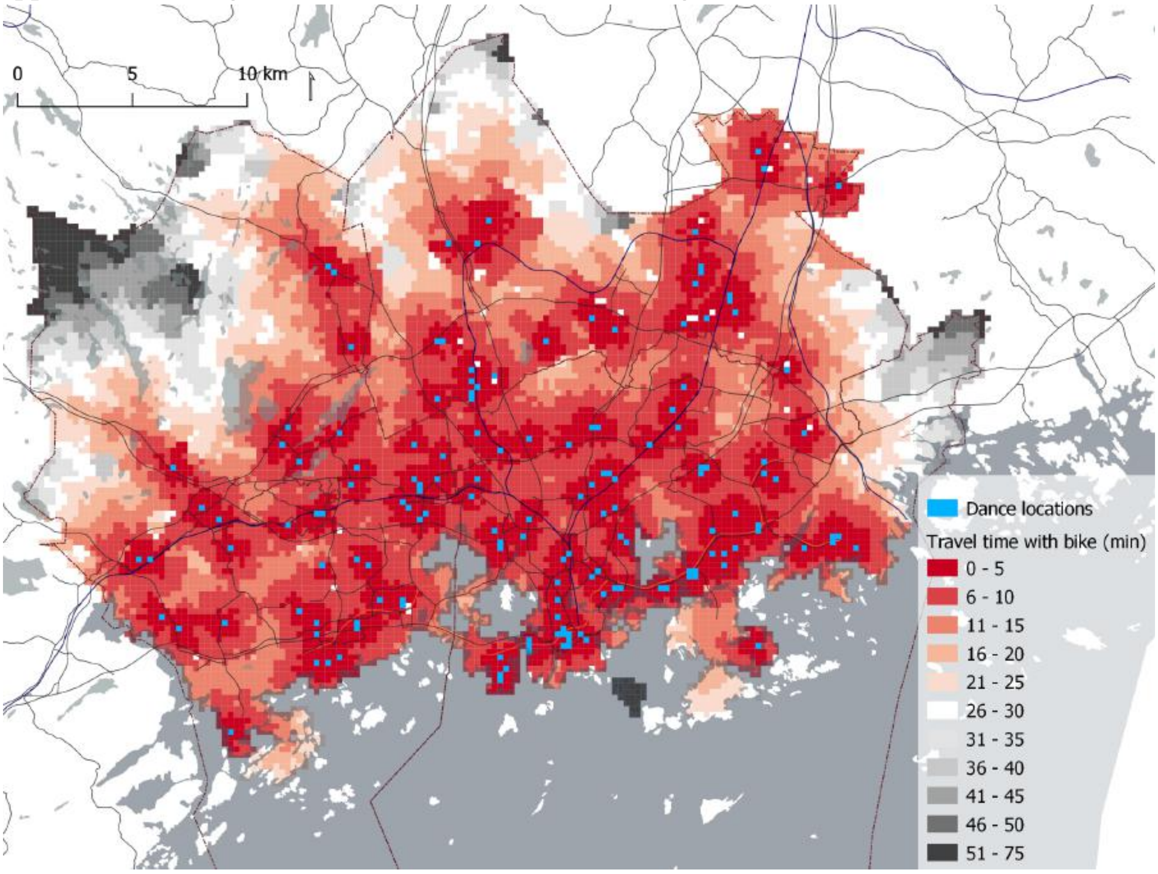
Appendix 5. Biking travel times to closest football location.



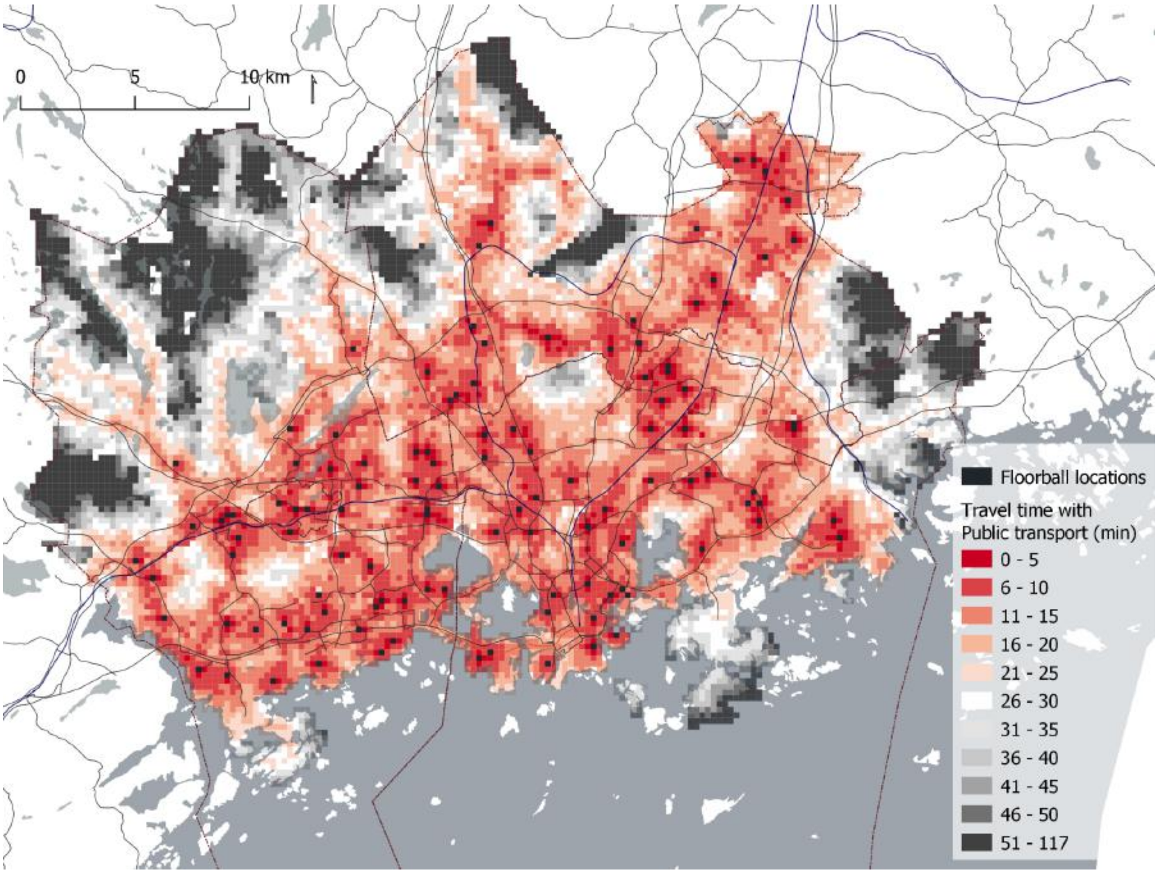
Appendix 6. Biking travel times to closest floorball location.



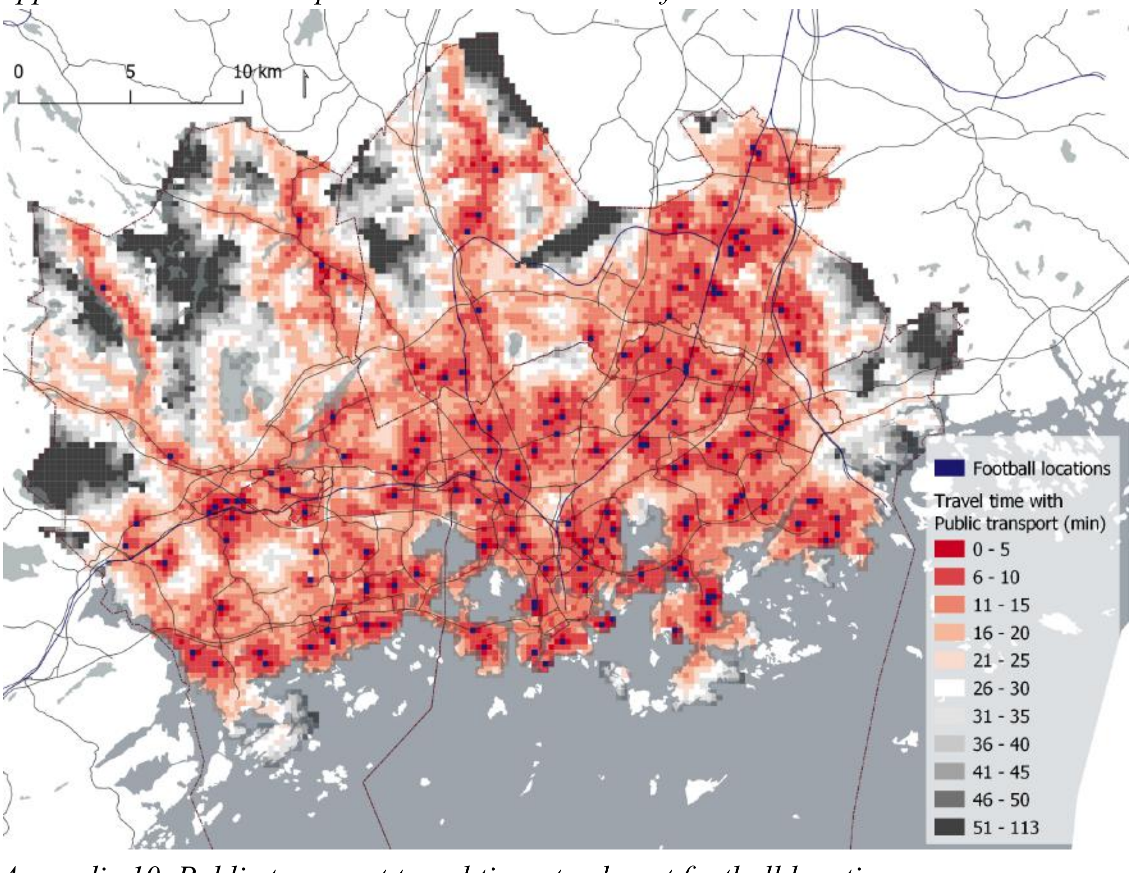
Appendix 7. Biking travel times to closest horse riding location.



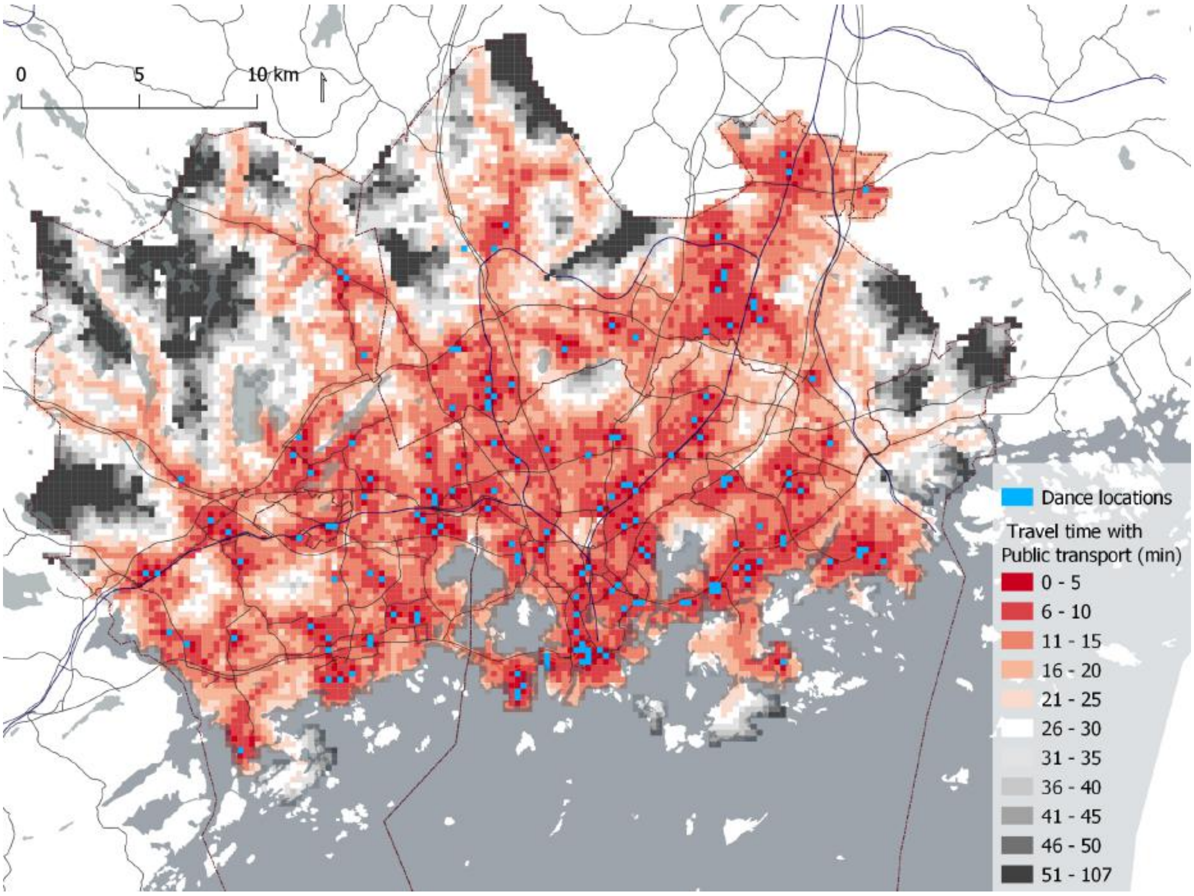
Appendix 8. Biking travel times to closest dance location.



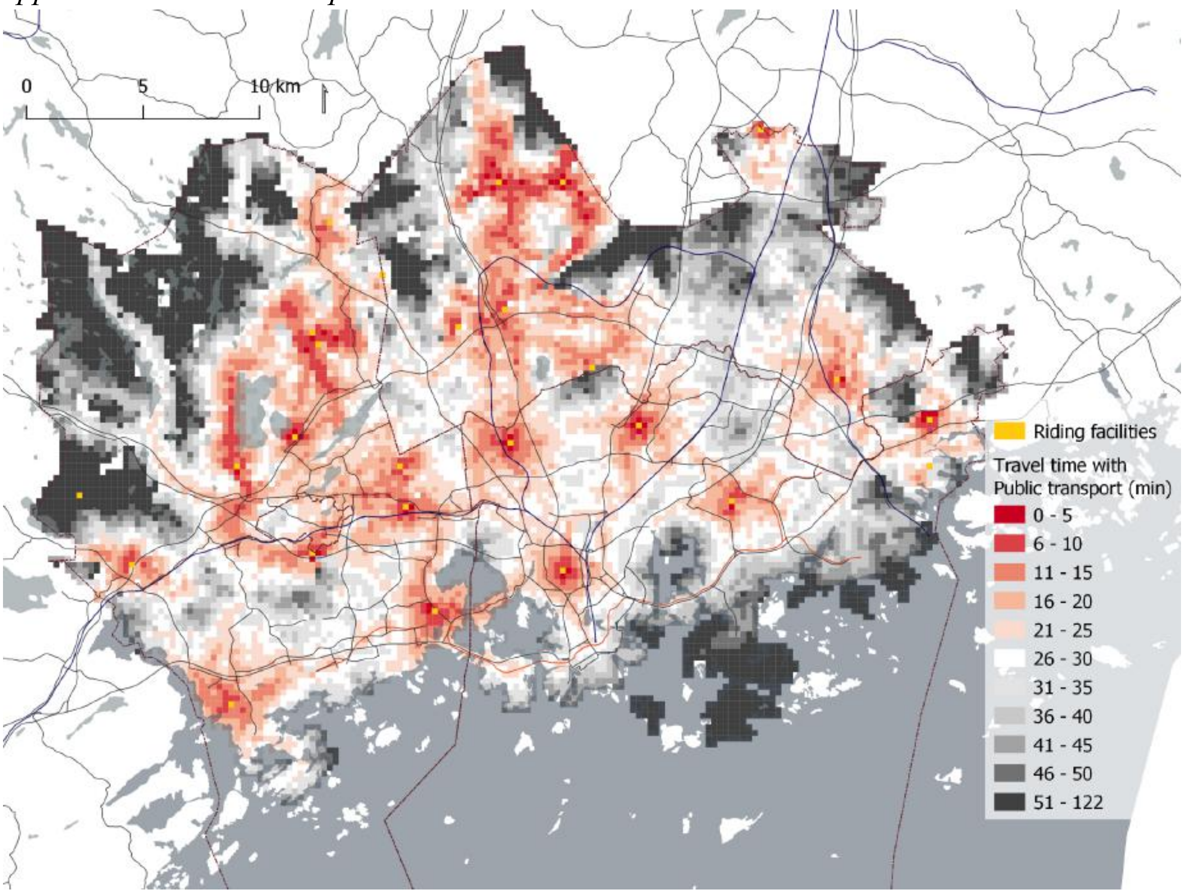
Appendix 9. Public transport travel times to closest floorball location.



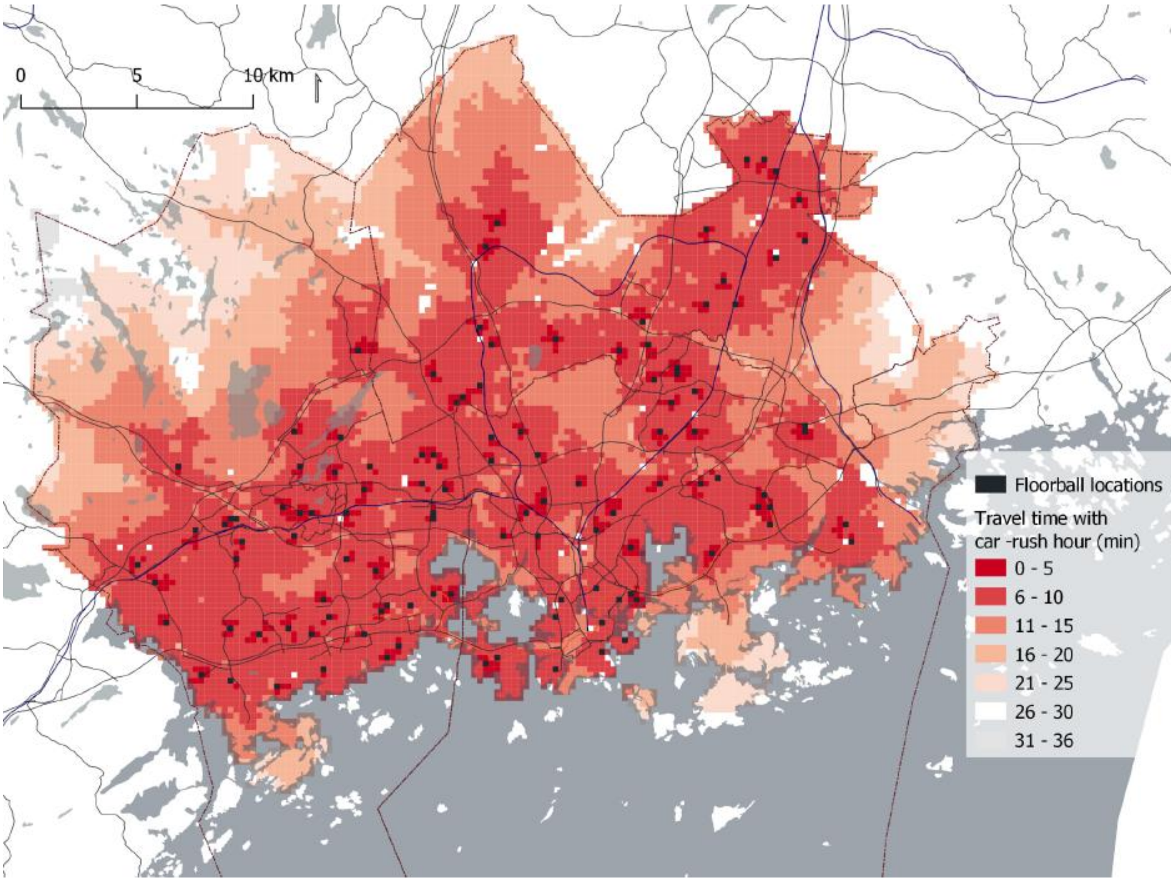
Appendix 10. Public transport travel times to closest football location.



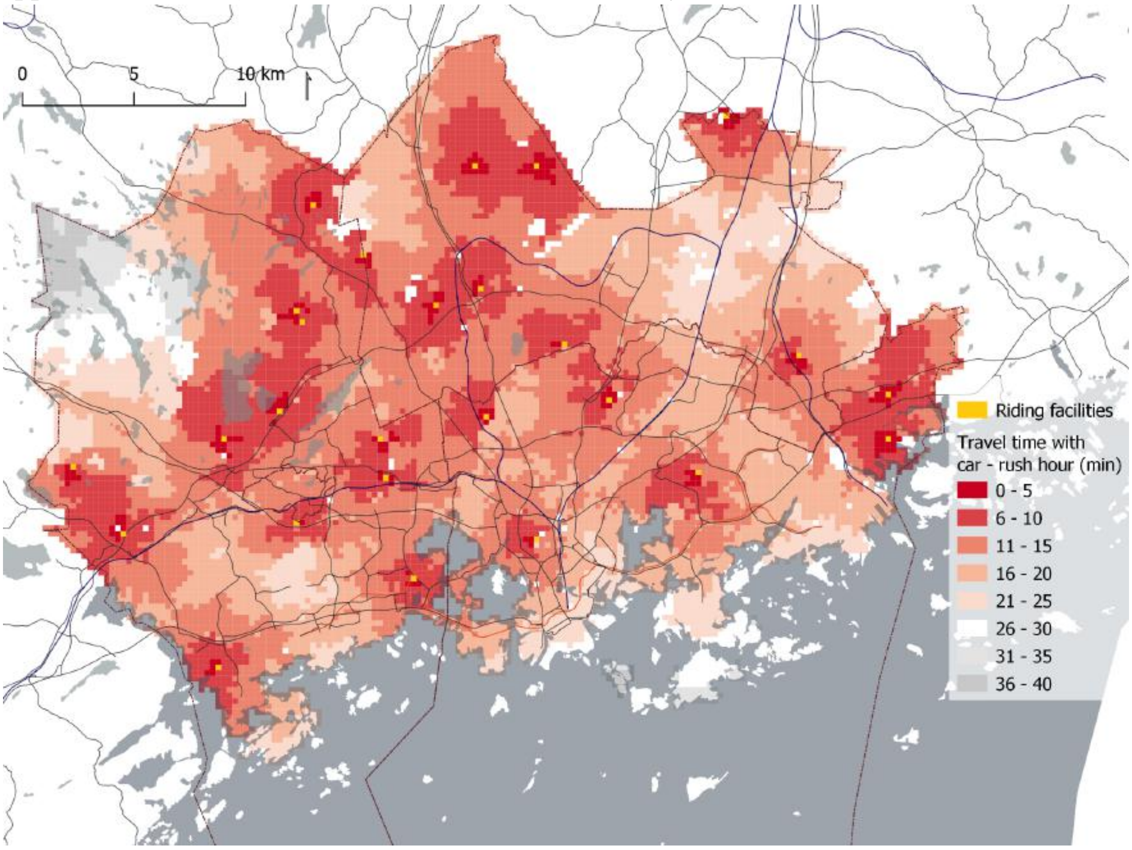
Appendix 11. Public transport travel times to closest dance location.



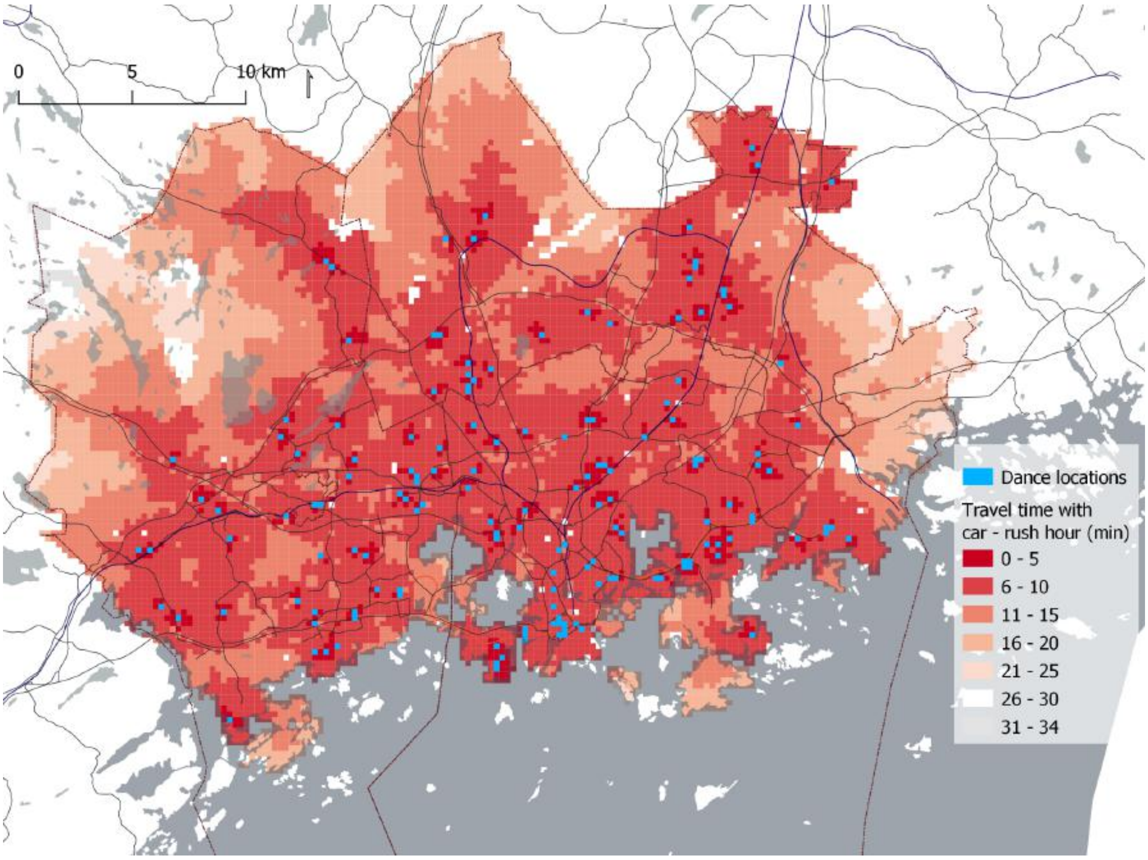
Appendix 12. Public transport travel times to closest horse riding location.



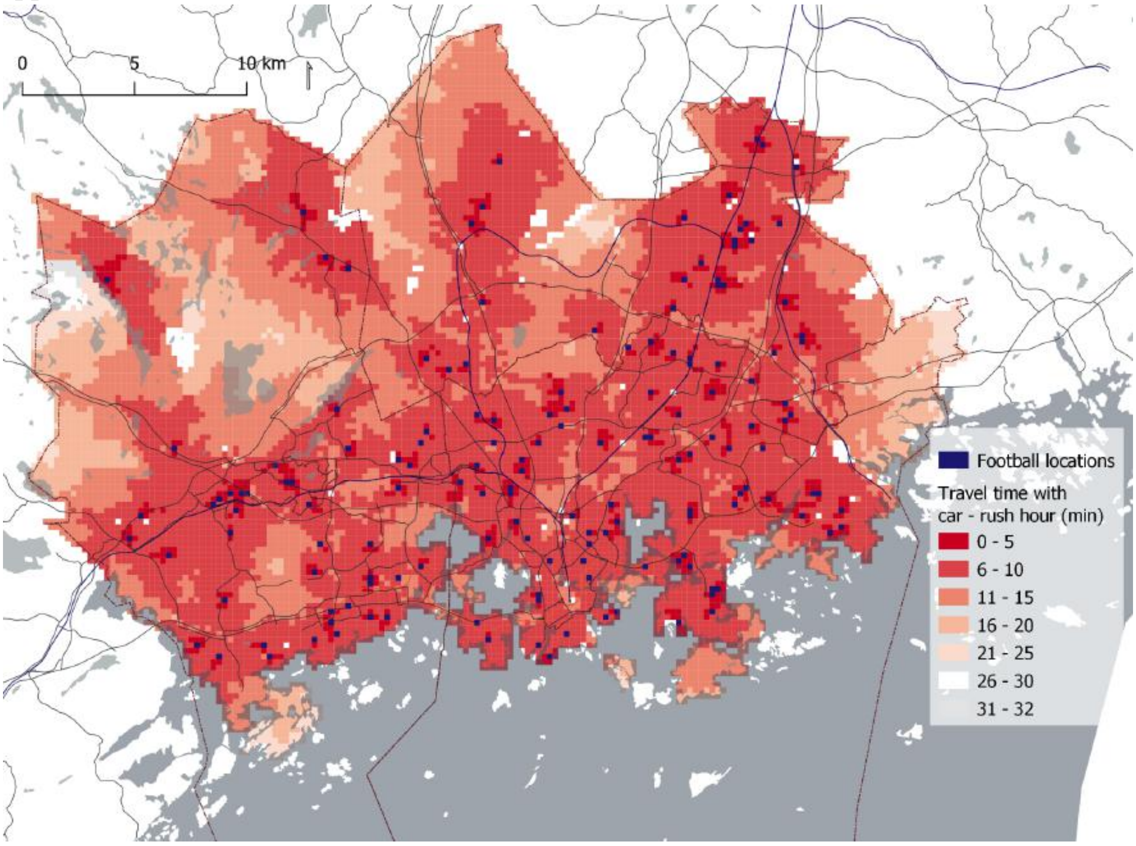
Appendix 13. Car (rush hour) travel times to closest floorball location.



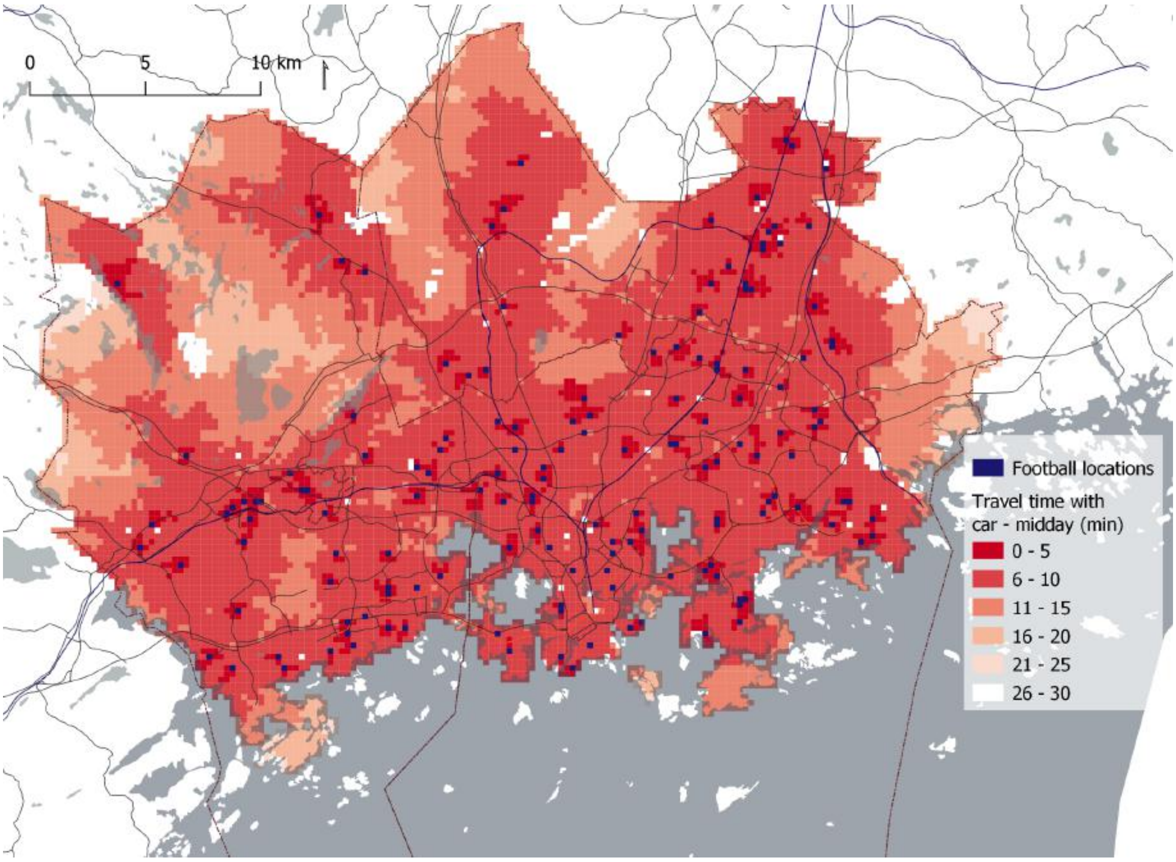
Appendix 14. Car (rush hour) travel times to closest horse riding location.



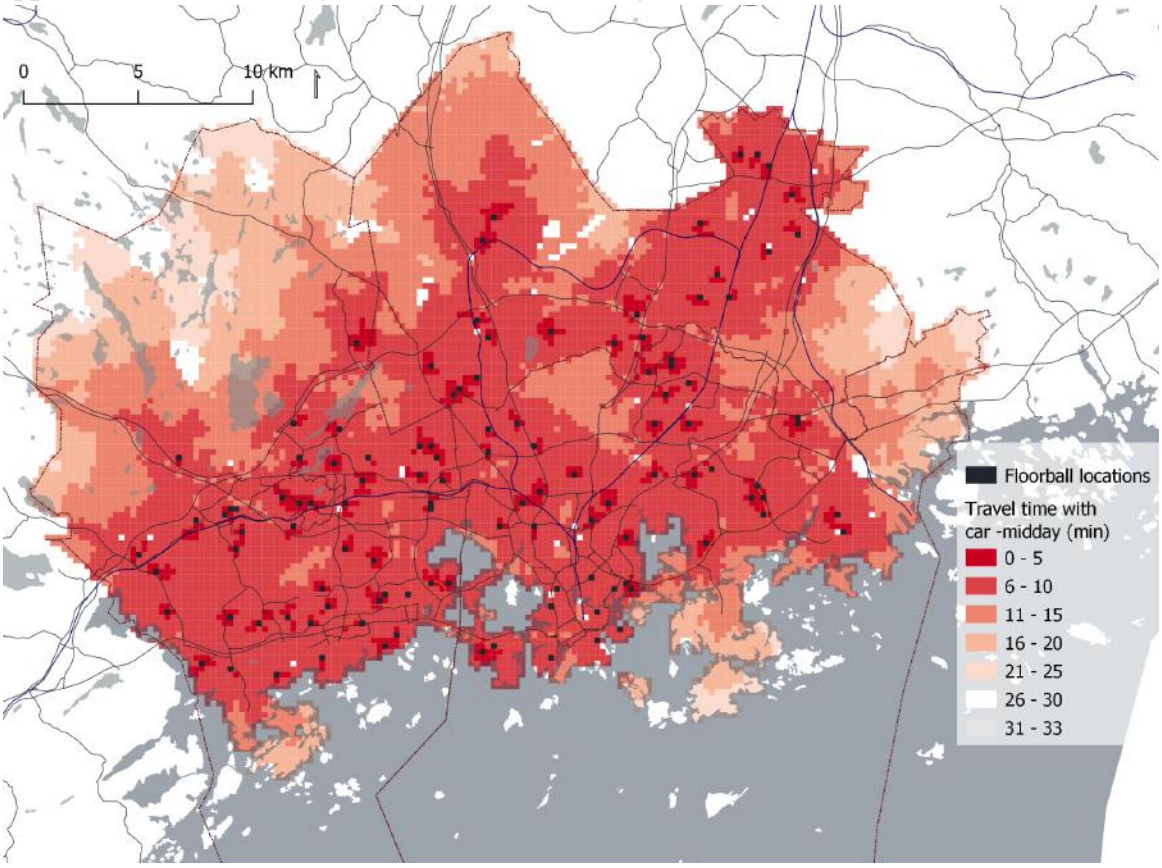
Appendix 15. Car (rush hour) travel times to closest dance location.



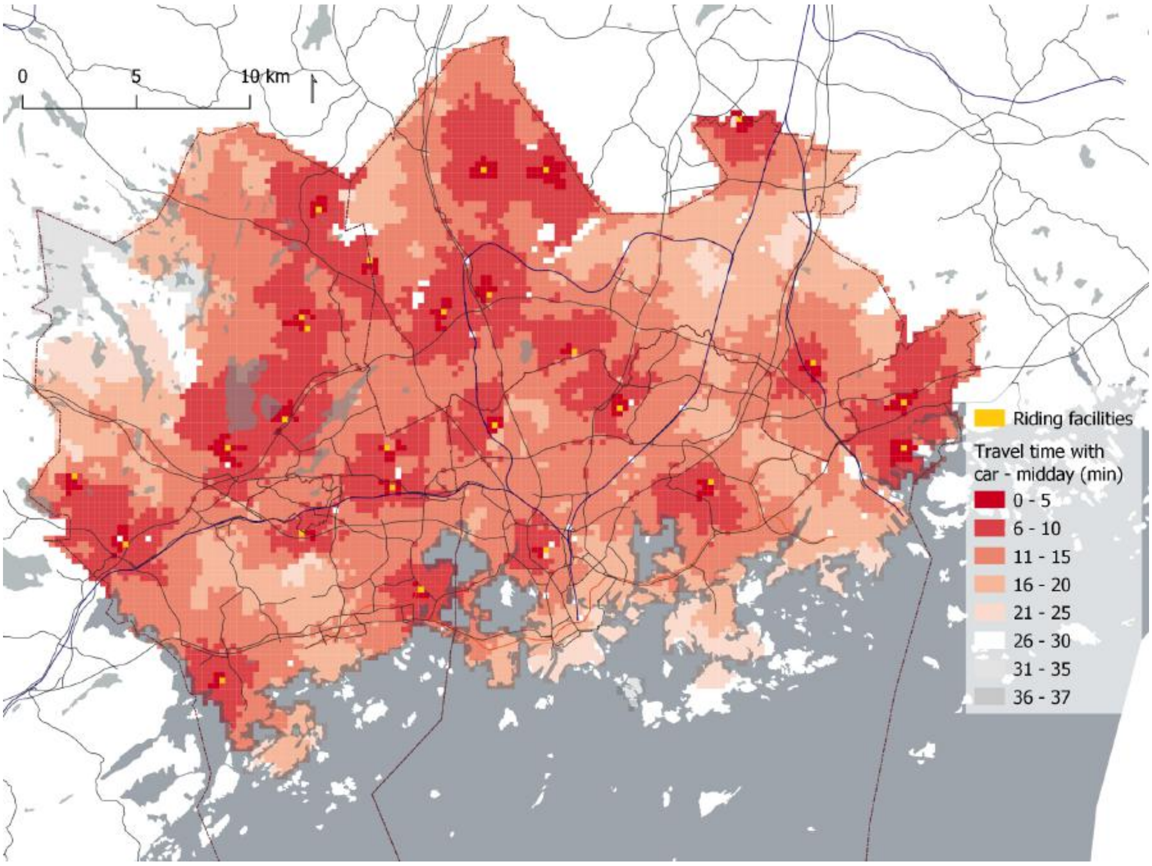
Appendix 16. Car (rush hour) travel times to closest football location.



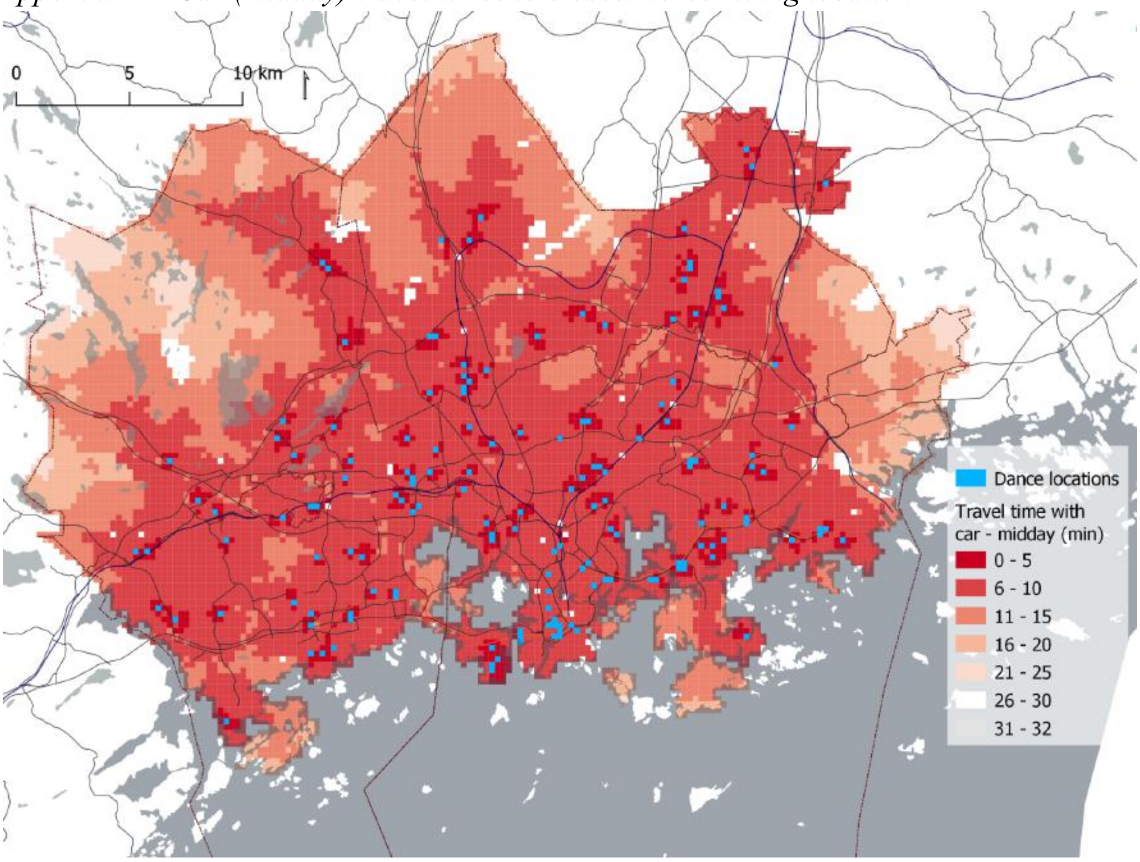
Appendix 17. Car (midday) travel times to closest football location.



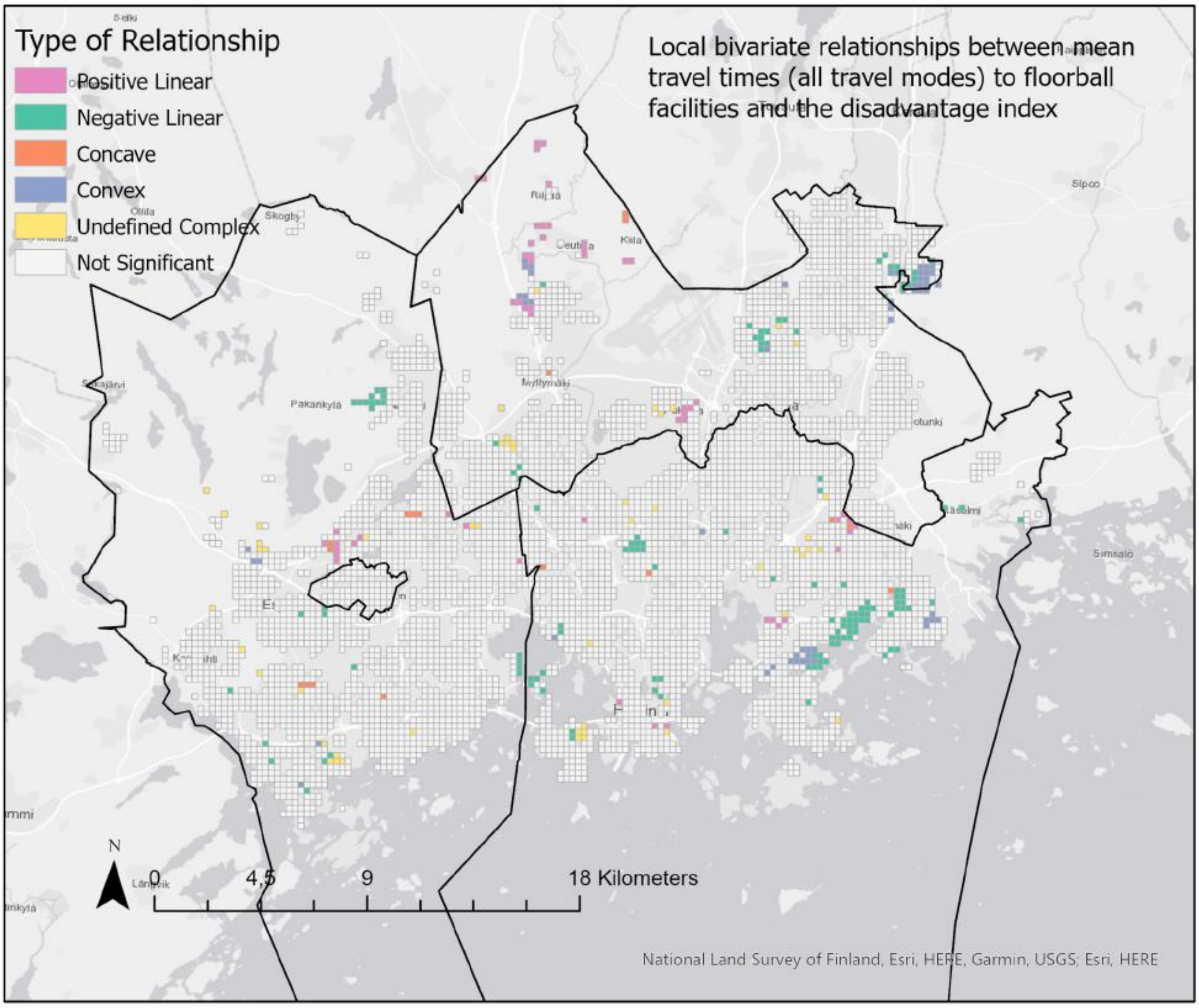
Appendix 18. Car (midday) travel times to closest floorball location.



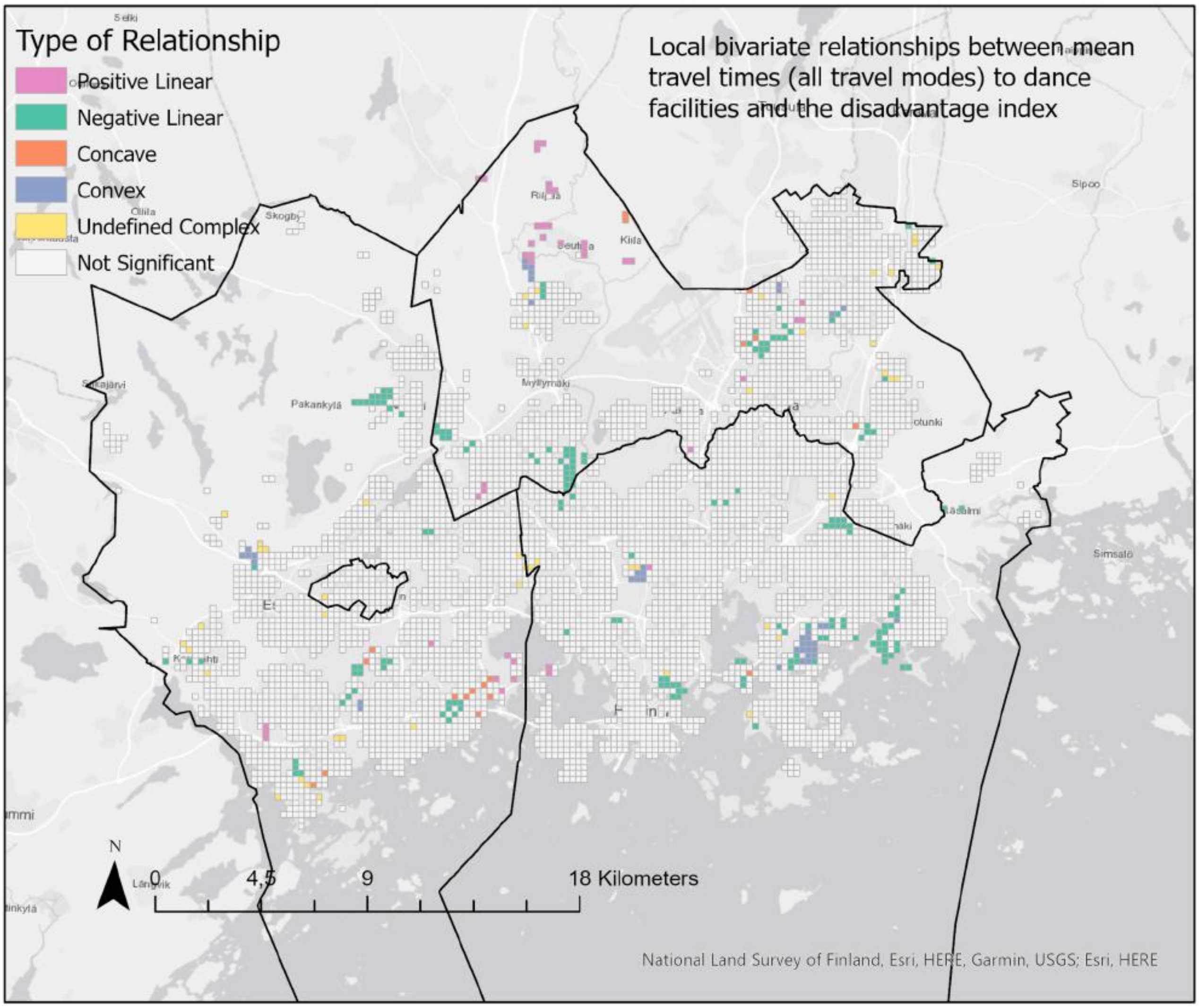
Appendix 19. Car (midday) travel times to closest horse riding location.



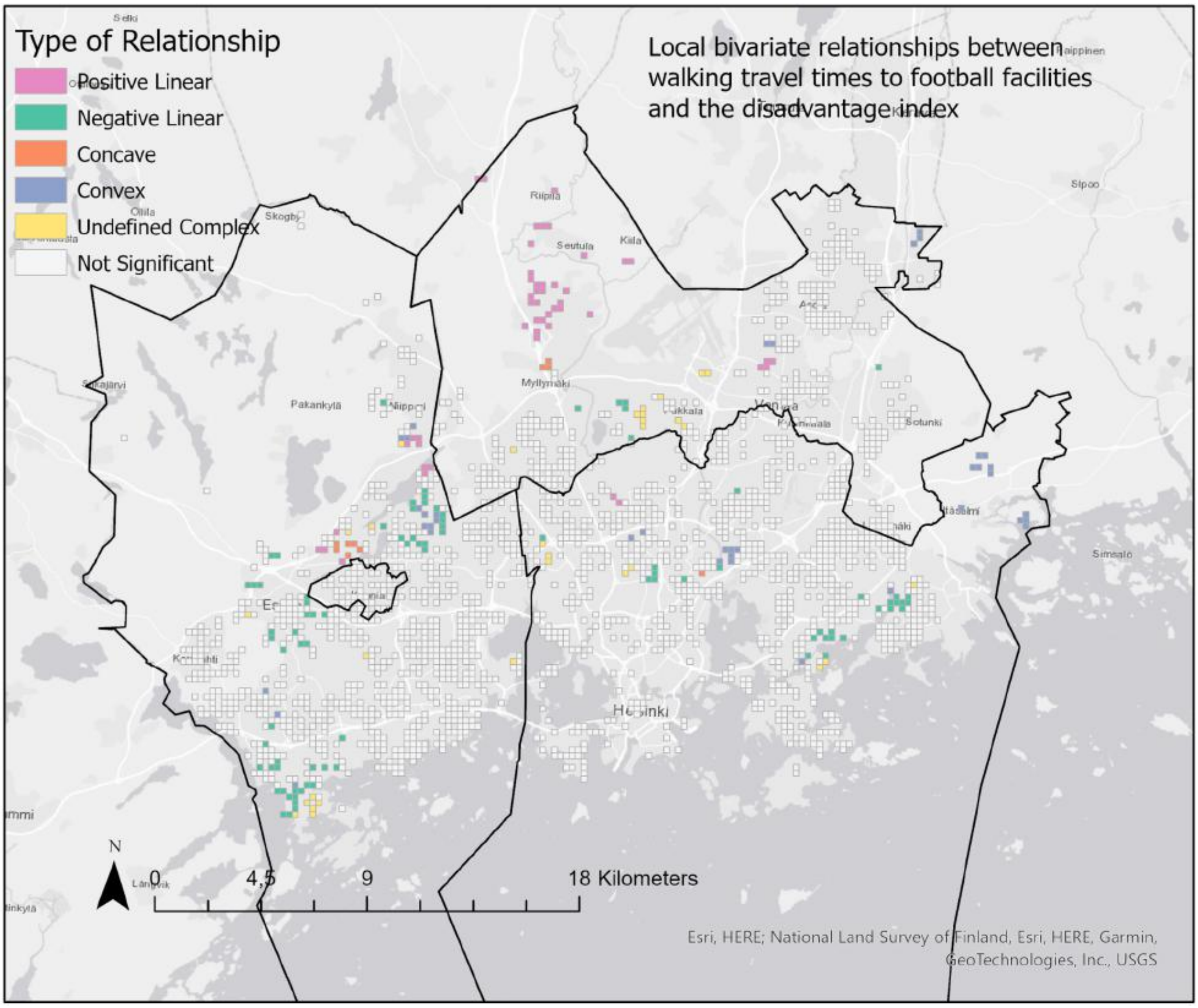
Appendix 20. Car (midday) travel times to closest dance location.



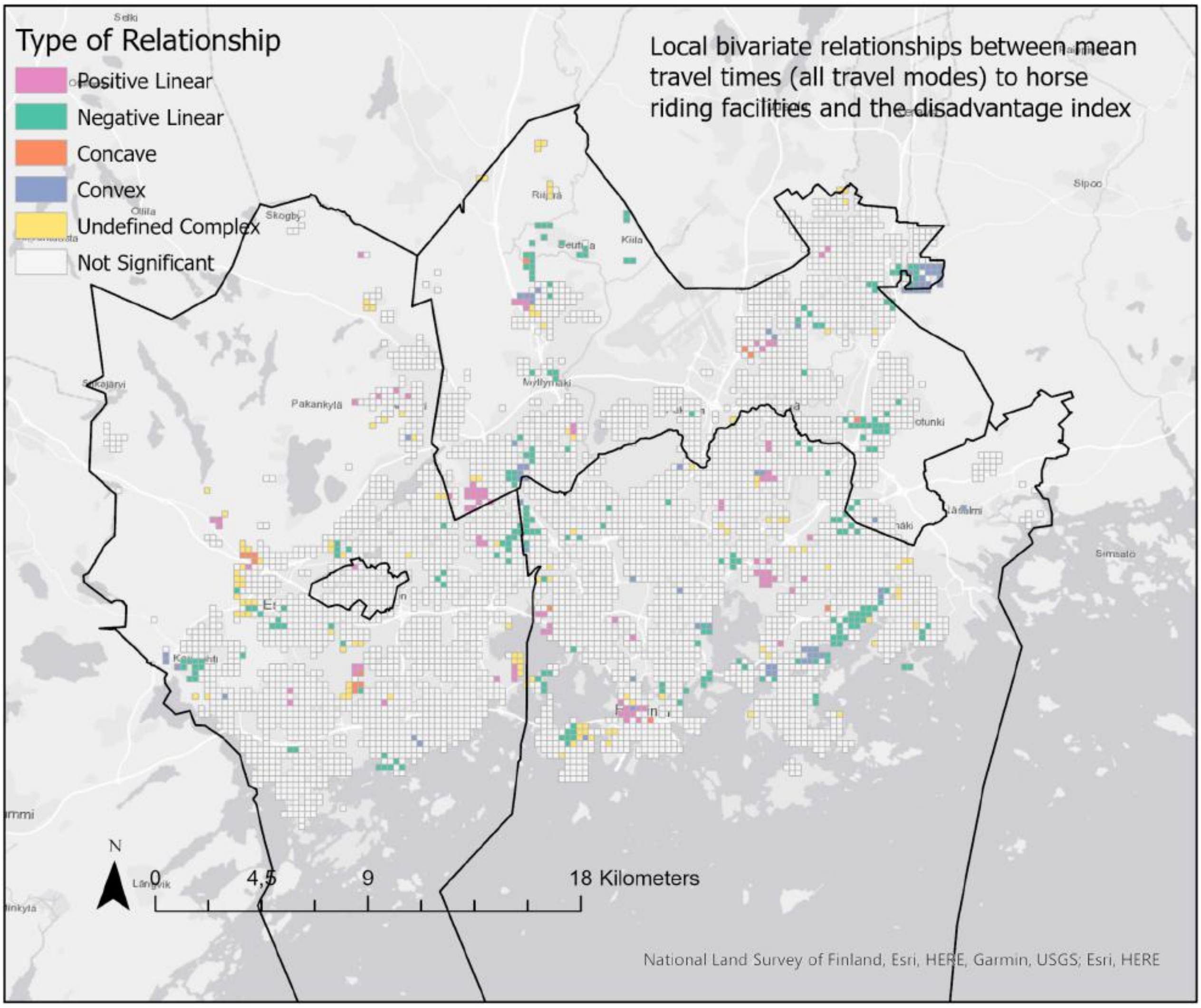
Appendix 21. Local bivariate relationships between floorball facility travel times and the disadvantage index



Appendix 22. Local bivariate relationships between dance facility travel times and the disadvantage index



Appendix 23. Local bivariate relationships between football facility travel times and the disadvantage index



Appendix 24. Local bivariate relationships between horse riding facility travel times and the disadvantage index

Appendix 25. Lists of identified physical activity locations:

Coordinates	**Horse riding school**	**City**
MultiPoint ((378893.98462159000337124 6673736.99157309997826815))	Tapiolan ratsastuskoulu	Espoo
MultiPoint ((373888.20224041002802551 6685066.81343299988657236))	Stall Gobbacka	Espoo
MultiPoint ((377253 6679818))	Leppävaaran ratsastuskoulu	Espoo
MultiPoint ((377549.12640424998244271 6678122.98116870038211346))	Kilon talli	Espoo
MultiPoint ((372936 6681089))	Primustalli	Espoo
MultiPoint ((374496.30597791000036523 6690399.66582768969237804))	Lahnuksen ratsastuskoulu	Espoo
MultiPoint ((373627.26472660998115316 6685711.48277650959789753))	Punametsän ratsastuskoulu	Espoo
MultiPoint ((373574.39005927997641265 6676016.51744799967855215))	Peikin ratsastuskoulu	Espoo
MultiPoint ((370191.57535577000817284 6669626.65861659962683916))	Espoonlahden ratsastuskoulu	Espoo
MultiPoint ((363561.56598395440960303 6678681.76834420301020145))	Talli Fageräng	Espoo
MultiPoint ((365832.27567373274359852 6675625.56587314698845148))	Espoon talli	Espoo
MultiPoint ((370454.21886158257257193 6679977.55376499705016613))	Miran miniponit	Espoo
MultiPoint ((400074.84348410001257434 6681957.19653220009058714))	Karlvikin Ratsastuskoulu	Helsinki
MultiPoint ((384273.02649797999765724 6675447.34403522964566946))	Keskustalli	Helsinki
MultiPoint ((391528.17590208002366126 6678319.8031513998284936))	Viikin ponikoulu	Helsinki
MultiPoint ((382180.66667683998821303 6680885.5))	Kaarelan Ratsutalli Oy	Helsinki
MultiPoint ((387678.75200233998475596 6681676.66022482980042696))	Tuomarinkartanon ratsastuskeskus	Helsinki
MultiPoint ((400241.17590208002366126 6679893.8031513998284936))	Husön Ratsastuskeskuksen	Helsinki
MultiPoint ((392812.34544298000400886 6694329.05177589971572161))	Trans Horses Ky	Vantaa
MultiPoint ((379791.9952808499801904 6685946.915623489767313))	Etelä-Vantaan Ratsastuskoulu	Vantaa
MultiPoint ((385585 6684124))	Tolkinkylän Ratsastuskoulu	Vantaa
MultiPoint ((396052.55925082002067938 6683526.58389140013605356))	Poni-Haka	Vantaa
MultiPoint ((381856.52867258311016485 6686666.95682069845497608))	Vantaanpuiston ratsutalli	Vantaa
MultiPoint ((381576.57549716206267476 6692170.83624948281794786))	Alsbölen talli	Vantaa
MultiPoint ((384338.59352587000466883 6692086.85029685869812965))	Islanninhevostalli Fagur	Vantaa
MultiPoint ((376662.83736216399120167 6688122.15342654008418322))	Tiias horses	Vantaa

Coordinates	Dance location	Dance school	City	Type
MultiPointZ ((24.83121650000000002 60.23480119999999971 0))	Painiityn päiväkoti	ESTRADAN OPETUSPISTEET	Espoo	Daycare center
MultiPointZ ((24.80606450000000152 60.21497389999999683 0))	Ruusulinnan Päiväkoti	ESTRADAN OPETUSPISTEET	Espoo	Daycare center
MultiPointZ ((24.813665799999999 60.22118369999999743 0))	Läkkitorin opetuspiste & toimisto	ESTRADAN OPETUSPISTEET	Espoo	Other
MultiPointZ ((24.74694369999999921 60.24367310000000231 0))	Laaksolahden monitoimitalo	ESTRADAN OPETUSPISTEET	Espoo	Other
MultiPointZ ((24.739897899999999 60.30579350000000005 0))	Ruskatalo	ESTRADAN OPETUSPISTEET	Espoo	Other
MultiPointZ ((24.7045716000000013 60.23773380000000088 0))	Espoon Kaupunki Aurorakoti 5 Vaahtera	ESTRADAN OPETUSPISTEET	Espoo	Other
MultiPointZ ((24.73636980090083881 60.15389259757490947 0))	Tiistilän koulu / Tanssisali (B-Rakennus)	Espoon tanssiopisto	Espoo	Other
MultiPointZ ((24.71166270164020418 60.2061521343514201 0))	Move Wellness Center / Tanssitila		Espoo	Other
MultiPointZ ((24.78552482678301061 60.17859805515657001 0))	Tapiolan liikuntahalli / Tanssitila		Espoo	Other
MultiPointZ ((24.76662278837349973 60.19486481159152191 0))		DCA	Espoo	Other
MultiPointZ ((24.8018727841867026 60.17562889913853041 0))		DCA	Espoo	Other
MultiPointZ ((24.73579296876195954 60.16394697514657963 0))		Stepup	Espoo	Other
MultiPointZ ((24.80420049265757854 60.17825586187660747 0))		Espoon tanssiopisto	Espoo	Other
MultiPointZ ((24.76546164036350106 60.16762662277852058 0))		Star dance studio	Espoo	Other
MultiPointZ ((24.76393004803104603 60.22890235467488651 0))		Tanssiklubi star	Espoo	Other
MultiPointZ ((24.81293267941712699 60.20996168503317847 0))		KM dance school	Espoo	Other
MultiPointZ ((24.7348596202676525 60.16788455298554084 0))		Dance now olari	Espoo	Other
MultiPointZ ((24.62903728002856951 60.16370859081432343 0))		Tanssipiste Loiste	Espoo	Other
MultiPointZ ((24.60234128446757396 60.19229222240844024 0))		Tanssipiste Loiste	Espoo	Other
MultiPointZ ((24.81240912556894784 60.22398347547068198 0))		Luhtavilla	Espoo	Other
MultiPointZ ((24.75317461059657731 60.15634624903383099 0))		Forever_lastenzumba	Espoo	Other
MultiPointZ ((24.7465263876539403 60.15311727180306178 0))		Style dance industry	Espoo	Other
MultiPointZ ((24.75347389999999947 60.27771870000000121 0))	Juvanpuiston koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.71001180000000019 60.24456320000000176 0))	Karamzinin Koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.71631999999999962 60.23214000000000112 0))	Auroran koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.73455390000000165 60.30725280000000055 0))	Kalajärven Koulu	ESTRADAN OPETUSPISTEET	Espoo	School

MultiPointZ ((24.76040199999999913 60.22356800000000021 0))	Karamalmin koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.62043440000000061 60.2283996999999971 0))	Karhusuon Koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.64209809999999834 60.21320260000000246 0))	Koulumestarin koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.80878009999999989 60.23958999999999975 0))	Lintuvaaran koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.80209250000010002 60.21682119999999827 0))	Ruusutorpan koulu	ESTRADAN OPETUSPISTEET	Espoo	School
MultiPointZ ((24.61489621296687602 60.16895909009087973 0))	Saunalahden koulu / Tanssitila	Espoon tanssiopisto	Espoo	School
MultiPointZ ((24.7214585094949939 60.17208621582327055 0))	koulu	Espoon tanssiopisto	Espoo	School
MultiPointZ ((24.66618237400215818 60.19673742541909434 0))	koulu	Espoon tanssiopisto	Espoo	School
MultiPointZ ((24.76738338832233666 60.16984233503484347 0))	koulu	Espoon tanssiopisto	Espoo	School
MultiPointZ ((24.65659375592354863 60.20745433677975456 0))	koulu	Jumppi maksuton	Espoo	School
MultiPointZ ((24.73958419652221963 60.19044010901532715 0))	koulu	Espoo Jumppi	Espoo	School
MultiPointZ ((24.82004702510171512 60.21342388010764068 0))	koulu	Latinomix	Espoo	School
MultiPointZ ((24.59238540386959926 60.19043074179887753 0))	koulu	Esvoli	Espoo	School
MultiPointZ ((24.77640046875346513 60.19188463442650772 0))	koulu	Tapiolan voimistelijat	Espoo	School
MultiPointZ ((24.66308540515672476 60.16813350792384085 0))	koulu	Espoon Syke	Espoo	School
MultiPointZ ((24.8271169193047001 60.22682582853533262 0))	koulu	Balettikoulu Heli Aalto	Espoo	School
MultiPointZ ((24.80759520715857747 60.2256680568353957 0))	nuorisotila	Tapiolan voimistelijat	Espoo	Youth center
MultiPointZ ((25.15770774424604284 60.20500621078846848 0))	pkoti	Helsingin tanssiopisto	Helsinki	Daycare center
MultiPointZ ((25.13877722109815238 60.20848708511574188 0))	paivakoti	Helsingin tanssiopisto	Helsinki	Daycare center
MultiPointZ ((24.90351059721568561 60.16115047306680452 0))	Ruoholahden palloiluhalli (htcGYM) / Aerobic-sali		Helsinki	Other
MultiPointZ ((24.92591171666267513 60.18698977264617156 0))	Olympiastadion / 1940 (A-sali 2)		Helsinki	Other
MultiPointZ ((24.93330650942119675 60.16336211976917525 0))	Tanssivintti / Tanssisali		Helsinki	Other
MultiPointZ ((24.97193617380916919 60.20660538014884366 0))	Indictus Oy / Tanssistudio		Helsinki	Other
MultiPointZ ((24.90291566071515916 60.16172088082782921 0))	Kaapelitehdas / Zodiak / Tanssistudio C4		Helsinki	Other
MultiPointZ ((25.01764307763674111 60.26541933856545796 0))	Tapanilan Urheilukeskus / Studio		Helsinki	Other
MultiPointZ ((25.0835566532616312 60.23233767550098605 0))	Tanssikoulu Ketonen / Tanssisali		Helsinki	Other
MultiPointZ ((25.04298928271386515 60.20045450005854804 0))	Tanssiklubi Master / Tanssisali		Helsinki	Other

MultiPointZ ((24.9672080906304501 60.18635471569441364 0))	EtnoFitness / Tanssisali		Helsinki	Other
MultiPointZ ((25.01458592958892169 60.25042214954977737 0))	Malmitalo / Esiintymisali (Malmisali)		Helsinki	Other
MultiPointZ ((24.85226931965396346 60.22107211023065787 0))	Tanssibuumi / Tanssisali		Helsinki	Other
MultiPointZ ((24.92841350766585506 60.16844437712744309 0))	Studio Manipura / Joogastudio		Helsinki	Other
MultiPointZ ((24.94824430274547211 60.16541530442018626 0))	Helsingin Tanssiopisto (Kasarmikatu) / Tanssisali 5		Helsinki	Other
MultiPointZ ((25.01458592958892169 60.25042214954977737 0))	Malmitalo / Esiintymisali (Pieni sali)		Helsinki	Other
MultiPointZ ((24.94176627274632096 60.22070685415723545 0))		Tanssila	Helsinki	Other
MultiPointZ ((24.89783198422850319 60.21202289073879399 0))		Tanssila	Helsinki	Other
MultiPointZ ((24.95070626792329449 60.24964440986300218 0))		Tanssila	Helsinki	Other
MultiPointZ ((24.94201598908518136 60.16703058637385482 0))		DCA	Helsinki	Other
MultiPointZ ((25.07963372053091433 60.21087740662674292 0))		DCA	Helsinki	Other
MultiPointZ ((24.89749435146013212 60.20431691664788332 0))	kerhotila	Helsingin tanssiopisto	Helsinki	Other
MultiPointZ ((24.92923380731729566 60.16913617567668382 0))		Helsingin tanssiopisto	Helsinki	Other
MultiPointZ ((24.95687900847226359 60.2150593811517183 0))	karjalatalo	Helsingin tanssiopisto	Helsinki	Other
MultiPointZ ((24.96040581842148143 60.1834735694665639 0))	leipätehdas	Helsingin tanssiopisto	Helsinki	Other
MultiPointZ ((24.90356351380899724 60.16583852230142071 0))		Helsingin tanssiopisto	Helsinki	Other
MultiPointZ ((24.97381256418945839 60.18686921541146972 0))		Helsingin tanssiopisto	Helsinki	Other
MultiPointZ ((24.88014691714344551 60.15143331375721658 0))		Footlight	Helsinki	Other
MultiPointZ ((25.06361343278591036 60.21647635948883703 0))	kylatalo	Vapaa tanssikoulu	Helsinki	Other
MultiPointZ ((25.04023985595969748 60.23427030209139588 0))	asukastalo	Vapaa tanssikoulu	Helsinki	Other
MultiPointZ ((24.95616950051011074 60.19380186637242502 0))		Helsingin tanssikeskus	Helsinki	Other
MultiPointZ ((24.93315786287803704 60.16473416145940689 0))		Saiffa	Helsinki	Other
MultiPointZ ((24.93343482187942683 60.19851027175091218 0))		Balettiakatemia	Helsinki	Other
MultiPointZ ((24.92657971534634598 60.17996238421463318 0))		Forever_lasten_zumba	Helsinki	Other
MultiPointZ ((25.02834783162636612 60.19273171229167474 0))		Forever_zumba	Helsinki	Other
MultiPointZ ((25.01100938505382842 60.255930927785883 0))		Balettikoulu Anne	Helsinki	Other
MultiPointZ ((24.94669302329597471 60.22727863413780369 0))		Pakilan voimistelijat	Helsinki	Other
MultiPointZ ((24.94907377846337937 60.24916491328617951 0))		Pakilan voimistelijat	Helsinki	Other

MultiPointZ ((24.951727275899799 60.18949789744774392 0))		Elina Robinson Flamenco	Helsinki	Other
MultiPointZ ((24.93139618313812989 60.1630256583764762 0))		Flamenco	Helsinki	Other
MultiPointZ ((24.93469420211345877 60.16782656165151622 0))		Annantalo	Helsinki	Other
MultiPointZ ((24.87923155059736047 60.14877672986035861 0))		Attitude	Helsinki	Other
MultiPointZ ((24.89892434412188393 60.24427938107732672 0))		Kannelmäen voimistelijat	Helsinki	Other
MultiPointZ ((24.92447007495557543 60.17411953835154748 0))		Papagaio	Helsinki	Other
MultiPointZ ((25.02856978264645349 60.19079630712209905 0))	asukastalo	MML herttoniemi	Helsinki	Other
MultiPointZ ((24.96043350177009046 60.23204755718830228 0))			Helsinki	School
MultiPointZ ((25.04370289217703771 60.2093511648062929 0))	koulu	Helsingin tanssiopisto	Helsinki	School
MultiPointZ ((25.09137866851239806 60.23155740752113019 0))	koulu	Helsingin tanssiopisto	Helsinki	School
MultiPointZ ((24.87842534974638653 60.20020135992572818 0))	koulu	Helsingin tanssiopisto	Helsinki	School
MultiPointZ ((24.9582211558322804 60.23032353669067618 0))	koulu	Helsingin tanssiopisto	Helsinki	School
MultiPointZ ((25.11913286002026879 60.20313752003121976 0))	koulu	Helsingin tanssiopisto	Helsinki	School
MultiPointZ ((25.0528788438568597 60.19545078717451503 0))	koulu	Footlight	Helsinki	School
MultiPointZ ((25.0318462511533717 60.19086921900887432 0))	koulu	Lastenliitto	Helsinki	School
MultiPointZ ((24.88540060951528332 60.153606429526846 0))	koulu	Lastenliitto	Helsinki	School
MultiPointZ ((25.00922062759764941 60.18566921328202568 0))	koulu	Lumets	Helsinki	School
MultiPointZ ((24.92497057480784761 60.16700624711794632 0))	koulu	Lumets	Helsinki	School
MultiPointZ ((25.00315388113659409 60.18698951966054977 0))	koulu	Lumets	Helsinki	School
MultiPointZ ((25.08270913437443994 60.16639483996335969 0))	koulu	MML Laajasalo	Helsinki	School
MultiPointZ ((25.05319252516364514 60.20061757505056477 0))	koulu	Karjalan nuoret	Helsinki	School
MultiPointZ ((24.92760300074534641 60.24203968622394711 0))	koulu	Pakilan voimistelijat	Helsinki	School
MultiPointZ ((24.87592850673979328 60.2025402896362607 0))	koulu	HKI lastenliitto	Helsinki	School
MultiPointZ ((24.92682067211699604 60.19709048838426213 0))			Helsinki	Youth center
MultiPointZ ((25.08508465205587612 60.23786025669340205 0))			Helsinki	Youth center
MultiPointZ ((25.08034393007069696 60.21206955098419655 0))			Helsinki	Youth center
MultiPointZ ((24.8761580724282183 60.23874162015589917 0))	nuorisotila	Helsingin tanssiopisto	Helsinki	Youth center
MultiPointZ ((24.87431438651412208 60.20629676219132165 0))	nuorisotalo	Helsingin tanssiopisto	Helsinki	Youth center
MultiPointZ ((24.86001000764250435 60.22602195617896825 0))	nuorisotila	Helsingin tanssiopisto	Helsinki	Youth center
MultiPointZ ((25.06177379699982666 60.20308566749252321 0))	nuorisotalo	Helsingin tanssiopisto	Helsinki	Youth center

MultiPointZ ((25.03362755105237625 60.19440633682825137 0))	nuorisotila	HKi_ilm_tanssi	Helsinki	Youth center
MultiPointZ ((25.1400572903970172 60.20571171604198213 0))	nuorisotalo	HKI_ilm	Helsinki	Youth center
MultiPointZ ((24.97655307222463961 60.20427622289078329 0))	nuorisotila	HKI_ilma	Helsinki	Youth center
MultiPointZ ((24.9940052259943819 60.24324006897682438 0))	nuorisotalo	HKI_ilma	Helsinki	Youth center
MultiPointZ ((24.96479325404669325 60.22789968848727682 0))	nuoristalo	HKI_ilma	Helsinki	Youth center
MultiPointZ ((25.03406122880097584 60.23384192301544715 0))	Nuorisotalo	HKI_ilma	Helsinki	Youth center
MultiPointZ ((24.96682436825558327 60.21856914324880705 0))	nuorisotalo	HKI_ilma	Helsinki	Youth center
MultiPointZ ((24.88245869209311678 60.15832096501029724 0))	nuorisotalo	HKI_ilma	Helsinki	Youth center
MultiPointZ ((24.85882319322951872 60.24407874845124411 0))	nuorisotalo	HKI_ilma	Helsinki	Youth center
MultiPointZ ((24.73740647517516678 60.21208663366272162 0))	paivakoti	Helsingin tanssiopisto	Kauniainen	Daycare center
MultiPointZ ((24.73403257910810282 60.21120432438461734 0))		Balettikoulu Heli Aalto	Kauniainen	Other
MultiPointZ ((24.9459816801697265 60.29176781956577003 0))	päiväkoti	Vantaan voimisteluseura	Vantaa	Daycare center
MultiPointZ ((24.82863504988095116 60.31823037030769541 0))	paivakoti	Vantaan lastenliitto	Vantaa	Daycare center
MultiPointZ ((25.01832967162366472 60.29071458837288588 0))		Helsingin tanssiopisto	Vantaa	Other
MultiPointZ ((24.85269296607169309 60.2703460251037626 0))		Stepup	Vantaa	Other
MultiPointZ ((25.03622281448965836 60.29171218054865733 0))		Kulttuurikeskus Pressi	Vantaa	Other
MultiPointZ ((24.85316526521355485 60.25855804128808302 0))		Vantaan tanssiopisto	Vantaa	Other
MultiPointZ ((25.03129037424017866 60.30961831893096559 0))		Vantaan tanssiopisto	Vantaa	Other
MultiPointZ ((24.85200263754398264 60.31899258738843628 0))	Monitoimitalo	Vantaan tanssiopisto	Vantaa	Other
MultiPointZ ((24.85389853182037001 60.2631801311594586 0))		Vantaan katutanssi	Vantaa	Other
MultiPointZ ((24.82367023053479471 60.28001486985613866 0))		Vakita	Vantaa	Other
MultiPointZ ((25.05314699189104743 60.30205172807512071 0))		Sc Vantaa	Vantaa	Other
MultiPointZ ((24.8262585449034745 60.28104426734966381 0))		Forever_lasten_zumba	Vantaa	Other
MultiPointZ ((25.07668357615657229 60.35182594313913995 0))	koulu	Helsingin tanssiopisto	Vantaa	School
MultiPointZ ((24.96204689857550107 60.28618019846031473 0))	koulu	Vantaan tanssiopisto	Vantaa	School
MultiPointZ ((24.85055429454523335 60.26145023505537068 0))	koulu	Vantaan katutanssi	Vantaa	School
MultiPointZ ((24.86120543512009462 60.32732920392221843 0))	koulu	Vantaan katutanssi	Vantaa	School
MultiPointZ ((24.86893026168488774 60.2675858061235914 0))	koulu	Vantaan katutanssi	Vantaa	School
MultiPointZ ((25.06995574105981461 60.35788858184116634 0))	koulu	SC Vantaa	Vantaa	School
MultiPointZ ((25.10008575747515991 60.27383999672456127 0))	koulu	Balettikoulu hari	Vantaa	School

MultiPointZ ((25.05845430484810166 60.29582212876860581 0))	koulu	Balettikoulu Hari	Vantaa	School
MultiPointZ ((25.13459967718911514 60.3454317619127778 0))	koulu	Lastenliitto	Vantaa	School
MultiPointZ ((25.02909403416764889 60.31248208551521373 0))	koulu	Lastenliitto	Vantaa	School
MultiPointZ ((24.82360667917634345 60.25842936868951938 0))	koulu	Vantaan voimisteluseura	Vantaa	School
MultiPointZ ((24.90894102647761343 60.28254857578382087 0))	koulu	Vantaan voimistelijat	Vantaa	School
MultiPointZ ((25.11442660503308133 60.24876703846199177 0))	koulu	Itä-Vantaan urheilijat	Vantaa	School
MultiPointZ ((25.02563988460905975 60.32694960787624439 0))	koulu	Vantaan naisvoimistelijat	Vantaa	School
MultiPointZ ((25.05161576607455842 60.29930347804107527 0))	koulu	Tikkurilan naisvoimisteilijat	Vantaa	School
MultiPointZ ((25.02388489268903626 60.3070000763817049 0))	koulu	Tikkurilan naisvoimistelijat	Vantaa	School

Coordinates	**Football location**	**City**	**Sports club(s)**	**Type**
Point (24.78262082422356727 60.17661839999999529)	Esport areena	Espoo	etikka, fchonka, hoogee, kaupunki	Other field or Hall
Point (24.65295770878673309 60.20615963241176161)	Kannusillan sali	Espoo	ebk	Other field or Hall
Point (24.5930560653651149 60.1990631000000036)	Myntinsyrjä Halli	Espoo	etikka ja muut	Other field or Hall
Point (24.76450878030207647 60.16629064842816632)	Haukilahden koulu	Espoo	Liikuntaleikki	School
Point (24.70192287978576218 60.14651440000000093)	Iivisniemen koulu	Espoo	etikka	School
Point (24.73540554892419863 60.30579500000000337)	Kalajärven koulu	Espoo	ponsi	School
Point (24.61992244169834265 60.22782228610844868)	karhusuon koulu	Espoo	ponsi	School
Point (24.66479633889373702 60.20940490000000267)	Kirkkojärven koulu	Espoo	ebk	School
Point (24.65707660223663567 60.20749670000000009)	Lagstadin koulu	Espoo	ebk	School
Point (24.81858468765654635 60.23380124705616367)	Lintulaakson koulu	Espoo	Liikuntaleikki	School
Point (24.77988185355884809 60.1930689000000001)	Mankkaan koulu	Espoo	Liikuntaleikki	School
Point (24.74864589999999964 60.16392059999999731)	Mattlidenin koulu H	Espoo	fc honka	School
Point (24.66365956467473808 60.16832964999999689)	Nöykkiön koulu	Espoo	Liikuntaleikki	School
Point (24.73716311680472302 60.18020570000000191)	Olari koulu HTN	Espoo	espa, westend indians	School
Point (24.81899770000000061 60.18411300000000352)	Otaniemen lukio	Espoo	westend indians	School
Point (24.66803535641169276 60.1957251000000042)	Saarnilaakson koulu	Espoo	ebk	School
Point (24.73663462526314305 60.15385109999999713)	Tiistilän koulu	Espoo	Liikuntaleikki	School

Point (24.67718924999999786 60.21005565000000104)	EBK-Honka Areena ja keskiespoo TN	Espoo	ebk, fc honka	Articifial turf field
Point (24.66284292100271358 60.14619154999999751)	Espoonlahti	Espoo	icehearts, eps, etikka, espa	Articifial turf field
Point (24.7144764839122999 60.32351200000000091)	Haarssinpuiston kenttä	Espoo	ponsi	Articifial turf field
Point (24.58520563704338713 60.1908294499999954)	Hansavalkama TN	Espoo	Kapy	Articifial turf field
Point (24.69688366803369917 60.14933034999999961)	Kaitaa TN	Espoo	etikka, hoogee	Articifial turf field
Point (24.75775814055115376 60.2297804499999998)	Karakallio TN	Espoo	kasiysi	Articifial turf field
Point (24.67446721905316664 60.21018402265441694)	Keski-espoon TN	Espoo		Articifial turf field
Point (24.67153307278939778 60.20288958655034151)	Kirstin koulu TN (8v8)	Espoo	ebk	Articifial turf field
Point (24.64260277962428347 60.15005015027103497)	Kivenlahti TN	Espoo	eps	Articifial turf field
Point (24.74694569101839292 60.24593424988660928)	Laaksolahti	Espoo	ebk, fce, kasiysi	Articifial turf field
Point (24.80086779634503813 60.22606774999999857)	Leppävaaran urheilupuisto	Espoo	fce	Articifial turf field
Point (24.75123045775335839 60.15987495000000251)	Matinkylä TN	Espoo	espa, fchonka, kaupunki	Articifial turf field
Point (24.7537752848063235 60.15490055000000069)	Matinlahden koulu TN	Espoo	espa	Articifial turf field
Point (24.75554116480868316 60.30163813745992485)	Metsamaa TN	Espoo	Ponsi	Articifial turf field
Point (24.73962309999999931 60.19051879999999954)	Opinmäki TN	Espoo	espa	Articifial turf field
Point (24.79414955958996103 60.16364335000000096)	Settle Field TN, Westendinpuisto	Espoo	hoogee, westend ind	Articifial turf field
Point (24.56014219965103251 60.29426245000000506)	Solvalla TN	Espoo	pelejä ainaki	Articifial turf field
Point (24.78207943609123021 60.1619821111575348)	Sorsis Areena TN, Toppelund	Espoo	hoogee	Articifial turf field
Point (24.79905379621703077 60.21505244658647626)	Säterinniitty TN	Espoo	fce	Articifial turf field
Point (24.77924820000000139 60.17843680000000006)	Tapiola Urheilupuisto	Espoo	fchonka	Articifial turf field
Point (24.80109399999999908 60.17921299999999718)	Tapion kenttä TN	Espoo	pelejä ainaki	Articifial turf field
Point (24.82266371098781121 60.23841976207567228)	Uusmäen pallokenttä TN	Espoo	fce	Articifial turf field
Point (24.61871179593241621 60.18399552405772113)	Vanttila TN	Espoo	Kapy	Articifial turf field
Point (24.80719810000000081 60.22506489999999957)	Veräjävahti TN	Espoo	lepa	Articifial turf field
Point (25.02209657768707984 60.24681390000000647)	Ala-Malmi	Helsinki	hjk	Other field or Hall
Point (24.9684121999999995 60.19984720000000067)	Arcadahalli	Helsinki	hponnistus	Other field or Hall
Point (24.87772174238195433 60.15572894999999676)	Erkkeri halli	Helsinki	ppj	Other field or Hall
Point (25.03412370179868773 60.20900144516935626)	Herttoniemi H	Helsinki	herto	Other field or Hall

Point (24.97897068508344987 60.16808224123673909)	Katajanokan Jalkapallokenttä	Helsinki	sapa	Other field or Hall
Point (24.9712153999999984 60.16691320000000331)	Katajanokan Liikuntahalli	Helsinki	sapa	Other field or Hall
Point (24.97095165305343301 60.21106929999999835)	Koreankadun kenttä	Helsinki	Arabian brasilia	Other field or Hall
Point (25.05685558685711101 60.16859652360302846)	Kultapossupuisto	Helsinki	lps	Other field or Hall
Point (25.14862228143242717 60.20255484999999851)	Lillkalvikinpuiston hiekkakentäll	Helsinki	liikuntaleikki	Other field or Hall
Point (25.07541882885890416 60.21615595000000098)	Myllypuro LP	Helsinki	Pk35, hjk	Other field or Hall
Point (25.07992613867918763 60.21965540000000061)	Pallomylly	Helsinki	fcatlantis	Other field or Hall
Point (25.03789910000000063 60.18678229999999729)	päiväkodin salissa	Helsinki	liikuntaleikki	Other field or Hall
Point (24.98166875000000076 60.27328515000000664)	Siltamäki LP	Helsinki	icehearts	Other field or Hall
Point (25.02958091028700949 60.19013195000000138)	Sportpark Herttoniemenranta	Helsinki	lps	Other field or Hall
Point (24.95335199999999887 60.19420660000000112)	Stadin ammattiopiston sali	Helsinki	sapa	Other field or Hall
Point (25.02911671319595044 60.16461932438462412)	Stansvikin nurmikenttä	Helsinki	lps	Other field or Hall
Point (25.01910808927136287 60.27272800000000075)	Tapulikaupungin LP	Helsinki	puiu	Other field or Hall
Point (25.05177607052221944 60.25688664421785745)	Tattarisuon kuplahalli	Helsinki	puiu, mps	Other field or Hall
Point (25.02605158986308709 60.22937294999999835)	Viikin Monitoimitalo	Helsinki	Pk35	Other field or Hall
Point (24.89109306978347647 60.2143586499999941)	Haagan peruskoulu	Helsinki	liikuntaleikki	School
Point (25.07111484814986113 60.21315839999999753)	Helsingin kielilukio	Helsinki	liikuntaleikki	School
Point (25.03576634845683202 60.20655589999999791)	herttoniemen yhteiskoulu	Helsinki	hponnistus	School
Point (25.0321700000000007 60.19091310000000306)	Herttoniemenrannan ala-asteen koulu	Helsinki	hjk	School
Point (24.92934239719735956 60.24210890000000518)	HPS juniorikenttä	Helsinki	hps	School
Point (25.15769205315139345 60.20451764999999966)	Kanavan koulu	Helsinki	liikuntaleikki	School
Point (25.05441981805211071 60.17775756772096685)	koulu	Helsinki	liikuntaleikki	School
Point (24.89090749176116191 60.21677025000000327)	Lärkan	Helsinki	pohu	School
Point (25.00083160000000149 60.25520410000000027)	Malmin peruskoulu	Helsinki	liikuntaleikki	School
Point (24.85980823481012436 60.24577474999999538)	Malminkartanon ala-aste	Helsinki	liikuntaleikki, hjk	School
Point (24.96384444917534751 60.23586914999999919)	Oulunkylän koulu	Helsinki	gnistan	School
Point (24.93566626852032897 60.24909155864725108)	Pakila ala-aste	Helsinki	liikuntaleikki	School

Point (24.93041716885838355 60.25483034999999887)	Paloheinän koulu	Helsinki	liikuntaleikki	School
Point (24.999197164836648 60.23755328260993025)	Pihlajamäki	Helsinki	pk35	School
Point (24.89487035336522069 60.2018361000000013)	Pikku Huopalahden ala-aste	Helsinki	liikuntaleikki	School
Point (24.89785988764476343 60.22677490000000233)	pohjoishaagan koulu	Helsinki	pohu	School
Point (24.99826652340207644 60.27584184643508536)	Suutarilan ala-aste	Helsinki	liikuntaleikki	School
Point (24.91611294673538879 60.17473336391415017)	Taivallahden peruskoulu	Helsinki	liikuntaleikki	School
Point (25.12371434557622507 60.2090056499999946)	Vuoniityn peruskoulu	Helsinki	liikuntaleikki	School
Point (25.13488658698709344 60.21830169999999782)	Vuoniityn peruskoulu	Helsinki	liikuntaleikki	School
Point (24.97629600270167316 60.20416850000000153)	Arabia tn	Helsinki	hjk, tote	Articifial turf field
Point (24.95636049999999884 60.18197289999999811)	Haapaniemi TN	Helsinki	hponnistus, sapa	Articifial turf field
Point (24.92491774999999876 60.14900384999999972)	Hernesaari nap TN	Helsinki	ppj	Articifial turf field
Point (25.05772063721997256 60.17906915000000367)	Ilomäentie nap TN	Helsinki	hjk	Articifial turf field
Point (25.08196984532812834 60.26092889999999613)	Jakomäki	Helsinki	puiu, fckontu	Articifial turf field
Point (24.91778616351074049 60.15444992162154136)	Jätkäsaari LP	Helsinki	ppj	Articifial turf field
Point (24.94945816729288524 60.18746016769409835)	Kallio TN	Helsinki	hponnistus	Articifial turf field
Point (24.87719349287840132 60.24375385772245295)	Kannelmäki TN	Helsinki	hjk	Articifial turf field
Point (25.15541823675037136 60.21146935000000155)	Kartano	Helsinki	viikingit	Articifial turf field
Point (25.05239236030639205 60.23846830000000097)	Kivikko nap TN	Helsinki	peleja ainaki	Articifial turf field
Point (25.09169323672261953 60.23421944999999766)	Kontula	Helsinki	kontu, hjk	Articifial turf field
Point (25.00261779999999945 60.18635890000000188)	Kulosaari nap TN	Helsinki	herto, kulps	Articifial turf field
Point (24.9531407999999999 60.19946060000000188)	Kumpula	Helsinki	hifk, hjk, käpa	Articifial turf field
Point (25.06673941551948914 60.23446156109704219)	Kurkimäki TN	Helsinki	fckontu	Articifial turf field
Point (24.94111817346669469 60.20538704572923905)	Käpylä UP	Helsinki	hifk, hjk, käpylä united	Articifial turf field
Point (25.05604110040040666 60.17562683831438619)	Laajasalo	Helsinki	hjk, lps	Articifial turf field
Point (24.89822158162217391 60.2223668000000032)	Laajasuon liikuntapuisto	Helsinki	hps, pohu	Articifial turf field
Point (24.87587034838927025 60.23379334999999912)	Lassila Liikuntapuisto	Helsinki	pohu	Articifial turf field
Point (25.03629274649912162 60.23119690000000048)	Latokartanon urheilupuisto	Helsinki	Pk35	Articifial turf field
Point (24.86685004250161057 60.16306689452427037)	Lauttasaari TN	Helsinki	hjk, ppj	Articifial turf field
Point (24.90732954266977828 60.19556923428744)	Lehtikuusentie TN	Helsinki	hjk	Articifial turf field
Point (25.03099179503953309 60.2685552539067757)	Mosa TN	Helsinki	mps	Articifial turf field

Point (24.87522749596079663 60.19631525208448153)	Munkkiniemi tn	Helsinki	hjk	Articifial turf field
Point (24.96210372009170797 60.23471038068418437)	Oulunkylä	Helsinki	gnistan	Articifial turf field
Point (24.84852950000000149 60.21890460000000189)	Pajamäki	Helsinki	hjk, pps	Articifial turf field
Point (24.92220535087052724 60.24679042568257614)	Paloheinä	Helsinki	hps	Articifial turf field
Point (25.00081440000000299 60.23868294999999762)	Pihlajamäen tekonurmi	Helsinki	Pk35	Articifial turf field
Point (24.91347315786321559 60.23417231100155789)	Pirkkola UP	Helsinki	hjk, pps, pohu	Articifial turf field
Point (24.86155079999999984 60.22556670000000167)	Pitäjänmäki TN	Helsinki	hjk, pita	Articifial turf field
Point (25.05525510000000011 60.2676879999999997)	Puistola	Helsinki	Puiu	Articifial turf field
Point (25.09731165179581325 60.21471090000000004)	Puotila TN	Helsinki	tips, valtti	Articifial turf field
Point (24.86828800531701233 60.21401369999999531)	Tali LP	Helsinki	atlantis fc, hjk	Articifial turf field
Point (25.03071165328742254 60.27088168214385888)	Tapanila	Helsinki	puiu, hjk, mps	Articifial turf field
Point (25.01910808927136287 60.27272800000000075)	Tapuli N	Helsinki	puiu, hjk,mps	Articifial turf field
Point (24.9403511999999985 60.15938959999999724)	Tehtaanpuisto nap TN	Helsinki	hifk, ppj	Articifial turf field
Point (24.92362375832718158 60.18790312322783365)	Töölö PK	Helsinki	hjk	Articifial turf field
Point (25.08267666314372235 60.24428904999999901)	Vesala nap TN	Helsinki	kontu	Articifial turf field
Point (25.13745919999999856 60.21835819999999728)	Vuosaari LP	Helsinki	puiu, viiking	Articifial turf field
Point (24.91765993499308962 60.17212203722647246)	Väinämöinen TN	Helsinki	hifk	Articifial turf field
Point (24.73003362442304365 60.20707381567702754)	Medsin kenttä	Kauniainen	Grifk football	Other field or Hall
Point (24.71633744050818748 60.2152186759891066)	Saharan hiekkakenttä	Kauniainen	Grifk football	Other field or Hall
Point (24.7005548687203671 60.22132108429442354)	Fa solutions areena	Kauniainen	Grifk football	Articifial turf field
Point (24.70813078400961516 60.21650310906253623)	Keskuskenttä	Kauniainen	Grifk football	Articifial turf field
Point (25.11986309907111803 60.28013269999999579)	Hakunilan ylipainehalli	Vantaa	Ita-hakkilan kilpa, Koips	Other field or Hall
Point (25.07004321048214024 60.32262106170994542)	Havukosken nuorisotalo	Vantaa	Koips	Other field or Hall
Point (25.05527778000208627 60.30038494999999443)	Hiekkaharju UP	Vantaa	koips	Other field or Hall
Point (24.85313659999999913 60.32189149999999955)	Lipunkantajan kenttä	Vantaa	keika	Other field or Hall
Point (24.86495380137296962 60.29078644999999881)	Ministreet kenttä	Vantaa	vjs	Other field or Hall
Point (25.07830380000000048 60.31857850000000099)	Havukosken koulu	Vantaa	Koips	School
Point (25.02566441820908238 60.3268388042705439)	Ilolan koulu	Vantaa	tips	School
Point (25.05215908031899374 60.29942516946243103)	Jokiniemen koulu	Vantaa	tips	School
Point (24.95536940806395165 60.28032397025418021)	Kartanonkosken koulu	Vantaa	pps	School

Point (25.07567757271429087 60.32519627172597865)	Koivukylän koulu	Vantaa	Koips	School
Point (25.08359362041171181 60.35693890000000295)	Korpikontionpuisto H	Vantaa	kopse	School
Point (25.06695470130846815 60.3182468499999942)	Kytöpuiston koulu	Vantaa	Koips	School
Point (25.09769910526770076 60.27435415000000063)	Lehtikuusen koulu	Vantaa	tips	School
Point (25.11451259147055026 60.24863960000000418)	Länsimäen koulu	Vantaa	ivu	School
Point (25.09956809999999905 60.32553589999999843)	Päiväkummun koulu	Vantaa	Koips	School
Point (25.11036693042373003 60.25253299999999967)	Rajakylän koulu	Vantaa	tips	School
Point (25.05927606350100234 60.33501739999999813)	Rekolanmäen koulu	Vantaa	Koips	School
Point (24.87476427937002299 60.34734810000000493)	Seutulan koulu	Vantaa	Keika	School
Point (25.05439709401829873 60.30180805000000532)	Varia	Vantaa	Liikuntaleikki	School
Point (25.01654873359918696 60.28962160000000381)	Viertolan koulu	Vantaa	tips	School
Point (25.12074694937479435 60.27846334999999556)	Hakunila	Vantaa	tips	Articifial turf field
Point (25.06542560000000108 60.31568450000000325)	Havukoski	Vantaa	Koips	Articifial turf field
Point (25.03638130797082084 60.30768224999999916)	Hiekkaharju Koulu TN,aktia	Vantaa	tips	Articifial turf field
Point (25.10708635821120538 60.29392185131716531)	Itä-Hakkila	Vantaa	Ita-hakkilan kilpa	Articifial turf field
Point (25.11297469999999876 60.34752749999999821)	Jokivarren TN	Vantaa	kopse	Articifial turf field
Point (25.08089532583631254 60.3584463858844984)	Kalmuuri Halli TN	Vantaa	kopse	Articifial turf field
Point (24.85938851118614679 60.32769171048033741)	Kenraalinpuisto TN	Vantaa	keika	Articifial turf field
Point (24.85111525860127202 60.26541077882452413)	Myyrmaki TN	Vantaa		Articifial turf field
Point (24.83939016455735427 60.2623416035165107)	Myyrmäki	Vantaa	keika_myos halli	Articifial turf field
Point (25.10894883918042453 60.24729091601307118)	Rajakylä TN	Vantaa	rcd, ivu	Articifial turf field
Point (25.02425221902727515 60.30067784999999958)	Tikkurila	Vantaa	Keika, Koips	Articifial turf field
Point (24.82115285320001874 60.26647915000000211)	Vapaalanaukea	Vantaa	pelejä	Articifial turf field

Coordinates	**Floorboll Location**	**City**	**Sport club(s)**	**Type**
Point (24.71507581922875119 60.23193675000000269)	Auroran koulu	Espoo	ESPORT OILERS_westend	School

Point (24.68500304866853412 60.16580745000000263)	Eestinkallion koulu	Espoo	WESTEND INDIANS	School
Point (24.73302927230729154 60.17942055000000323)	Espoon Steinerkoulu	Espoo	ESPORT OILERS	School
Point (24.70716877274337264 60.16886494999999968)	Friisilän koulu	Espoo	ESPORT OILERS	School
Point (24.59230564659828389 60.1904066499999999)	hansakallion koulu	Espoo	WESTEND INDIANS	School
Point (24.765676495294354 60.16623535000000089)	Haukilahden koulu	Espoo	ESPORT OILERS	School
Point (24.70192287978576218 60.14651440000000093)	Iivisniemen koulu	Espoo	ESPORT OILERS	School
Point (24.75350967833939109 60.27766925000000242)	Juvanpuiston koulu	Espoo	SC WILD TITANS	School
Point (24.66004140000000078 60.21012699999999995)	Kaivomestari	Espoo	V- JA U-SEURA TUOMARILAN URHEILIJAT	School
Point (24.76146917278243365 60.22377174999999738)	Karamalmens skola	Espoo	ESPORT OILERS	School
Point (24.70946899999999857 60.24479689999999721)	Karamzinin koulu	Espoo	ESPORT OILERS	School
Point (24.62045217561983179 60.22867390000000398)	Karhusuon koulu	Espoo	V- JA U-SEURA TUOMARILAN URHEILIJAT	School
Point (24.66479633889373702 60.20940490000000267)	kirkkojärven koulu	Espoo	KIRKKOJÄRVEN LOISKE	School
Point (24.66953702682059912 60.20109850000000051)	kirstin koulu	Espoo	V- JA U-SEURA TUOMARILAN URHEILIJAT	School
Point (24.72591634591973531 60.16697465000000022)	Kuitinmäen peruskoulu	Espoo	WESTEND INDIANS	School
Point (24.65707660223663567 60.20749670000000009)	Lagstadin koulu	Espoo	V- JA U-SEURA TUOMARILAN URHEILIJAT	School
Point (24.64445486058879453 60.14833450000000425)	Laurinlahden koulu	Espoo	ESPORT OILERS	School
Point (24.82063006071427935 60.23371955000000355)	Lintulaakson koulu	Espoo	ESPORT OILERS	School
Point (24.8191421192489976 60.23778144999999995)	Lintumetsän koulu	Espoo	WESTEND INDIANS	School
Point (24.80660783651206103 60.2382118499999999)	lintuvaaran koulu	Espoo	WESTEND INDIANS	School
Point (24.74367632089157354 60.24296574999999621)	LÄHDERANNAN KOULU	Espoo	WESTEND INDIANS	School
Point (24.77601207606263856 60.19222239999999857)	Mankkaanpuron koulu	Espoo	ESPORT OILERS	School
Point (24.63215970680042233 60.20531315000000205)	Mikkelän koulu	Espoo	WESTEND INDIANS	School
Point (24.66365956467473808 60.16832964999999689)	Nöykkiön koulu	Espoo	ESPORT OILERS	School
Point (24.81950454849128818 60.21510169999999817)	Omnia Leppävaara	Espoo	ESPORT OILERS	School
Point (24.81899770000000061 60.18411300000000352)	Otaniemen lukio	Espoo	NORTHERN STARS	School
Point (24.82044359576642378 60.21336764999999502)	Perkkaanpuiston koulu	Espoo	ESPORT OILERS	School
Point (24.82535642765092376 60.22340164999999956)	Postipuun koulu	Espoo	Leppävaaran sisu	School
Point (24.73793780758495942 60.17361220000000088)	Päivänkehrän koulu	Espoo	WESTEND INDIANS	School
Point (24.76979024445250843 60.23230989999999707)	Rastaalan koulu	Espoo	Leppävaaran sisu	School
Point (24.66803535641169276 60.1957251000000042)	Saarnilaakson koulu	Espoo	ESPORT OILERS_tuomarilan urheilijat	School

Point (24.6156021724852252 60.16896570000000111)	Saunalahden koulu	Espoo	ESPORT OILERS	School
Point (24.6655153809855463 60.14761504999999886)	Storängens Skola	Espoo	ESPORT OILERS	School
Point (24.75132690682390901 60.19611975000000115)	Taavinkylän koulu	Espoo	ESPORT OILERS_westend	School
Point (24.80430373063408922 60.17917620000000056)	Tapiolan koulu	Espoo	ESPORT OILERS	School
Point (24.73663462526314305 60.15385109999999713)	TIISTILÄN KOULU	Espoo	WESTEND INDIANS	School
Point (24.78469490000000164 60.15926129999999716)	Toppelundin koulu	Espoo	WESTEND INDIANS	School
Point (24.79414955958996103 60.16364335000000096)	Westendinpuiston koulu	Espoo	WESTEND INDIANS	School
Point (24.74228529999999893 60.22916690000000273)	Viherkallion koulu	Espoo	ESPORT OILERS_westend	School
Point (24.71120519525329939 60.20482055000000088)	Ymmerstan koulu	Espoo	WESTEND INDIANS	School
Point (24.78262082422356727 60.17661839999999529)	Esport Arena	Espoo	ESPORT OILERS	Other sports hall
Point (24.81086720000000057 60.22518070000000279)	Leppävaaran liikuntahalli	Espoo	NORTHERN STARS	Other sports hall
Point (24.8356166000000016 60.18447669999999761)	Otahalli	Espoo	WESTEND INDIANS	Other sports hall
Point (24.75082590000000238 60.21444205000000238)	Stars Arena	Espoo	NORTHERN STARS	Other sports hall
Point (24.78528389449614977 60.17879285000000067)	Tapiolan Urheiluhalli	Espoo	ESPORT OILERS	Other sports hall
Point (24.60588096487803966 60.1845581999999979)	THT-Center	Espoo	IDROTTSFÖRENINGEN KAMRATERNA GRANKULLA	Other sports hall
Point (24.97472999583617081 60.20429839999999899)	Arabian peruskoulu	Helsinki	ERÄVIIKINGIT	School
Point (24.85227105804436576 60.31914349999999558)	Aurinkokiven koulu	Helsinki	Sporttia kaikille	School
Point (24.95075287095566097 60.16331884999999602)	Grundskolan Norsen	Helsinki	Stadin pallo	School
Point (24.89159880000000058 60.21710869999999716)	Haagan peruskoulu	Helsinki	M-TEAM	School
Point (25.03542003544449912 60.20380719999999997)	Hertsikan ala-aste	Helsinki	ERÄVIIKINGIT	School
Point (24.97892522210383248 60.18401780000000656)	Kalasataman peruskoulu	Helsinki	SC HAWKS	School
Point (24.88229748322736867 60.24846770000000618)	Kannelmäen peruskoulu	Helsinki	ERÄVIIKINGIT	School
Point (24.96936678470996185 60.16769035000000088)	Katajanokan ala-aste	Helsinki	stadin pallo	School
Point (24.95639193732876038 60.21740465000000597)	Kottby Lågstadieskola	Helsinki	ERÄVIIKINGIT	School
Point (24.94607279814090006 60.21026009999999928)	Käpylän peruskoulu	Helsinki	ERÄVIIKINGIT	School
Point (24.86273146802683698 60.15816199999999725)	Lauttasaaren yhteiskoulu	Helsinki	LAUTTASAAREN PALLO LAPA	School
Point (24.85980823481012436 60.24577474999999538)	Malminkartanon peruskoulu	Helsinki	ERÄVIIKINGIT	School
Point (24.87136861073926397 60.20631949999999932)	Munkkivuoren ala-aste	Helsinki	stadin pallo	School
Point (24.87074432997746243 60.16068574999999896)	Myllykallion ala-asteella	Helsinki	lAUTTASAAREN PALLO LAPA	School

Point (25.06953254051639846 60.2204346500000014)	Myllypuron peruskoulu	Helsinki	SC HAWKS	School
Point (24.99397349999999918 60.22943310000000139)	Pihlajiston ala-aste Viikinmäen sivupiste	Helsinki	ERÄVIIKINGIT	School
Point (24.99121960000000087 60.2498002000000028)	Pukinmäen peruskoulu	Helsinki	ERÄVIIKINGIT	School
Point (24.98822600000000094 60.27055059999999997)	Siltamäen ala-aste	Helsinki	ERÄVIIKINGIT	School
Point (25.0173747352288629 60.25023534999999697)	Stadin ammattiopisto Malmi	Helsinki	ERÄVIIKINGIT	School
Point (24.90577596477255895 60.22070349999999905)	Stadin ammattioppilaitos	Helsinki	M-TEAM	School
Point (25.00136748574636414 60.26027444999999716)	Staffansby lågstadieskola	Helsinki	ERÄVIIKINGIT	School
Point (25.00335484680907072 60.27488465000000417)	Suutarinkylän peruskoulu	Helsinki	ERÄVIIKINGIT	School
Point (24.9167242539801137 60.17545160000000237)	Taivallahden peruskoulu	Helsinki	M-TEAM	School
Point (25.00245188829179455 60.27115424999999505)	Töyrynummen ala-aste	Helsinki	ERÄVIIKINGIT	School
Point (24.92200449999999989 60.18267780000000045)	Töölön ala-aste	Helsinki	Stadin pallo	School
Point (25.13792924816443985 60.21512844999999459)	Vuoniityn peruskoulu	Helsinki	ERÄVIIKINGIT	School
Point (24.94532759999999882 60.18897559999999913)	Åshöjdens –koululla	Helsinki	ERÄVIIKINGIT	School
Point (24.95266163276132687 60.17492602483628872)		Helsinki	stadin pallo	School
Point (24.96445459999999983 60.18388819999999839)	Arena Center Hakaniemi	Helsinki	SC HAWKS	Other sports hall
Point (24.8984111722761412 60.23819149999999922)	Arena center Kaarela	Helsinki	SC HAWKS	Other sports hall
Point (25.07985910000000018 60.22092349999999783)	Arena center Myllypuro	Helsinki	SC HAWKS	Other sports hall
Point (24.97186204933613141 60.18661420000000106)	Jaffa Station Hakaniemi	Helsinki	ERÄVIIKINGIT	Other sports hall
Point (25.03742181206180817 60.23115724999999543)	Latokartanon liikuntahalli	Helsinki	SC HELSINKI UNITED_eraviiki	Other sports hall
Point (25.0770390542762982 60.2248901500000023)	Liikuntamylly Myllypuro	Helsinki	ERÄVIIKINGIT	Other sports hall
Point (24.93233417500001536 60.22918965000000213)	Maunulan liikuntahalli	Helsinki	ERÄVIIKINGIT_pakilan visa	Other sports hall
Point (25.0167035999999996 60.26518879999999712)	Mosahalli	Helsinki	ERÄVIIKINGIT	Other sports hall
Point (25.07987636711087731 60.21485214999999869)	Myllypuron liikuntapuisto	Helsinki	SC HAWKS	Other sports hall
Point (24.90199569208650487 60.20662464523918089)	rusa center	Helsinki	mteam	Other sports hall
Point (24.86344588512460518 60.23662310000000275)	Varma Tennisklubi	Helsinki	SB VANTAA	Other sports hall
Point (25.02605158986308709 60.22937294999999835)	Viikin monitoimitalo	Helsinki	viikin säbäkoulu	Other sports hall
Point (25.14168377288135758 60.20880209999999977)	Vuosaaren Urheilutalo	Helsinki	ERÄVIIKINGIT	Other sports hall
Point (24.91881730247390792 60.15513264983632524)		Helsinki	mteam	Other sports hall

Point (24.70228825630984915 60.21538839999999482)	Kasavuoren koulu	Kauniainen	IDROTTSFÖRENINGEN KAMRATERNA GRANKULLA	School
Point (24.72302579334331796 60.21388779999999485)	Grankulla Gymnasiet Samskolan	Kauniainen	IDROTTSFÖRENINGEN KAMRATERNA GRANKULLA	School
Point (24.71648730000000072 60.21407090000000295)	Kauniaisten Palloiluhalli	Kauniainen	IDROTTSFÖRENINGEN KAMRATERNA GRANKULLA	Other sports hall
Point (25.07830380000000048 60.31857850000000099)	havukosken koulu	Vantaa	TIKKURILAN TIIKERIT	School
Point (24.98079320000000081 60.28244159999999852)	Helsinge Skola	Vantaa	ERÄVIIKINGIT	School
Point (25.03638130797082084 60.30768224999999916)	hiekkaharjun koulu	Vantaa	TIKKURILAN TIIKERIT	School
Point (24.81617284546214819 60.26904139999999899)	Hämeenkylän koulu	Vantaa	SB VANTAA	School
Point (25.02572049999999848 60.32778559999999857)	ilolan koulu	Vantaa	TIKKURILAN TIIKERIT	School
Point (24.86115606605920192 60.3276462500000008)	Kanniston koulu	Vantaa	SB VANTAA	School
Point (24.95792790038461817 60.28015195000000404)	KARTANONKOSKEN KOULU	Vantaa	SB VANTAA	School
Point (24.86032349287254917 60.28053724999999474)	Kivimäen koulu	Vantaa	SB VANTAA	School
Point (25.07659160000000043 60.35164139999999833)	Lumo monari	Vantaa	KORSON KAIKU	School
Point (25.09608638864033736 60.34081714999999946)	Mikkolan koulu	Vantaa	KORSON KAIKU	School
Point (25.09956809999999905 60.32553589999999843)	Päiväkummun koulu	Vantaa	SALIBANDYSEURA SISU	School
Point (25.06950770077553159 60.35519935000000658)	Ruusuvuoren koulu	Vantaa	KORSON KAIKU	School
Point (25.04977170606053249 60.299344099999999)	tikkurilan lukio	Vantaa	SALIBANDYSEURA SISU	School
Point (25.05485519999999866 60.35585604999999987)	vierumäen koulu	Vantaa	VANTAAN NMKY URHEILIJAT	School
Point (24.90911729999999835 60.28435259999999829)	Ylästön Koulu	Vantaa	SB VANTAA	School
Point (25.10697469999999853 60.2522207000000023)	Campo center	Vantaa	ERÄVIIKINGIT	Other sports hall
Point (24.83857689867438268 60.25991444999999658)	Energia Areena	Vantaa	SB VANTAA	Other sports hall
Point (24.85139358549883326 60.26531855000000348)	myyrmäen urheilutalo	Vantaa	SB VANTAA	Other sports hall
Point (25.10679651356271336 60.25114824999999996)	Rajakylän tenniskeskus	Vantaa	SC HAWKS_korson kaiku	Other sports hall
Point (24.83274811930275661 60.25855913903058791)	Rajatorpan kalliosuoja	Vantaa		Other sports hall
Point (24.85130219999999923 60.28683070000000299)	Sanomalan Liikuntahalli	Vantaa	SB VANTAA	Other sports hall
Point (24.97610857668747286 60.2919918999999993)	Tiger Sport Areena	Vantaa	KORSON KAIKU	Other sports hall
Point (25.02755261117917485 60.29951024999999731)	Tikkurilan urheilutalo	Vantaa	SALIBANDYSEURA SISU	Other sports hall