MAPPING HEALTH OPPORTUNITIES

SUSHMA BAJRACHARYA
February, 2016

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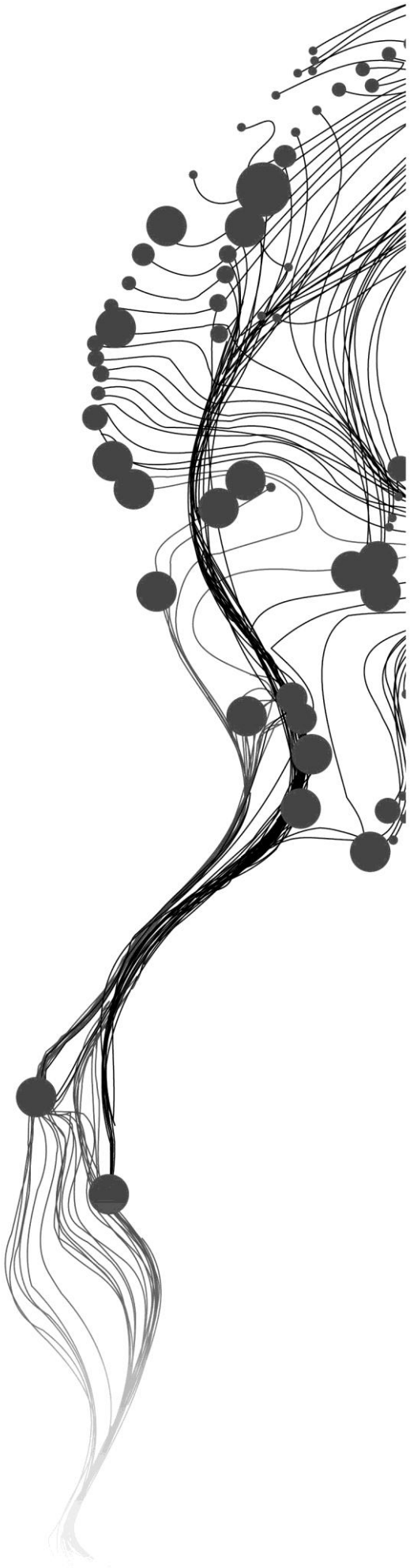

MAPPING HEALTH OPPORTUNITIES

SUSHMA BAJRACHARYA
Enschede, The Netherlands, February, 2016

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ABSTRACT

Health being one of the most important aspects of life, people are much concerned about their health. Because people value their health, today cities are planned considering the health and environment for providing good quality of life. Many studies have shown different effects in health due to interaction with environment. As socioeconomic, environmental and cultural conditions may vary from place to place, people living in different areas in the cities can have different health outcomes. Also, people's perception of such neighbourhood conditions can vary which can influence their health. There can be different resources in and around the neighbourhood that provide opportunity for its people to perform different health-benefitting activities. Such physical features can be termed as health-related resources or in other words health opportunities.

The study was conducted in two different type of neighbourhoods in Dortmund, Nordstadt being deprived and Kreuzviertel being affluent. To know which locations people consider as good or bad for their health, participants who agreed to take part in survey were directly asked to point out the places they use and avoid for health related activities. The perception of location where resources were located was asked by conducting closed questionnaire survey. The perception on distance, cost of resources, availability of services as required, cleanliness, safety, air quality and noise was captured using 6 point Likert-scale. The match or mismatch between actual and perceived environmental quality (air quality and noise) was also assessed using 2x2 quadrant which distinguished four combinations of actual and perceived environmental situations, two representing match and two representing mismatch.

This study found out different types of health opportunities identified by respondents in Nordstadt and Kreuzviertel. Respondents from Nordstadt mentioned health opportunities inside and outside their neighbourhood whereas in Kreuzviertel health opportunities were pointed outside the neighbourhood. Participants from both areas mentioned social relationship activities as health-related followed by walking. Parks came out to be the location mostly used as health opportunities for different health related activities by respondents from both areas. In both areas, avoided health opportunities were mostly footpaths along the roadways. Participants from Nordstadt had negative perception about neighbourhood characteristics in the locations they identified as health opportunities inside their neighbourhood. Respondents from Nordstadt perceived predominantly social characteristics, (e.g., safety) whereas respondents from Kreuzviertel perceived environmental quality noise. Respondents from both areas perceived distance and cleanliness as the main reason for using health opportunities. There was some similarity and variation in perception based on personal characteristics such as gender, age, migration background, education level and employment status.

Further analysis of actual and perceived environmental qualities showed more locations were avoided in Nordstadt in spite of actual good environment qualities. Respondents from Nordstadt were dissatisfied with the environmental quality of the locations inside their neighbourhood and they avoided health opportunities in such locations. The information about people's perception on local neighbourhood can be taken as useful insights for planners and decision-makers to plan development programs. The research provides an opportunity to formulate policies that address main problems acting as barriers so that people can get maximum benefits from health opportunities. To find out detailed explanations for differences between actual and perceived environmental situation, more in-depth research is needed.

Keywords: Health related resources, Health opportunities, Perception, Neighbourhood characteristics.

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1. INTRODUCTION

This chapter is presented in five sections. The first section explains the background, the second section presents the justification of the research. Research problem is presented in the third section. The research's main objective, sub-objectives and research questions are presented in the section four. The conceptual framework that guides this research is presented in the final section.

1.1. Background

Health is one of the most important aspects of human life. Today, urban planning is done considering the health and environment aiming for good quality of life. The principles of Healthy Urban Planning developed by the World Health Organization were implemented in European cities which illustrates the integration of health in planning for the healthy environment (Barton & Grant, 2013). Likewise The Healthy Cities/Healthy Communities Movement concept has integrated health with urban planning by means of various approaches and programs that aim to improve the health and well being of the community (Perlstadt, 2014).

The studies have also been conducted on the environmental health issues. Such studies show that health of people is affected by the interaction with the environment. The interaction with the environment can turn out into positive or negative result. For example, the beneficial effects on the health because of the exposure to the green environment (Mitchell & Popham, 2008).

Health equity is the central issue within the environmental health studies. "Health equity is absence of disparities in health between social groups who have different levels of underlying social advantage or disadvantage" (Braveman, 2003, p. 254). Health equity may not be achieved due to difference in the capability to achieve good health and distribution of health facilities (Sen, 2002). Studies have revealed that the determinants of urban health equity like socioeconomic, cultural and environmental conditions, influence the health of the individuals and populations (WHO & UN Habitat, 2010). Such factors define an area in the city and it can be said that where in a city one lives in and the way it is governed can determine if or not one benefits (WHO & UN Habitat, 2010). This means that people living in deprived and affluent areas in the city can have different health outcomes.

Varieties of researches have been conducted regarding environmental health. Different frameworks have been developed to analyse the urban health inequities. For example, the indicator framework that allows to map the relationships between exposure and health effects that can be used for planning interventions (Flacke & Kockler, 2015, pp. 365–376). On the other hand, some researches emphasize on the importance of people's perception of neighbourhood conditions to understand influence of those conditions on people's health. For instance, perception of threatening conditions like crime, drug use and violence and social cohesion in neighbourhood are associated with adolescent mental health outcomes (Aneshensel & Sucoff, 1996). Researches based on perception of people about environment and health helps in identifying the conditions that influence on their health positively and negatively (Woodgate & Skarlato, 2015). Spotting out the resources in and around the neighbourhood by directly asking the residents of that area can be one of the way to understand about what features of the neighbourhood people consider good or bad for their health. Such resources can be any physical feature in neighbourhood that give opportunity for people to perform activities that can be beneficial to their health. The health-related resources as such are the health opportunities.

1.2. Justification

Researches have shown the perception on neighbourhood conditions influencing mental and physical well-being. For example, youth in the low socioeconomic status neighbourhood who perceived their neighbourhood as dangerous, were found to have mental health problem (Aneshensel & Sucoff, 1996). So, to improve health and well-being of the community, it is necessary to know about people's perception of their neighbourhood. Physical and social conditions of the neighbourhood can contribute in health outcomes (Macintyre, Ellaway, & Cummins, 2002). For example, older people were found to have higher risk of functional loss because of perceived neighbourhood conditions like crime, noise, traffic, trash and litter (Balfour, 2002).

Many researches have been done on the perception of people regarding health (Santo, Ferguson, & Trippel, 2010; Timperio, 2004; Ellaway, Macintyre, & Kearns, 2001). There may be many services, facilities and amenities within an area that may be beneficial to health and wellbeing which are community resources. Such health-related resources can be termed as health opportunities as they can play a significant role in making lives of people healthy. However, the perception of the people about the health opportunities (health-related resources) in their neighbourhood have not been recognized and different characteristics linked with such health-related resources have not been identified. Such perceived neighbourhood characteristics can be supporting or limiting the use of health-related resources.

Research in neighbourhood studies have been conducted based on secondary sources such as the census or municipal records. The study done by Roosa et al. (2009) shows that people's perception about their environment differ from statistics describing that environment. Perceptions of people matter a lot in planning because their opinions are a rich source of information that inform about the conditions in which they live (Briggs, 2003, p. 18). Such information helps to have a clear understanding about problems of people. The process of information gathering has a benefit of involving the people directly. This has been proved by Santo et al. (2010) where youth perspectives were captured by engaging them and this influenced in community development decisions which resulted as positive planning outcome.

Involvement of people from the community enables policy makers to understand the needs and assets of the community which is important in planning process (WHO, 2002, p. 23). The most important part in getting to know about health opportunities in the neighbourhood can be the involvement of people of the community for data collection which are their subjective perceptions. Upon understanding of the distribution of opportunities in the community, policies can be made targeting those health opportunities where people point out constraints. The policies can be formulated for improving the conditions which people point out as barrier to get benefits from the particular opportunity.

1.3. Research Problem

There can be numerous health opportunities i.e., health-related resources in the neighbourhood which are relevant for better health of its people. However, everyone in the neighbourhood might not make use of all of those opportunities. There can be many reasons behind this. Some might even be unaware of such opportunities existing in their neighbourhood whereas others might not use those opportunities because of their socioeconomic condition. Use of the health opportunities depends on many factors such as, the quality of the services they provide, accessibility, cost, etc. Also, as different people have different opinions and views about same thing, people can perceive same opportunity in different ways. The characteristics of the place where the resources are located can also influence people's perception. Because of individual personal characteristics and characteristics of place, people might not be using the health opportunities. If the factors acting as barrier to use the health opportunities can be known, necessary measures required to remedy such impediments can be taken.

Therefore, through the use of people's perception, not only various perceived resources can be identified but also perceived neighbourhood characteristics related to such perceived resources can also be understood.

Understanding the geographic distribution of such health opportunities could inform policymakers about the problems and dissatisfactions of the public regarding different neighbourhood factors where the health opportunities are located. This in turn can assist in identifying necessary measures required to remedy the barriers to the health opportunity. The inclusion of people's perception about the health opportunities can bring decision-makers and public together to better inform further interventions. Health opportunity maps show the linkages between people and the areas of opportunity related to health.

1.4. Research Objectives

The main objective of this research is to map health opportunities as indicated by people in two contrasting neighbourhoods.

1.4.1. Sub-objectives and Research Questions

To identify the health-related local resources in deprived and affluent neighbourhoods.

1. How to get people's perception on health-related resources?
2. What are different types of health-related resources that are used by people residing in deprived neighbourhood?
3. What are different types of health-related resources that are avoided by people residing in deprived neighbourhood?
4. What are different types of health-related resources that are used by people residing in affluent neighbourhood?
5. What are different types of health-related resources that are avoided by people residing in affluent neighbourhood?

To identify the perception of people on neighbourhood characteristics for used and avoided health-related resources in two neighbourhoods.

6. Which neighbourhood characteristics (social, environmental) are perceived for used health-related resources by people residing in deprived neighbourhood?
7. Which neighbourhood characteristics (social, environmental) are perceived for avoided health-related resources by people residing in deprived neighbourhood?
8. Which neighbourhood characteristics (social, environmental) are perceived for used health-related resources by people residing in affluent neighbourhood?
9. Which neighbourhood characteristics (social, environmental) are perceived for avoided health-related resources by people residing in affluent neighbourhood?

To check the match or mismatch between the objective and subjective neighbourhood characteristics of the locations of health-related resources.

10. Does the objectively measured situation or actual environmental quality show the health-related resource to be health-promoting?
11. To what extent the actual and perceived environmental quality of health-related resources match?

1.5. Conceptual Framework

Health opportunities are the physical characteristics of neighbourhood that can be identified in terms of health-promoting resources, such as fresh food stores, sites for physical activity (Michalos, 2014, p. 2721) or health-damaging resources, such as alcohol beverage stores, convenience stores selling junk food and tobacco products (Kawakami, Winkleby, Skog, Szulkin, & Sundquist, 2011). Perception of health-related resources can be distinguished into used resources and avoided or not used resources. Individuals vary in their perceptions of neighbourhoods because of their personal characteristics (Roosa et al., 2009). The

personal characteristics such as gender, age, migrant background, education level and employment will be considered for this research. For capturing the perception of health opportunities, people could be asked about neighbourhood characteristics such as social and environmental characteristics as many researchers (Muhajarine, Labonte, Williams, & Randall, 2007) have given importance to the contextual factors (neighbourhood characteristics) in addition to the compositional factors (personal characteristics). Personal characteristics can hinder access to resources to enhance health and well-being (Michalos, 2014, p. 2721). For example, the barriers to the participation in such resources may be the socioeconomic position of the individuals. Also, the increasing rates of crime, vandalism and drug dealing may be the reason for lack of willingness for people to use such resources (Baum, 2002) which are the neighbourhood characteristics.

The research will map different health opportunities as mentioned by people of different gender, age groups, education, migration background and occupation. Also, the research will find out which dimensions of neighbourhood people perceive particularly relevant for using the health opportunities and which dimensions they perceive as barrier for using those health opportunities. The match or mismatch between actual and perceived neighbourhood characteristics can be further checked to assess to what extent the actual and perceived neighbourhood characteristics coincide. Based on the result, planning interventions can be suggested intended to improve neighbourhood characteristics. In this research, it is intended to find out important factors that people perceive as support and barrier to benefit from the health opportunities in two contrasting neighbourhoods.

In short, mapping the health opportunities can help in identifying if people of different socioeconomic status show similar or different types of health-related resources in addition to identifying different neighbourhood characteristics associated with each health opportunities and further, the extent to which the perceived and actual neighbourhood characteristics match or not can be checked. This result can help in further interventions to improve the neighbourhood characteristics which people perceive as constraints to achieve better healthy life.

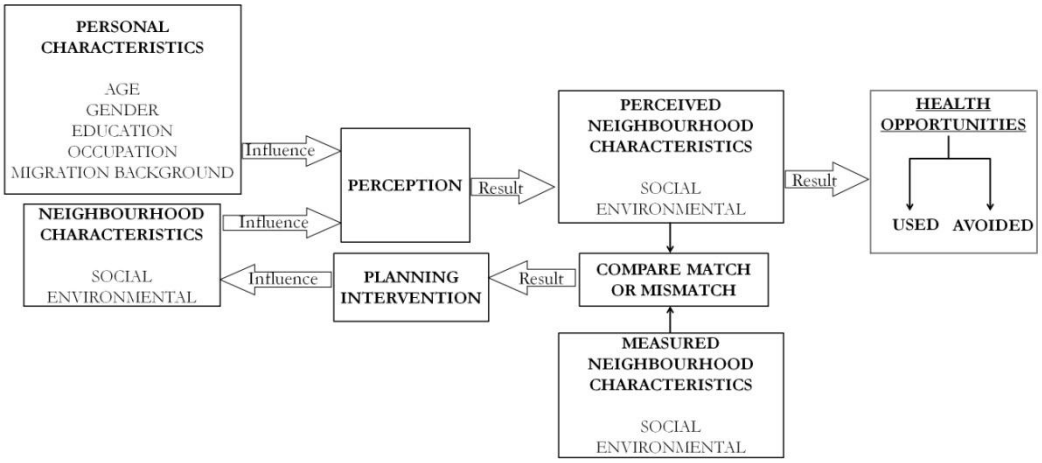


Figure 1-1 Conceptual Framework

2. LITERATURE REVIEW

This chapter presents the relevant literatures for this research. The first section gives the general concept of health opportunity and its categories based on different literatures. The second section reviews the neighbourhood characteristics. The third section is the literature review on perception which describes perception of neighbourhood characteristics and different perceptions based on personal characteristics. The fourth section gives a short review on different methods used to measure perception. Finally, in the fifth section of the chapter, method to analyse association between actual and perceived environmental quality is reviewed.

2.1. Health Opportunity

Opportunity is defined as a situation or condition favourable for attainment of a goal. The neighbourhood conditions and access to opportunities can have impact on an individual's chances to succeed. According to the Kirwan Institute's concept of opportunity, there are different opportunity structures like housing, education, health care, employment, transportation, and civic engagement that help in shaping quality of life (Kirwan Institute for the study of Race and Ethnicity, n.d.). Health opportunities are the physical characteristics of neighbourhood that help in improving health of its residents. For example-health facilities, hospitals, pharmacies, green parks, health clubs, fitness centres, etc. The opportunity structures are related to the social determinants of health which are the social and physical conditions of the neighbourhood environment. Such social and physical conditions can impact on the health positively and negatively. For example- crime, violence, lack of safety, etc are subjected to social conditions that can have a negative impact on health where as good air quality is the characteristics of physical environment that can give positive impact on health outcomes.

Health opportunities are the local resources within an area that promote health directly or indirectly. Local resources can be health promoting or health damaging. Health promoting resources can be supermarkets, parks, sports and leisure centres, health facilities (Pearce, Witten, Hiscock, & Blakely, 2007) whereas potentially health damaging facilities can be fast food and alcohol outlets (Pearce, Day, & Witten, 2008). Researchers have found out that health-promoting services and resources may be sport facilities that help people to stay physically active and healthy; health care resources are health promoting as better care for diseases can be obtained through such resources (Kawakami et al., 2011). Similarly, another research mentions that health promoting opportunities can be physical recreation facilities, primary care, food outlets (Macintyre & Ellaway, 1998). Supermarkets are categorised as the health promoting resources as most healthy food items at lower prices are found in supermarkets (Morland, Wing, Diez Roux, & Poole, 2002). The fast food consumption is associated with weight gain and fast food outlets have been linked with obesity. Therefore, such facilities have been considered as health damaging resources (Pearce et al., 2008).

Physical activity and diet are important determinants of health. The beneficial effects of physical activity for different diseases like cardiovascular disease and diabetes have been supported by a large amount of evidence. Physical activity has been linked with better health. The physical activity is important for health and physical inactivity contributes to different diseases. The physical activity resources are the health promoting resources like parks, sport facilities, fitness clubs, community centres, walking and biking trails (Estabrooks, Lee, & Gyurcsik, 2003). Parks have proved to be beneficial to people's health as they provide opportunities for physical activity, social interaction and enjoyment of nature (Chiesura, 2004; Weber & Anderson, 2010; Brown, Schebella, & Weber, 2014). Also, public open spaces are health promoting resources as such spaces have been mentioned as the community assets that can influence the health of

the residing people (Giles-Corti et al., 2005). Researches have suggested that streets designed for walking and cycling are health promoting as they promote social interaction in addition to physical activity (Giles-Corti & Donovan, 2002). Walking is most preferred form of physical activity among women and inactive groups such as elderly populations (Booth, Bauman, Owen, & Gore, 1997).

Some resources may be health-promoting for some people whereas, health-damaging for others. Supermarkets and grocery stores which are considered as health-promoting resources may include beverages and junk food whereas, fast food restaurant which are considered as health-damaging resources may include healthy food like salads and fresh fruits (Kawakami et al., 2011).

Social contacts, social networks are found to be beneficial to health. They are found to help in reducing stress. Different terms have been used for such health-enhancing component, such as social integration, social relationship (Maas, van Dillen, Verheij, & Groenewegen, 2009) which include a conversation, performing some joint activities, or meeting. Different places are being used for such contacts like parks, churches, recreational facilities, etc. People of all age groups prefer outdoor areas with natural elements like greenery for social interactions (Coley, Sullivan, & Kuo, 1997). Green space in the living environment is found to have positive effect on health such as recovery from stress, opportunity for physical activity (walking, cycling) and facilitation of social contacts (Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003).

The same physical characteristics of neighbourhood can create different opportunities for people. For example, people can get food and other healthy products from local neighbourhood resources where people can interact and obtain social support as well (Cohen et al., 2003). Public open spaces and parks are very valuable resources because people of different age visit these resources for different reasons which ultimately contribute to their well-being (Chiesura, 2004). Also, green spaces have been found important for neighbourhood social ties. Kweon, Sullivan, and Wiley (1998) found out the relationship between the use of green space and the neighbourhood ties and sense of community among older adults of inner-city neighbourhoods.

Health opportunities can be categorised into four types based on the literature. These different type of resources considered as health opportunities in this study are :

1. **Resources related to health care** such as hospitals, general practitioners, pharmacies, clinics, health care facilities, etc.
2. **Resources related to physical activity** such as recreational and leisure centres, public open spaces, parks, sports centres, health clubs, fitness centres, cycling trial, walking or jogging trail, etc.
3. **Resources related to food** such as supermarkets, grocery shop, fast food outlets, alcohol outlets, restaurants, etc.
4. **Resources related to social connections** such as cafes, coffee shops, community centres etc. which are used as venues for informal meeting, discussion, social gatherings, social interactions.

2.2. Neighbourhood Characteristics

Health of people is influenced by the neighbourhood environment in which they live and work in addition to the individual characteristics (Ellaway, Macintyre, & Kearns, 2001; Macintyre, Ellaway, & Cummins, 2002). This has been explored in many studies. Studies have proved that perceived environmental factors have effect on the health behaviours (Evenson et al., 2006). People perceive some aspects of environment as the hindrance to being physically active whereas, they perceive some aspects of environment being helpful to stay physically active. So, how one perceives the local environment may be important for health (Muhajarine et al., 2007). The study of how specific features of places such as, features of the built or social environments are related to health have been done by many researchers. Such study helps to identify potential possibilities for intervention. The difference in the health of people can be due to the differentiation in the access to health-related features in the neighbourhoods such as green parks, healthy

food shops, leisure and recreational centres (Pearce et al., 2007). The size and quality of park and its physical and economic accessibility influences people's use of such areas (Giles-Corti et al., 2005; Bengoechea, Spence, & McGannon, 2005). Perception of safety and aesthetics also influence their use (Evenson et al., 2006). Through the perception of people about different neighbourhood characteristics associated with the place, provides an opportunity to improve such characteristics by taking necessary interventions. The use of community resources can be affected by proximity including costs such as transport and cost to use services (Pearce et al., 2007).

There is a need to consider those features of local social and physical environments which might promote or inhibit health, and improvements in health might be achieved by focusing on places (Macintyre et al., 2002). Three types of important neighbourhood characteristics have been considered by Stevenson, Pearce, Blakely, Ivory, and Witten (2009) in their research regarding health and neighbourhood which are environmental (e.g. air pollution, etc), social (e.g. social cohesion, safety, etc) and access to community resource (e.g. recreational facilities, etc). Some other research consider social characteristics as crime, access to health care and physical characteristics as air quality and waste disposal (Molinari, Ahern, & Hendryx, 1998). Sooman and Macintyre (1995) considered distance to local amenities, socio-environmental characteristics such as cleanliness (litter and rubbish), safety (crime, vandalism, burglaries, etc), smells and fumes in their study to explore perception of features of local environment in socially contrasting neighbourhoods.

Researches in neighbourhood satisfaction mention that neighbourhood characteristics have important effects on the satisfaction (Hipp, 2010). Based on literature, the neighbourhood characteristics that can play role in achieving good health can be:

1. **social characteristics** such as crime, vandalism, drug dealing, litter and rubbish (cleanliness), safety (may be due to traffic, street light), access to potential health opportunities, social cohesion etc.

2**. environmental characteristics** such as air pollution, noise pollution, smell or odour. Health is effected by air quality. It is a known fact that exposure to air pollution can cause different health effects. Air pollution can cause premature deaths due to cardiovascular and respiratory diseases and cancers ("WHO | Ambient (outdoor) air quality and health," n.d.). Air quality is deteriorated because of one or more air pollutants such as nitrogen dioxides (NO_2), sulphur dioxides (SO_2), fine particulate matter (PM), ground-level ozone (O_3), etc. Air pollutants such as nitrogen dioxides are emitted from combustion processes such as from industries, road traffic. NO_2 can affect the lung leading to respiratory diseases. It also contributes to formation of particulate matter and ozone. Particulate matter (PM) is mixture of aerosol particles. PM_{10} refers to particles with a diameter of 10 micrometers or less. PM is emitted from natural sources as sea salt, volcanic ash and naturally suspended dust as well as from anthropogenic sources such as fuel combustion for vehicles, vehicle tyre and brake, road wear, domestic heating etc. PM can cause cardiovascular and lung diseases. It can also effect reproductive system and central nervous system and can cause cancer (EEA, 2015, p. 14). NO_2 and PM_{10} are both measured in micrograms per cubic meter ($\mu g/m^3$). Likewise, air quality, noise is also considered as an environmental issue that can also have adverse effect on health such as hearing impairment, cardiovascular and physiological effects, sleep disturbance, etc (WHO, 2011). The various sources of noise include road traffic, railways, aircrafts, industries (EEA, 2014).

2.3. Perception of neighbourhood characteristics

Perception of people is increasingly acknowledged. There are many researches which illustrate the importance of perception of people for community development. The paper by Pepall, Earnest, and James (2007) mentions how the acknowledgement of community perception helped in community development. In the process of recognizing the issues and problems of community, the perception of community about socioeconomic condition, health and education was captured. Youth-oriented perspective emphasized for need of recreational and leisure activities. The strategies were recommended for the development of

community to promote local skills and income through tourism and improve the education in the community.

The perception of neighbourhood environment reflects the neighbourhood conditions (Wen, Hawkley, & Cacioppo, 2006). For instance, Ellaway, Macintyre, and Kearns (2001b) found that perception of neighbourhood problems and attraction to neighbourhood are linked in the poorest areas. The study also found that people in poorest neighbourhood perceived highest social problems and lowest level of cohesion. Green areas in the neighbourhood are perceived as health promoting resource that promote communication and socialization among people and also facilitate relaxation (Chappell & Funk, 2004). Researches have been done in which association between perceptions of particular area and health were studied. The study by Sooman and Macintyre (1995) shows people in socially advantaged neighbourhood had positive perceptions about their neighbourhood environment and health outcome. People living in high-income areas perceive safety more in comparison to those living in low income areas (Chappell & Funk, 2004).

Different age group have different perception. Research done by Timperio (2004) shows the differences between children's and parent's perception of their local neighbourhood. With the growing age, feeling of unsafety also increases, the reason being increase in physical vulnerability (Ceccato & Hansson, 2013).

Different gender have different perception. Women are found to perceive social quality of the local environment, whereas men perceive physical quality of the local environment (Molinari et al., 1998). Social characteristics in that study included crime, access to health care, crime and physical characteristics included air quality, drinking water quality and waste disposal. For older women living in areas of varying socioeconomic status, features of social networks were fundamental to women's satisfaction with the area (Walker & Hiller, 2007). Stafford, Cummins, Macintyre, Ellaway, and Marmot (2005) also mentioned that women living in either affluent or lower unemployment areas tend to participate or are found to meet friends more frequently which is not seen for men. Men were found to be less satisfied with noise while women tended to be less positive about safety (Carp & Carp, 1982). Safety is important concern for women living in poor neighbourhood.

Socioeconomic status of individual are found to be predictor of satisfaction. Perception also varies due to education level. Less educated men and women perceive danger more than those more educated (Roosa et al., 2009). People with higher incomes and more education are likely to have more choices about where to live. People with high income can afford the nicer places to live with all necessary amenities that meet their needs and desires. So, people with more income are likely to be more satisfied with their community (Hannscott, 2015). People with low education and low income are found to benefit from green space in their living environment for social contacts (Maas et al., 2009). People living in the area with high quality services and good condition of physical structures reported positive health and quality of life (Muhajarine et al., 2007). The low socioeconomic group report more physical ambient and social stressors and they are found to report poorer physical and mental health (Honold, Beyer, Lakes, & van der Meer, 2012). For low socio-economic people, local neighbourhood resources are important in comparison to the affluent people (Cohen et al., 2003). People with migration background also have different perceptions. Roosa et al. (2009) has mentioned immigrants have different perception of neighbourhood, specially related to crime and also women perceive their neighbourhood differently than men.

2.4. Methods to capture perception of people

In the study of quality of life, people are directly asked about their feeling regarding life which represents the attitudes of people and this means measurement of personal satisfaction (Y.-J. Lee, 2008). The satisfaction of people about their neighbourhood quality have been used to measure individual perceptions in researches related to quality of life. Different domains are used to measure the satisfaction from the environment. For example, Tesfazghi, Martinez, and Verplanke (2010) mentioned about the

domains like housing, built environment, neighbourhood safety, neighbourhood sanitation, quality of public services, social connectedness and family income in the research related to quality of life.
Lu (1999) has mentioned that neighbourhood satisfaction is additive process broken down into satisfaction with different neighbourhood attributes that are considered important to individuals as safety, physical appearance, amenities, etc. Researchers have used scales to measure community satisfaction as importance to different community characteristics vary from one person to another (Lu, 1999). Individuals are asked to directly rate the neighbourhood attributes on a Likert-type scale to express the extent of their agreement or disagreement with statements that reflect positive or negative attitudes towards these attributes. Use of Likert-scale varies such as 10 point, 7 point, 6 point or 5 point. The ratings are then summed to generate aggregate measure. Regrouping of satisfaction measures are done if there are smaller number of observations in the original satisfaction levels and also to make easy interpretation of results.
Qualitative approach have been adopted by many researchers to capture the perception of people on their neighbourhoods (Walker & Hiller, 2007). Under this approach, in-depth, open-ended interviews are conducted which are audio taped. Initially, broad questions are asked and as interviews progress, more direct questions about perception of their neighbourhood are asked. Tapes of interviews are transcribed and computer-assisted qualitative data analysis programme such as NVivo are used for coding and analysis. In some other research (Sooman & Macintyre, 1995), people are asked a range of structured questions on how they perceived their local area with both general questions and more specific questions about particular characteristics of area.
Varieties of participatory mapping tools are used for spatial data collection that bring forth the information like local perceptions such as sketch mapping, scale mapping, transect walking, participatory three dimensional modelling, photo maps, GPS mapping, internet based mapping (Corbett, 2009; Rambaldi, Kyem, McCall, & Weiner, 2006). However, the tool that gives the output with efficient participation should be chosen (Corbett, 2009).

2.5. Method to analyse the association between actual and perceived neighbourhood characteristics

To assess the extent of match and mismatch of actual and perceived environmental quality, Kruize (2007) has used a 2x2 quadrant that distinguishes between four combinations of actual and perceived environmental quality (Table2-1):

- situation A(actual) g(good) P(perceived) g(good): the actual and perceived environmental quality are both good.
- situation AbPg: the actual environmental quality is bad, but perceived environmental quality is good.
- situation AgPb: the actual environmental situation is good, but perceived environmental quality is bad.
- situation AbPb: the actual and perceived environmental quality are both bad.

The researcher has considered noise, air quality and availability of public green space. In this research, perception on environmental quality has been recorded using ordinal scale. People were asked to evaluate annoyance with noise, dust, dirt using answer categories like often sometimes and never and satisfaction or dissatisfaction with green facilities using answer categories like very satisfied, satisfied, not satisfied, not dissatisfied, dissatisfied, very dissatisfied and don't know or no answer.
A 2x2 quadrant is shown below.

Table 2-1 A 2x2 quadrant to describe the match or mismatch between actual and perceived environmental quality: definition of the four combinations

			Actual environmental quality	
			+	-
			Noise<65dB NO_2 < 40μg/m^3 Green space > 75m^2 per inhabitant	Noise>65dB NO_2 < 40μg/m^3 Green space < 75m^2 per inhabitant
Perceived environmental quality	+	never annoyed by noise/ malodour, dust, dirt satisfied/ not dissatisfied with green facilities	**AgPg**	**AbPg**
		sometimes/ often annoyed by noise/ malodour, dust, dirt dissatisfied/ very dissatisfied with green facilities		
	-	sometimes/ often annoyed by noise/ malodour, dust, dirt dissatisfied/ very dissatisfied with green facilities	**AgPb**	**AbPb**

source (Kruize, 2007)

Planning interventions

The information from this quadrant can guide in planning interventions. Different policy approaches for different situations can be taken. For example technical and additional policy measures become necessary if the actual environmental quality is bad. Kruize (2007) has also mentioned the usefulness of quadrant for policymaking. The researcher found out issues related to environmental justice which could be useful for policymakers to set priorities for taking necessary measures. Other studies (Tesfazghi et al., 2010) related to quality of life which incorporated variability of objective and subjective quality of life also indicated situations of match and mismatch and the results gave insights to local planners for improving and enhancing better conditions of neighbourhood. The results from studies as such also made planners well acquainted with problems of the community.

3. CASE STUDY AREA

This chapter presents a brief description of study area and characteristics of selected study areas.

3.1. Study Area

The case study area is Dortmund in Germany. It is the largest city in Ruhr area and eighth largest city in German with nearly 600,000 inhabitants. The city is divided into 12 city districts, 62 statistical districts and 170 statistical sub districts. The city of Dortmund is located in the centre of Europe with excellent infrastructure and green parks in almost half of its urban area. Dortmund is the heart of Westphalia and is surrounded by eleven neighbours. Dortmund was industrial city with breweries, coal mining and iron extraction industries in the early 19th century. The population started to grow along with different traditional structures. The migrant workers from other countries such as Turkey, Italy, Spain came to Dortmund to work in mines. As a result, there was a necessity of accommodation for growing migrant population. The industries started to downfall due to deindustrialization which led to job losses of many industrial labours on one hand and several abandoned and dilapidated areas on the other. Presently, the city has research institutes, private universities and information technology companies ("City History - Home," n.d.; "Links - History - Town portrait - life in Dortmund - city portal dortmund.de," n.d.). There are deprived areas with mixed land use (residential area in close proximity to industry and commercial) towards the north of Dortmund. Such areas have higher migrant population compared to other districts. The distribution of green space is also low in such areas (Flacke & Kockler, 2015).

3.2. Site Selection Criteria

In this research, it is intended to find out different types of health opportunities and difference in the perception of the people about neighbourhood characteristics regarding health opportunities in two contrasting neighbourhoods. The study area selected towards the north of the city is Nordstadt being worst off and the second study area selected towards the west of the city is Kreuzviertel being better off area (Figure3-1). Both study areas are urban areas near by the city centre of Dortmund. Nordstadt is the inner-city area resided by mostly migrant population. The second study area includes residents that are more affluent. Both study areas were selected based on the suggestions by experts from the Jufo Salus research network.

The secondary data shows that northern part of the city is resided by high population than in the southern part and also, the share of population with migration background is higher in the northern areas of the city in comparison to the southern parts of the city. Figure3-2 shows that population density is higher in Nordstadt compared to Kreuzviertel. Figure3-3 shows percentage of population with background of migration is also higher in Nordstadt compared to Kreuzviertel. Figure3-4 shows availability of green areas in and around two areas. The green areas have been classified as public, private and urban garden. The public green areas include public parks, gardens and other green areas accessible to public such as zoo, cemetery. private green areas include private gardens in residential areas. Urban garden include garden plots which people can own. The map shows green areas are available in the immediate surroundings of Kreuzviertel and also within the neighbourhood. But, green areas can be seen bit far from Nordstadt and also very few green areas can be noticed within the neighbourhood. This shows unequal availability of green areas in two areas.

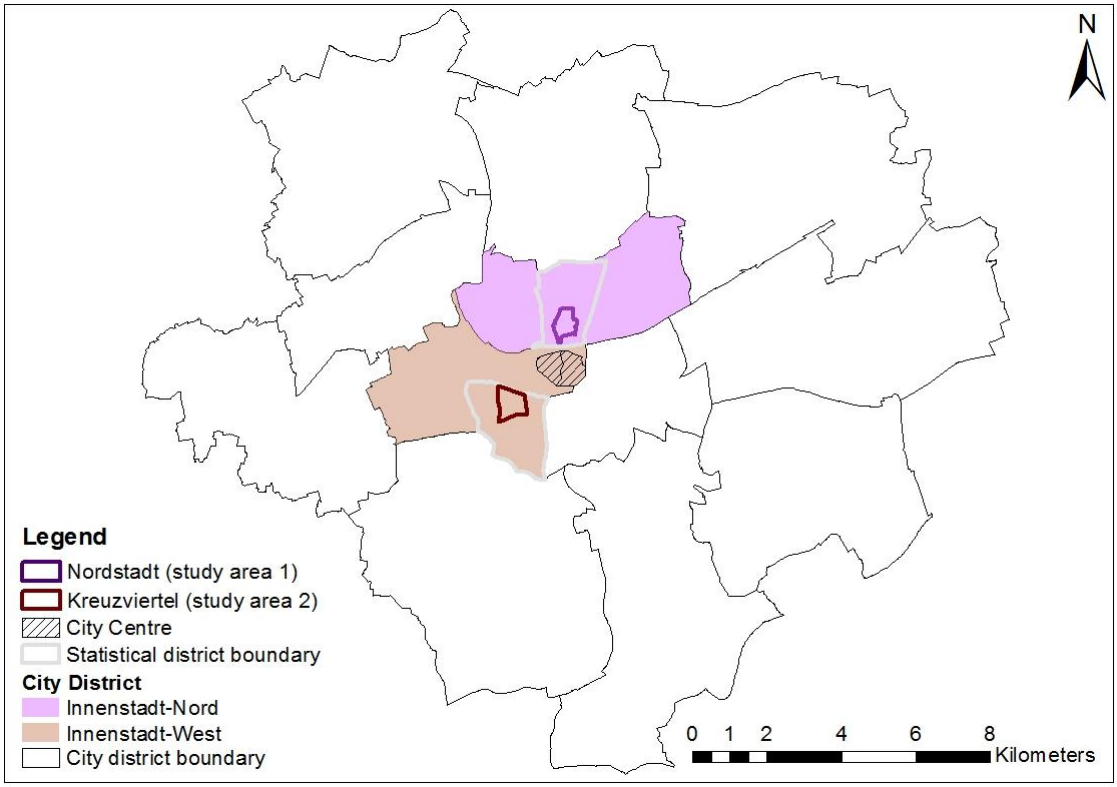


Figure 3-1 Map of Dortmund showing sampling frames (Nordstadt and Kreuzviertel)

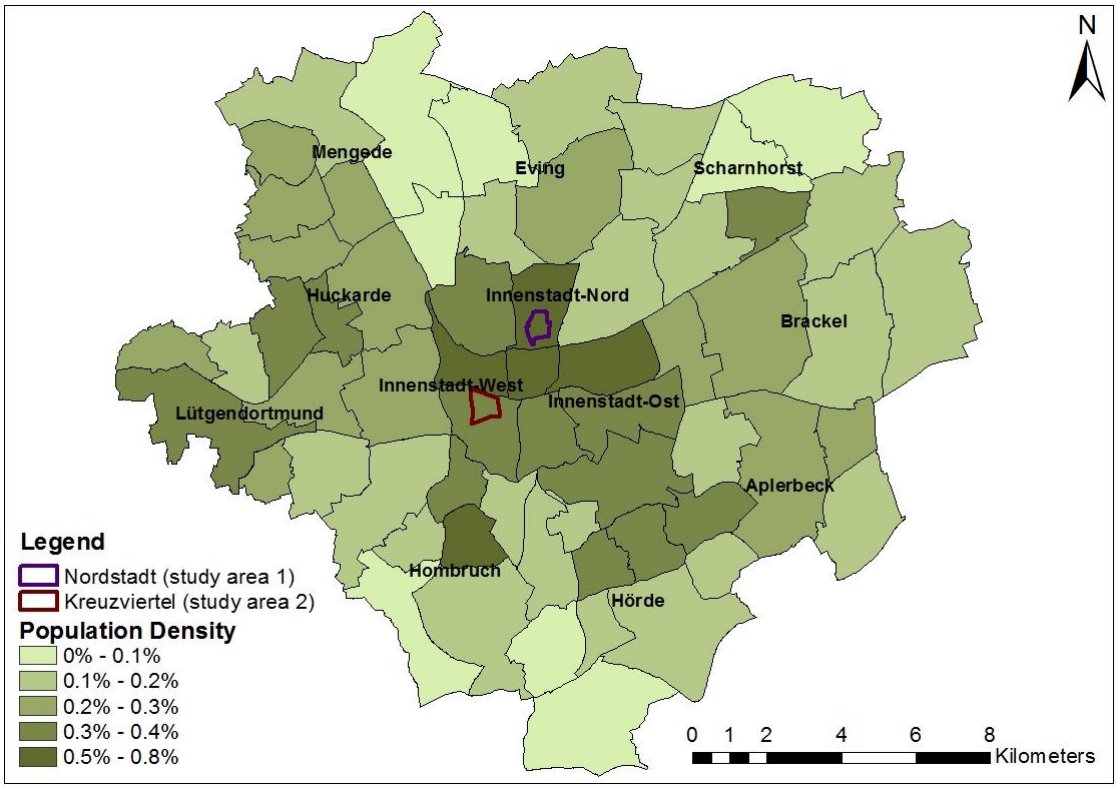


Figure 3-2 Map showing population density in Dortmund

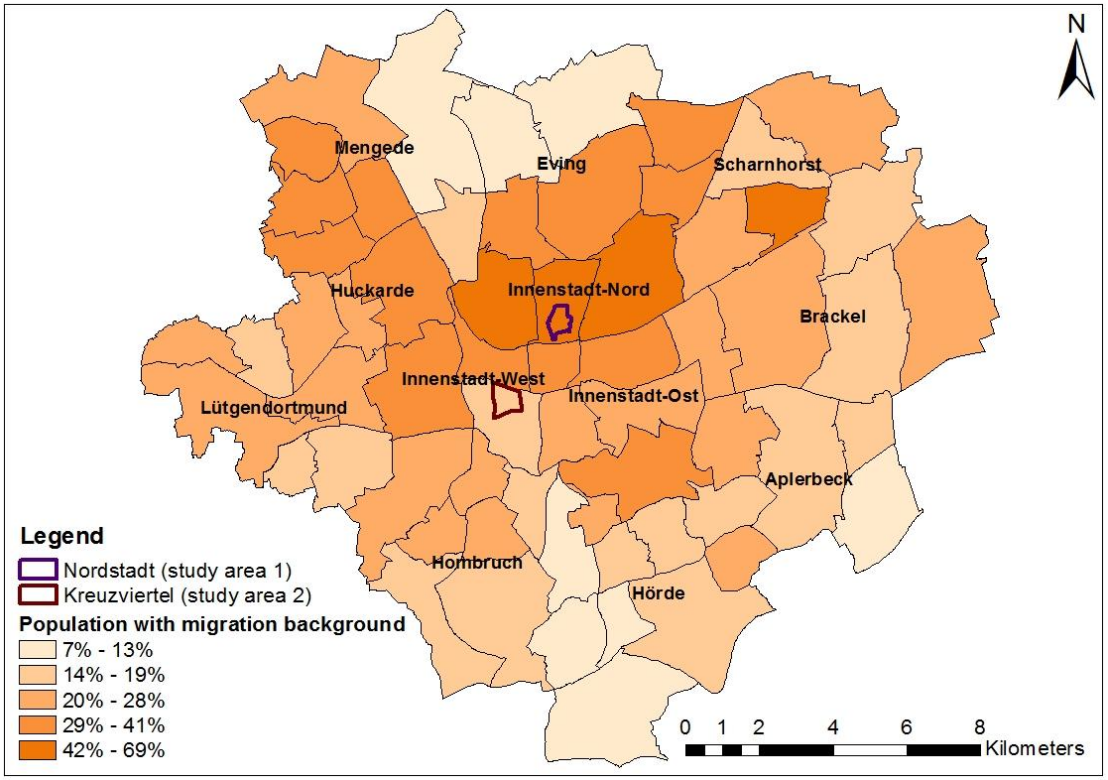


Figure 3-3 Map showing population with migration background in Dortmund

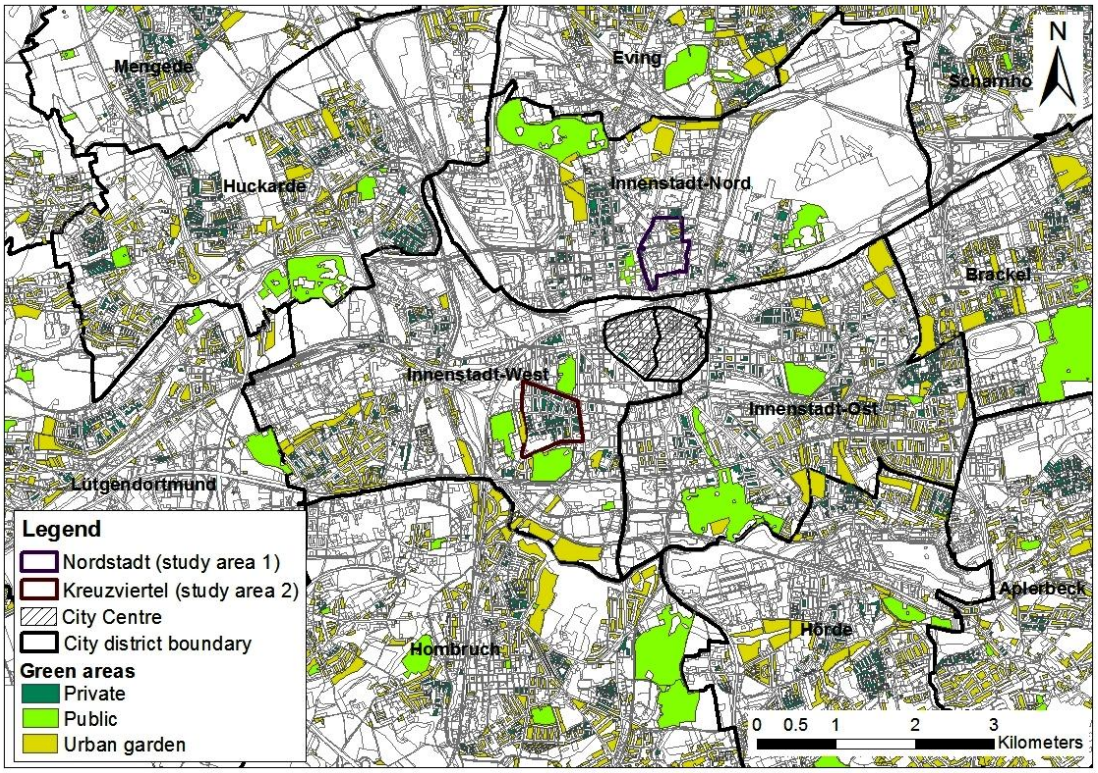


Figure 3-4 Map showing green areas in and around the study areas

4. METHODOLOGY

This chapter explains research design and methods of data collection to achieve the objectives. The first section gives the general overview of three different phases of this research. The second section presents the Table that shows different ways adopted in this research to answer the research questions to achieve the sub-objectives. The third, fourth and fifth sections explains each phases in detail.

4.1. Research Design

Pre-Fieldwork Phase

During this phase, theoretical knowledge on health opportunities, perceptions of people on neighbourhood characteristics, participatory methods to capture perception, method to analyse the actual and perceived neighbourhood characteristics were obtained. Literature review presents all such theoretical concepts gained.

Fieldwork Preparation included selection of appropriate method for primary data collection, selection of sampling strategy, selection of study area. For the primary data collection, questionnaire was prepared. During this phase, questionnaire was tested using the device (mobile Android tablet with GIS application-Esri Collector) for data collection. Pilot surveys were conducted after which modifications were made to questionnaire.

For the research, quota sampling was chosen as the sampling strategy to select the respondents based on characteristics like gender, age, migrant, education and occupation. Quota sampling is non-random sampling method in which units with some characteristics are selected to have same proportion of characteristics assumed to exist in the population being studied (Babbie, 2004, p. 184). In quota sampling, the general breakdown of the sample is decided (e.g., how many men and women, how many people in each age-group it is to include). The choice of the actual sample units to fit into this framework depends on the interviewer (Moser & Stuart, 1953, p. 350). The main advantages of the quota sampling procedure are applicability in case of time constraints and cost (Oppenheim, 1992, pp. 41–45).

For data collection, closed-questionnaire (see Appendix A) was used as the research instrument as questionnaire is an important instrument of research and one of the tools for data collection (Oppenheim, 1992, p. 100). Questionnaire has been used for collecting information about people's attitudes and opinions about social and environmental issues such as neighbourhood quality of life, environmental problems and risks. Questionnaire surveys are primary means of collecting data on people and their characteristics. The perceptions people hold, their feelings and judgements about a subject can be known. Also, information about personal characteristics like age, income, education, etc. can be gathered by using questionnaire.

Fieldwork Phase

In this phase interviews were conducted with people in two study areas. Structured questions were used with options and evaluation scale. In comparison to mobile device, paper maps came out to be less time consuming to point out different locations as indicated by respondents. Fieldwork is discussed in detail in next section.

Post Fieldwork Phase

The data collected from interview was entered into GIS database and analysed using descriptive statistical analysis method. The perception of people on health opportunities and reasons in terms of social and

environmental characteristics of the place were analysed. The results and findings are discussed and concluded.

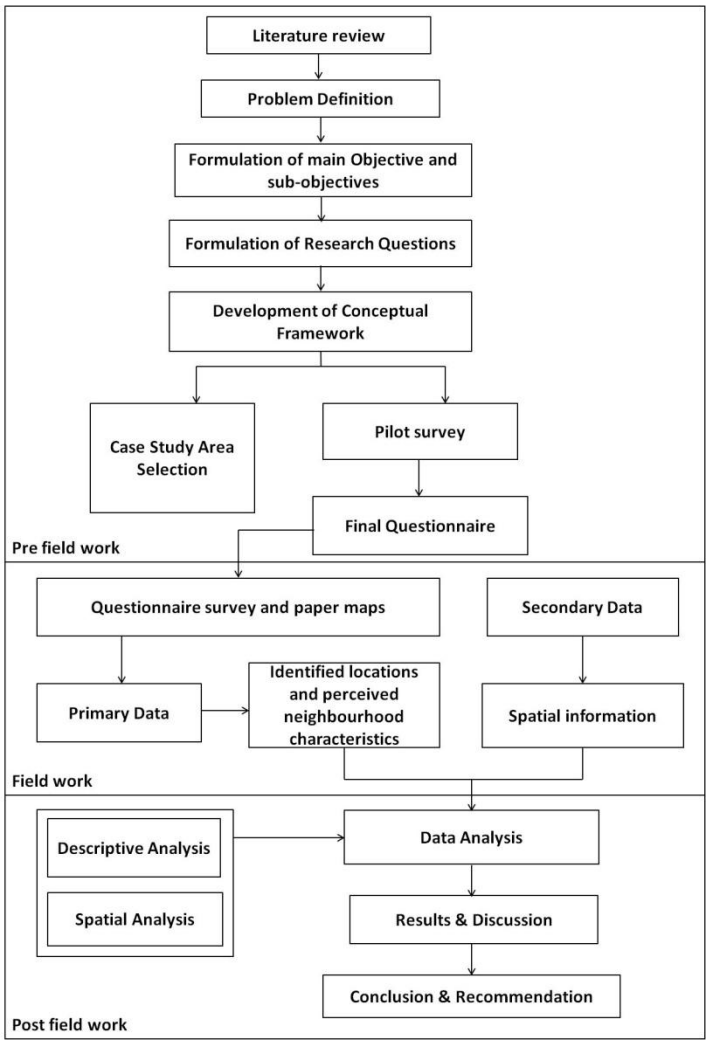


Figure 4-1 Research Design and Methodology

4.2. Research Matrix

Table 4-1 Research matrix

Sub-objective	Research Questions	Data required	Source of data	Data collection and analysis method
1	1. How to get people's perception on health-related resources?	Relevant Literature	Scientific Database	Literature review
	2. What are different types of health-related resources that are used by people residing in deprived neighbourhood?	Perceptions of people living in deprived neighbourhood	Participants from study area	Paper maps and structured interviews Digitization in Arc GIS, Spatial analysis in Arc GIS and descriptive statistics
	3. What are different types of health-related resources that are	Perceptions of people living in	Participants from study	Paper maps and structured interviews

	avoided by people residing in deprived neighbourhood?	deprived neighbourhood	area	Digitization in Arc GIS, Spatial analysis in Arc GIS and descriptive statistics
	4. What are different types of health-related resources that are used by people residing in affluent neighbourhood?	Perceptions of people living in affluent neighbourhood	Participants from study area	Paper maps and structured interviews Digitization in Arc GIS, Spatial analysis in Arc GIS and descriptive statistics
	5. What are different types of health-related resources that are avoided by people residing in affluent neighbourhood?	Perceptions of people living in affluent neighbourhood	Participants from study area	Paper maps and structured interviews Digitization in Arc GIS, Spatial analysis in Arc GIS and descriptive statistics
2	6. Which neighbourhood characteristics are perceived for used health-related resources by people residing in deprived neighbourhood?	Perceptions of people living in deprived neighbourhood	Participants from study area	Structured interviews Descriptive statistics and Spatial Analysis in ArcGIS
	7. Which neighbourhood characteristics are perceived for avoided health-related resources by people residing in deprived neighbourhood?	Perceptions of people living in deprived neighbourhood	Participants from study area	Structured interviews Descriptive statistics and Spatial Analysis in ArcGIS
	8. Which neighbourhood characteristics are perceived for used health-related resources by people residing in affluent neighbourhood?	Perceptions of people living in affluent neighbourhood	Participants from study area	Structured interviews Descriptive statistics and Spatial Analysis in ArcGIS
	9. Which neighbourhood characteristics are perceived for avoided health-related resources by people residing in affluent neighbourhood?	Perceptions of people living in affluent neighbourhood	Participants from study area	Structured interviews Descriptive statistics and Spatial Analysis in ArcGIS
3	10. Does the objectively measured situation or actual environmental quality show the health-related resource to be health-promoting?	Secondary data on environmental quality	Secondary data on environmental quality	Spatial Analysis in ArcGIS and comparison with threshold value
	11. To what extent the actual and perceived environmental quality of health-related resource match?	Perceptions of people and secondary data	Participants and Secondary data	Structured interviews for perception on environmental quality Use of a 2x2 quadrant and comparison and visualization in ArcGIS

4.3. Pre Fieldwork

Before going to the actual fieldwork, questionnaire was tested by conducting pilot survey. The database was prepared in ArcGIS and uploaded in the mobile device (android tablets) with the maps clearly demarcating first study area and second study area. The first pilot survey was conducted with 15 people (10 were students and staffs in ITC college and ITC hotel and 5 were people in city centre in Enschede). Questionnaire was modified after first pilot survey. The open-ended questions were asked to know the reasons for using or avoiding certain health related resources. The response was not as expected. The activities people perform in health related resource was mentioned as reasoning. Besides, the survey was time consuming. So, for the next pilot survey, closed questions were formulated. Then, second pilot survey was conducted in residential area in Enschede near to the faculty ITC building. After this pilot survey, the questionnaire was further modified. However, the time for interviewing one person at a time

was more than 10 minutes. Before actual fieldwork, paper maps were also produced in A3 size paper as the alternate data collection method. For this, open street map labelled with street names and main features was used and with demarcation of study areas over the open street map, coloured maps were printed out.

4.4. Fieldwork

The fieldwork was conducted for two days (5-6November, 2015). On the first day, data collection was done in Nordstadt, the first study area (deprived area) followed by second study area, Kreuzviertel (better off area) on the second day. Data collection was assisted by two German students from spatial planning programme and one ITC PhD student each day. The German students are familiar with the study areas. Data collection method in detail is described below.

4.4.1. Data Collection Method

Before starting data collection in the study areas, on the first day of fieldwork, the assistants were trained on how to administer the questionnaire (Please refer Appendix A for questionnaire). For the easy and fast data collection, questionnaire translated into German language were used. After training, the locations were decided to interview people in both the study areas. The convenient locations were those where there was possibility to find people like open spaces, bus stands, parks, outdoor sitting areas. In the first study area, the convenient locations selected for conducting interviews included park, open public space, and the areas with frequent movement of people. The convenient locations in first study area are shown in Table4-2 and Figure4-2 below. Location 2 outside study area was chosen as it was park and the assumption was that people residing in Nordstadt might be available as it is close to study area.

Table 4-2 Convenient locations selected in Nordstadt

Convenient Locations Selected in Nordstadt	
1	Square in front of church in Muensterstrasse
2	Leopoldpark
3	along Mallinckrodtstrasse

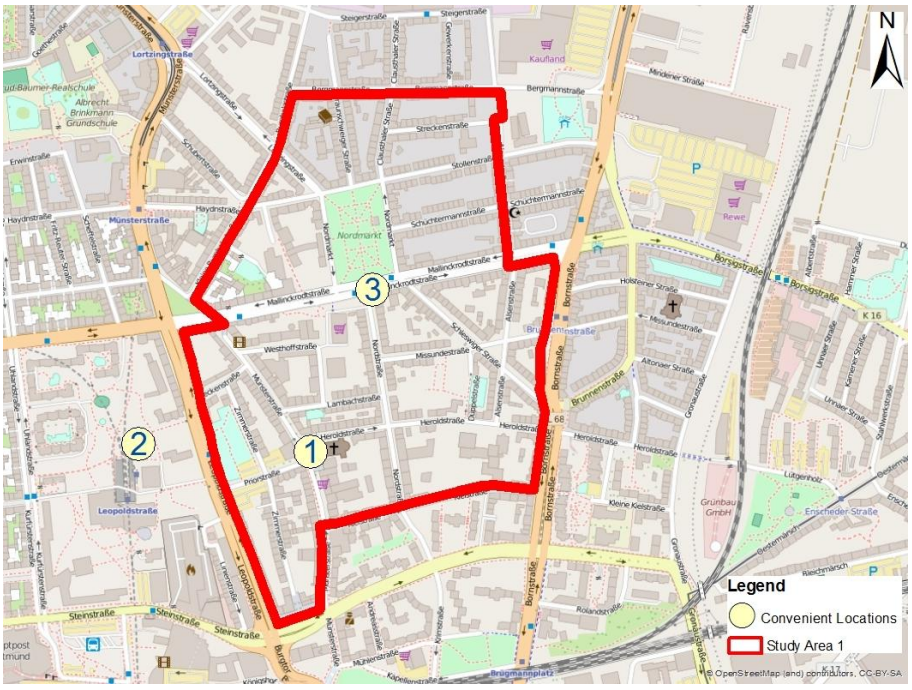


Figure 4-2 Convenient locations selected in Nordstadt

(For the name of the location for numbered points, refer Table4-2)

The convenient locations in second study area are shown in Table4-3 and Figure4-3 below.

Table 4-3 Convenient locations selected in Kreuzviertel

Convenient Locations Selected in Kreuzviertel	
1	Tremoniapark
2	outside Lidl in Kuithanstrasse
3	Kuithanstrasse
4	Neuer Graben
5	Althoffstrasse
6	Studtstrasse
7	Steubenstrasse
8	Roseggerstrasse
9	Sonnenplatz
10	Lindemannstrasse

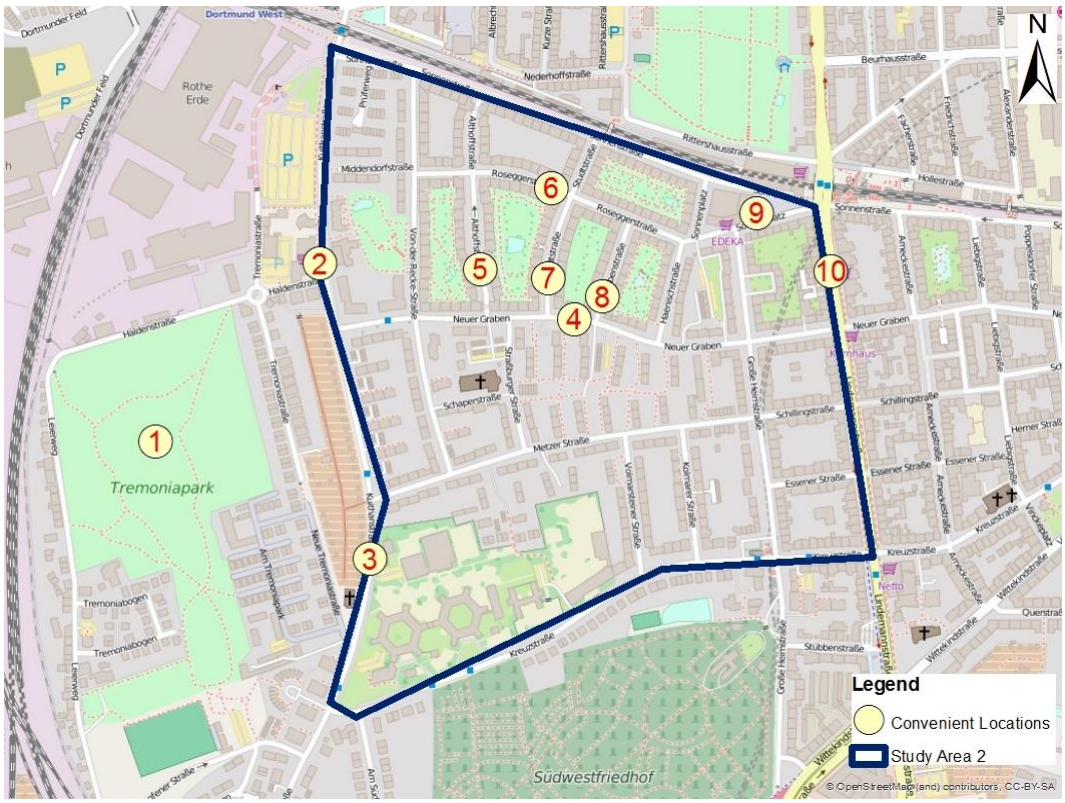


Figure 4-3 Convenient locations selected in Kreuzviertel

(For the name of the location for numbered points, refer Table4-3)

Since location 1 was a park close to Kreuzviertel, it was selected with an assumption that more people will be available for interviewing in park in comparison to other locations.

4.4.2. Interview

The interview process started after training the assistants. Two teams were made for interviewing people. Each team comprised of one German student. After few interviews, the use of mobile device (Android

tablet) for pointing locations as told by respondent were found to be time consuming (more than 10 minutes for one respondent) and inconvenient for further interviewing process. So, paper maps were used instead to get the locations of perceived places from respondents. In each team, one person administer interview and fill up the questionnaire with response whereas other person indicate the locations as told by respondent in the map. To minimise the time of interviewing, locations were not pointed during interview. Instead, the locations were pointed in map (by interviewer) immediately after each interview referring to noted down location name in questionnaire sheet during interview. As the surveying assistants were well acquainted with the study area, it was easy to indicate the locations in the paper map. In the first study area, 26 people were interviewed whereas in the second study area, 21 people were interviewed.

In the beginning of the interview, people were informed about the research and asked if they were willing to participate in survey. So, participants were those who agreed to participate in survey. Participants were asked to indicate the locations that they use and avoid for their good health. The perception about neighbourhood characteristics were captured by using Likert-scale ranging from 1=very dissatisfied to 6=very satisfied. The information about age, migration background, education, and occupation were also asked.

Secondary data was provided by Jufo Salus project. The data included administrative data, land use data, environmental data, demographic data.

4.5. Post Fieldwork

The locations collected from each respondents were digitized in ArcGIS. Open street map was used as the basemap for the process. Each respondents were given ID linked with their personal characteristics such as gender, age, migration background, highest education level attained, occupation and employment status. The places used by each respondents was provided unique id and same was done for each avoided places. Questionnaires collected from fieldwork were entered into ArcGIS. For the general overview of the data collected from the fieldwork, the data entered in ArcGIS was analysed in SPSS using cross tabulation. The works done in this phase are explained below.

4.5.1. Sample Characteristics

The information about the characteristics of samples in Nordstadt and Kreuzviertel has been presented in this section. Basically, gender, age, migration background, level of education and employment status are considered. For the age, the age group from 20-50 has been considered as young and above 50 years has been considered as old age group. Regarding education, categorisation has been done as respondents with middle secondary level or less and higher secondary level and more. Employment status has been categorised on the basis of occupation.

In Nordstadt (study area 1), 26 people participated in interview out of which 16 were male and 10 were female (Table4-4). Most of the respondents were in the age group of 20-30 years in both gender. Most of the respondents were unemployed and with migrant background. Regarding education, most of respondents had general secondary education Most of the participants were students in both gender. Female participants reported the occupation like children's nurse, cleaning lady, retailer and vendor whereas male participants reported their occupation such as kiosk owner, retailer, roofer, translator, trainer. Some also mentioned as pensioner, social worker and unemployed.

In Kreuzviertel (study area 2), 21 people participated in interview out of which 10 were male and 11 were female (Table4-5). Most of the respondents were in the age group of 61years and above in both gender.

Most of the respondents were unemployed and were non-migrants. Most of the female respondents had higher secondary level and more. Female respondents were pensioner, student, personal assistant, accountant, lecturer, social worker and housewife. Male respondents reported as pensioner, student, social worker, involved in job like insurance for aircraft and unemployed.

Table 4-4 Sample characteristics in Nordstadt

Characteristics	Classification		Percentage (%)	Quantity
Gender	Male		62	16
	Female		38	10
Age	20-30	Young	88	18
	31-40			4
	41-50			1
	51-60	Old	12	1
	>61			2
Migration Background	Yes		58	15
	No		42	11
Education level	Primary	≤ Middle Secondary	54	2
	Lower Secondary/ Hauptschule			7
	Middle Secondary/ Realschule			5
	Higher Secondary/ Abitur	≥ Higher Secondary	46	6
	Intermediate/ Fachschule/ Fachoberschule/ Bachelor			5
	Higher Education/ Fachhochschule/ Graduate/University			1
Employment status	Yes		35	9
	No		65	17

Table 4-5 Sample characteristics in Kreuzviertel

Characteristics	Classification		Percentage (%)	Quantity
Gender	Male		48	10
	Female		52	11
Age	20-30	Young	48	3
	31-40			3
	41-50			4
	51-60	Old	52	2
	>61			9
Migration Background	Yes		10	2
	No		90	19
Education level	Primary	≤ Middle Secondary	48	4
	Lower Secondary/ Hauptschule			3
	Middle Secondary/ Realschule			3
	Higher Secondary/ Abitur	≥ Higher Secondary	52	8
	Intermediate/ Fachschule/ Fachoberschule/ Bachelor			1
	Higher Education/ Fachhochschule/ Graduate/University			2
Employment status	Yes		19	4
	No		81	17

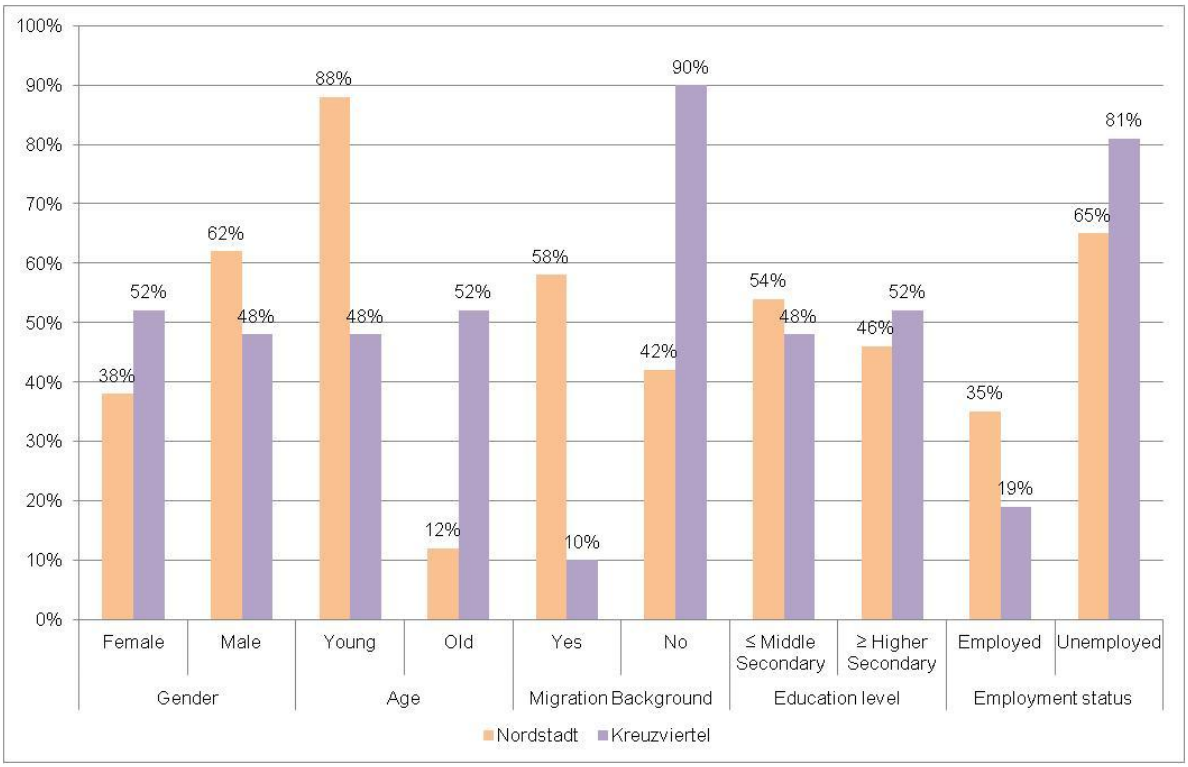


Figure 4-4 Sample characteristics in Nordstadt and Kreuzviertel

Comparing the sample characteristics from two areas (Figure4-4), it can be said that the respondents from Nordstadt were mostly of young age (88%), with migration background (58%) and fewer respondents were with higher secondary education level (46%). While in Kreuzviertel, most of the respondents were of old age(52%) and retired, non migrants(90%) and most of them had attained higher secondary education level(52%). Respondents in Nordstadt were mostly unemployed (65%) whereas in Kreuzviertel, most of unemployed respondents (81%) were pensioners.

4.5.2. Data Preparation

Likert-scale method which ranges from 1 very dissatisfied to 6 very satisfied was employed to capture respondents' perception on neighbourhood characteristics. This 6 point Likert-scale was regrouped into two categories as good and bad for easy interpretation of result. The responses for scales 1 to 3 (i.e., very dissatisfying, dissatisfying and slightly dissatisfying) were grouped as bad whereas, the responses for scales 4 to 6 (i.e., slightly satisfying, satisfying and very satisfying) were grouped as good. This categorisation of perception as good and bad was used for further analysis.

Actual environmental data associated with health opportunities

In this research, measured data on total noise, annual average concentration of NO_2 and PM_{10} were used. The average value of total noise and air quality (PM_{10} and NO_2 concentration) in the desired locations were calculated by using landuse map and emission grid 125 m by 125 m which was provided by Jufo Salus. The polygons covering the area of desired location was extracted from landuse map by using select by attribute command. Next, these polygons were clipped with polygons created using 125m by125m grid. Finally, the average value for noise, NO_2 and PM_{10} concentration were calculated by using statistics command from attribute table.

4.5.3. Analyzing match or mismatch between actual and perceived environmental quality

A match and mismatch between actual and perceived data on noise and air quality was assessed for the locations where respondents considered noise and air quality as the reasons for using and avoiding those locations. The threshold value for total noise from various sources is considered 55dB (decibel) and that for the annual average concentration of both NO_2 and PM_{10} are set as 40 $\mu g/m^3$ (micrograms per cubic meter) in Dortmund (SimuPLAN, 2013). So, the total noise level not exceeding 55dB was considered as good whereas annual average concentration of PM_{10} and NO_2, each not exceeding 40 $\mu g/m^3$ was considered good. As already mentioned in previous section, for the perceived environmental quality, the responses for Likert-scale ranging from 1 to 3 were considered as bad while the responses from scale 4 to 6 were considered as good.

The assessment was done using 2x2 quadrant as mentioned by (Kruize, 2007). In the quadrants, the locations whether identified as used or avoided health opportunities were also included. The locations identified as used and avoided health opportunities were represented by 'U' and 'A' respectively. Below is a 2x2 quadrant used in this research.

Table 4-6 A 2x2 quadrant showing actual and perceived environmental quality for identified health opportunities

			Actual environmental quality			
			+		**-**	
			Noise≤55dB		**Noise≥55dB**	
			NO_2 ≤40 $\mu g/m^3$		**NO_2 ≥40 $\mu g/m^3$**	
			PM_{10} ≤40 $\mu g/m^3$		**PM_{10} ≥40 $\mu g/m^3$**	
Perceived environmental quality	+	slightly satisfying satisfying very satisfying	**AgPg**	**U/A**	**AbPg**	**U/A**
	-	very dissatisfying dissatisfying slightly dissatisfying	**AgPb**		**AbPb**	

Four combinations of actual and perceived environmental quality as shown in Table4-6 can be read as:

- situation A(actual) g(good) P(perceived) g(good): the actual and perceived environmental quality are both good which means there is a match between actual and perceived environmental quality.
- situation A(actual)b(bad)P(perceived)g(good): the actual environmental quality is bad, but perceived environmental quality is good which means there is a mismatch between actual and perceived environmental quality.
- situation AgPb: the actual environmental situation is good, but perceived environmental quality is bad which means there is a mismatch between actual and perceived environmental quality.
- situation AbPb: the actual and perceived environmental quality are both bad which means a match between actual and perceived environmental quality.

5. RESULTS AND DISCUSSIONS

This chapter presents the results of the research conducted in two study areas (Nordstadt is the deprived area and Kreuzviertel is the affluent area). Section one to section three deals with the results from Nordstadt. The first section begins by presenting the results in the form of different used and avoided health opportunities from Nordstadt. The health opportunities identified as used health opportunities are further categorised. The reasons for used and avoided health opportunities are presented in second section and third section shows the analysis of reasons. Section four to section six presents the results from Kreuzviertel in the same way as for Nordstadt. In section seven, the comparison of results between Nordstadt and Kreuzviertel are done. Section eight presents the measured environmental quality, namely noise level and annual average of NO_2 and PM_{10} concentration for locations mapped by respondents from both study area. Section nine has two sub-sections. First sub-section shows the result of difference between actual and perceived environmental quality for Nordstadt and second sub-section shows the result for Kreuzviertel.

5.1. Health opportunities in Nordstadt

In Nordstadt, respondents mentioned twenty four locations as health opportunities. These locations were either used or avoided health opportunities. The locations identified as used and avoided health opportunities from interview are listed in Table5-1. Out of these health opportunities, six places were within Nordstadt. Altogether nineteen places were identified as health opportunities where people go for their good health and eleven places were reported as health opportunities that were avoided for health by respondents interviewed in Nordstadt. Table5-1 below shows the list of health opportunities identified in Nordstadt. The highlighted places in Table5-1 are inside the study area.

Table 5-1 Health opportunities reported by respondents in Nordstadt

Used Health Opportunities		Avoided Health Opportunities
Depot	Swimming Centre in EMS Kanal	Bergmannstrasse
All Fitness	Nordmarkt	Dortmund_Hauptbahnhof_Nord
Kaufland in Bornstrasse	Muensterstrasse	Mallinckrodtstrasse
Langer August Club	City Centre	Quadbeckstrasse
Helmholtz gymnasium	Hoeschpark	Borsigplatz
Nordpol in Muensterstrasse	Leopoldpark	Fredenbaumpark
Rewe in Schiitzenstrasse	Fredenbaumpark	Nordmarkt
Lidl in Schiitzenstrasse	Dippelstrassenpark	Leopoldpark
Subrosa café		Muensterstrasse
Bliicherstrassenpark		CityCentre
Westfalenpark		Dippelstrassenpark

The health opportunities included parks, supermarkets, cafes, restaurants, fitness centres, open square, footpaths. The respondents mentioned such health opportunities for different activities associated with health such as parks were mentioned for walking, jogging, strolling, and meeting friends whereas supermarkets were mentioned for buying food. Restaurants and cafes were pointed out as venue for meeting friends in addition to eating food while footpaths along roadways were found to be used for

physical exercise like walking and jogging. Also, fitness centres were mentioned by few respondents for staying physically fit. City centre and open square were referred as place for meeting friends.

A detailed list of locations mapped as used health opportunities along with the activities are shown in Table5-2. The table represents ranking numbers for locations based on the number of respondents who mapped them. These ranked numbers in table correspond to the numbers displayed in map in Figure5-1 to identify the locations spatially.

Table 5-2 A list of locations mentioned for different activities under used health opportunities in Nordstadt

Rank	Locations	No. of Respondents	Activities
1	Fredenbaumpark	14	jogging, walking, strolling, meeting friends, reading
2	Leopoldpark	9	jogging, walking, meeting friends, swimming
3	Hoeschpark	6	jogging, walking, strolling, playing soccer
4	City Centre	3	meeting friends, food shopping
5	Nordmarkt	2	meeting friends, food shopping
6	Muensterstrasse	2	walking, meeting friends, food shopping
7	Subrosa cafe	2	meeting friends, eating
8	Westfalenpark	2	jogging, walking
9	Depot	1	walking, food shopping in Lidl and Aldi
10	All Fitness	1	sports
11	Kaufland in Bornstrasse	1	food shopping
12	Langer August Club	1	meeting friends, eating
13	Helmholtz gymnasium	1	physical fitness
14	Nordpol in Muensterstrasse	1	meeting friends, eating
15	Rewe in Schiitzenstrasse	1	food shopping (good quality of food)
16	Lidl in Schiitzenstrasse	1	food shopping
17	Bliicherstrassenpark	1	walking, sun bathing
18	Swimming Centre at EMS Kanal	1	swimming, meeting friends, biking
19	Dippelstrassenpark	1	meeting friends

The table shows the activity meeting friends is mostly mentioned. Walking came out to be second reported activity by respondents. Most of the parks, city centre, open market area, open square area were used for different health related activities.

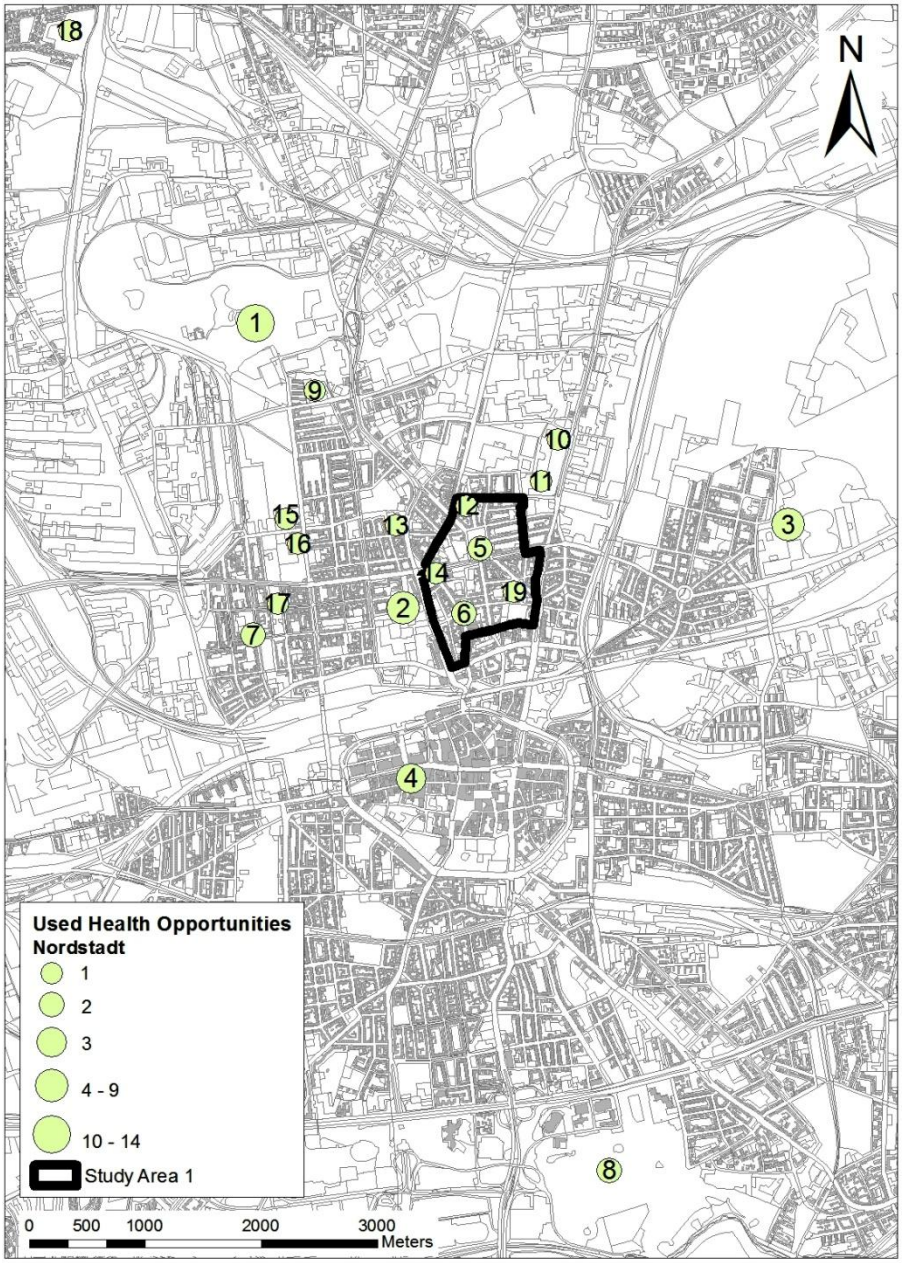


Figure 5-1 Map showing used health opportunities mentioned by respondents in Nordstadt

The avoided locations include open market area, open public space, footpaths, open square, city centre, bus station and parks. Among such locations, Nordmarkt which is an open market area was frequently mentioned. Borsigplatz is an open area towards the east of Nordstadt. Footpaths along main streets such as Mallinckrodtstrasse, Muensterstrasse and Bergmannstrasse were also among avoided locations. Few respondents considered parks such as Fredenbaumpark, Leopoldpark, Dippelstrassenpark as the locations not good for their health.

A detailed list of locations mapped as avoided health opportunities are shown in Table5-3. The table represents ranking numbers for locations based on the number of respondents who mapped them. These ranked numbers in table correspond to the numbers displayed in map in Figure5-2 to identify the locations spatially.

Table 5-3 A list of locations mentioned under avoided health opportunities in Nordstadt

Rank	Locations	No. of Respondents
1	Nordmarkt	10
2	Borsigplatz	5
3	Mallinckrodtstrasse	4
4	Muensterstrasse	4
5	Bergmannstrasse	2
6	City Centre	2
7	Fredenbaumpark	1
8	Dippelstrassenpark	1
9	Dortmund Hauptbahnhof Nord	1
10	Leopoldpark	1
11	Quadbeckstrasse	1

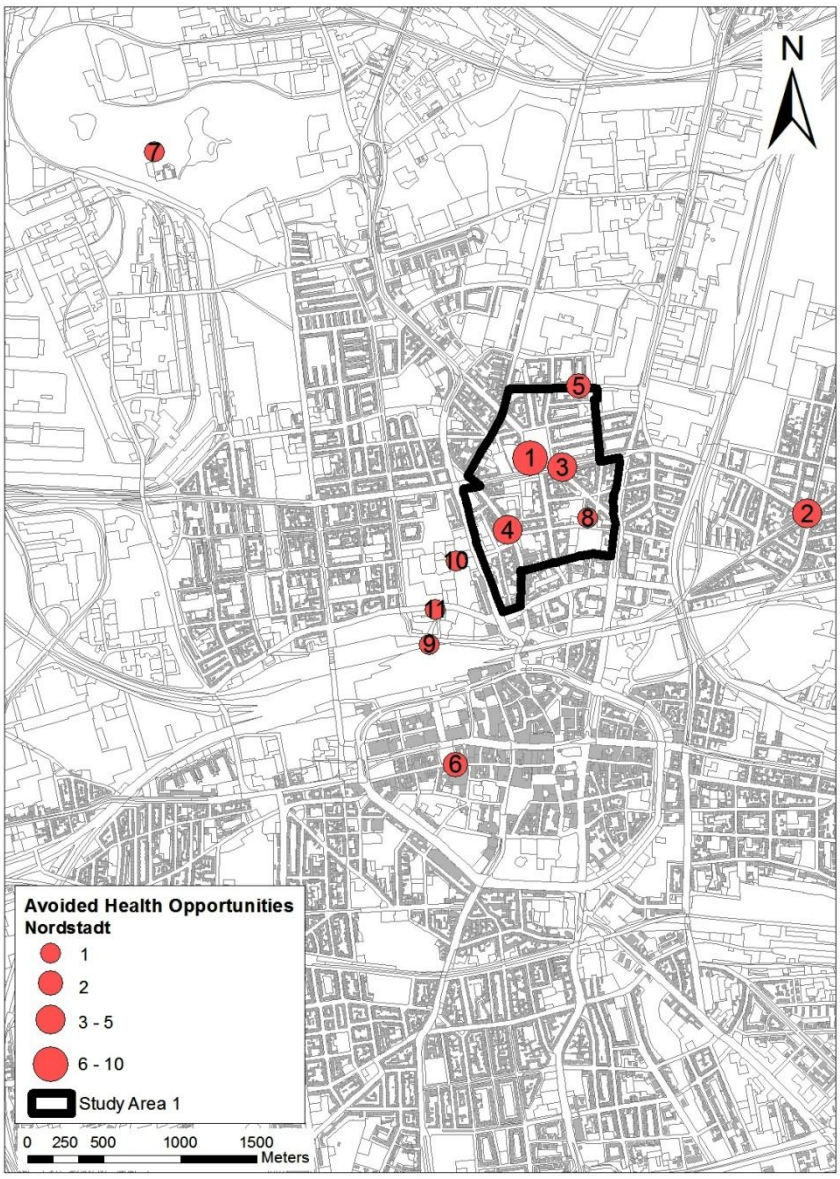


Figure 5-2 Map showing avoided health opportunities mentioned by respondents in Nordstadt

5.1.1. Categorization of used health opportunities in Nordstadt

In Nordstadt, the used places for health can be classified into three different categories (Table5-4 and Figure5-3) which are explained below.

Resources related to physical activity

Under this category, ten places were reported as used health opportunity. These places included 5 parks(Fredenbaumpark, Leopoldpark, Hoeschpark, Westfalenpark, Bliicherstrassenpark) for jogging, walking, strolling, 2 fitness centres (All Fitness, Helmholtz gymnasium) for sports and physical fitness activities, 1 swimming centre at EMS Kanal, 1 open market area (Nordmarkt) and 1 depot area.

Resources related to food

Under this category, ten places were mentioned by the respondents. It included supermarkets (supermarkets along Muensterstrasse, in city centre and depot area, Kaufland in Bornstrasse, Rewe and Lidl in Schiitzenstrasse) for buying food and 3 cafes (Subrosa cafe, Langer August club, Nordpol in Muensterstrasse) for eating. Open market area (Nordmarkt) was also mentioned as food buying venue.

Resources related to social connections

Under this category, ten places were reported which included 3 parks (Fredenbaumpark, Leopoldpark, Dippelstrassenpark), city centre, square in front of church in Muensterstrasse, open market area in Nordmarkt, 3 cafes (Subrosa cafe, Langer August club, Nordpol in Muensterstrasse), swimming centre in EMS Kanal.

Table 5-4 Categorization of used health opportunities in Nordstadt

Used Places	Type of health opportunity		
	related to physical activity	related to food	related to social relationships
Fredenbaumpark	√		√
Leopoldpark	√		√
Hoeschpark	√		
City Centre		√	√
Muensterstrasse		√	√
Nordmarkt	√	√	√
Westfalenpark	√		
Subrosa cafe		√	√
Depot	√	√	
All Fitness	√		
Kaufland in Bornstrasse		√	
Langer August Club		√	√
Helmholtz gymnasium	√		
Nordpol in Muensterstrasse		√	√
Rewe in Schiitzenstrasse		√	
Lidl in Schiitzenstrasse		√	
Bliicherstrassenpark	√		
Swimming Centre at EMS Kanal	√		√
Dippelstrassenpark			√

In Nordstadt, respondents mentioned equal number of places under each of three types of health opportunities (health opportunity related to physical activity, food and social relationships). However, none of the respondents mentioned resources related to healthcare such as hospitals.

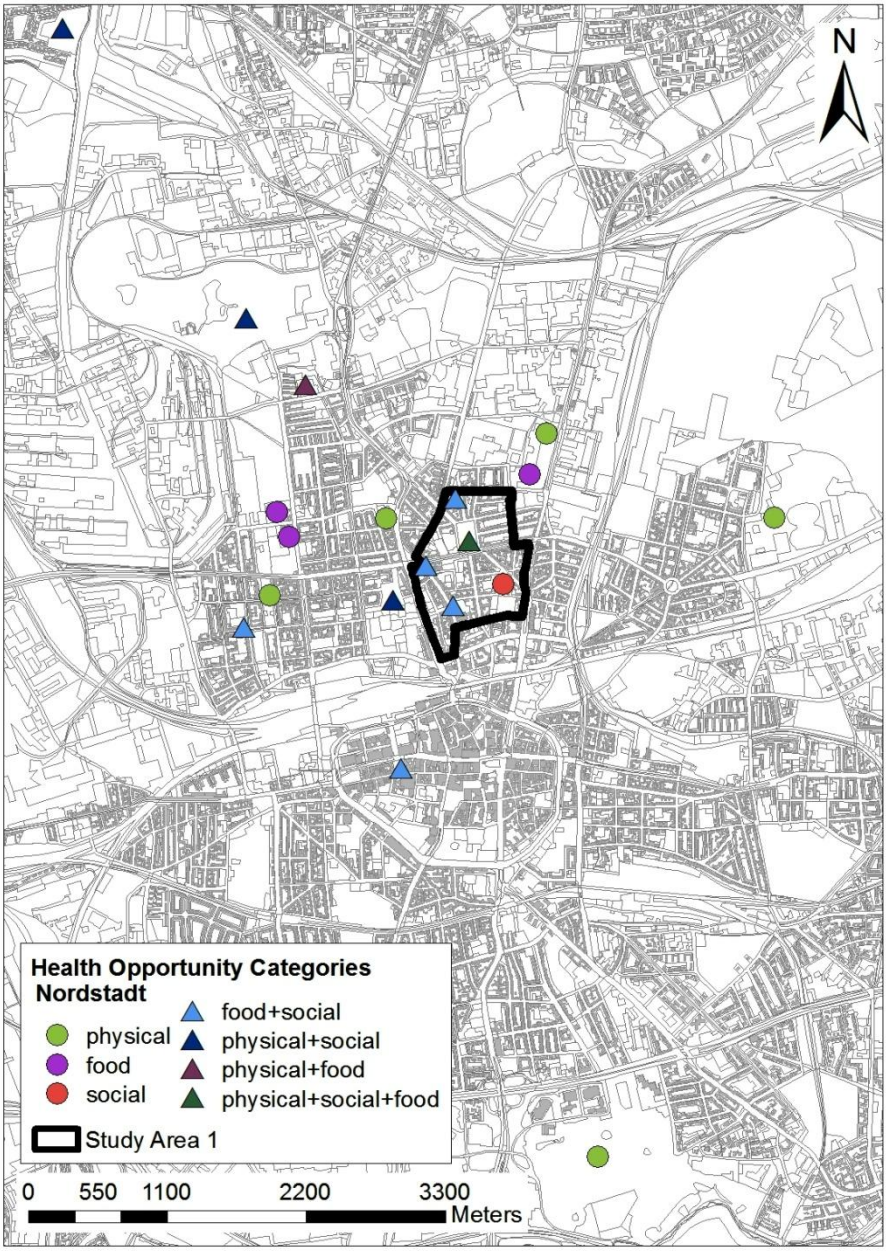


Figure 5-3 Map showing categorization of used health opportunities in Nordstadt

The map shows that used health opportunities are mostly located towards north side of Nordstadt. Green and purple circles representing resources related to physical activity and food respectively are situated outside the study area whereas resource related to social relationship indicated by orange circle is located inside the study area. Also, most of the resources related to food and social connections (sky blue triangles) are also inside the study area. There is only one location mapped as resource related to physical activity, food and social relationships (green triangle in map)that is also within the study area. City centre is used for food and social activities. The map indicates that respondents from Nordstadt also use the

locations far from their neighbourhood particularly for physical activity. Most of the used health opportunities are outside the study area.

5.2. Perception of neighbourhood characteristics for used and avoided health opportunities in Nordstadt

Respondents from Nordstadt had different perceptions for different health opportunities. To get an understanding of perceptions for each locations mentioned as used and avoided health opportunities, respondents were asked if a listed reasons(neighbourhood characteristics) were applicable (see questionnaire in Appendix A). Comparing the perception of respondents for used and avoided health opportunities in Nordstadt, distance to place and cleanliness (both 21%) in place were the most important reasons followed by safety in place (15%), availability of services (13%) and air quality (12%) for locations identified as used health opportunities. Noise and cost of resource (both 9%) were least perceived. On the other hand, safety (38%) was perceived higher than cleanliness in place (25%) followed by noise in place (18%) in case of avoided health opportunities(Figure5-4). Distance to place and air quality (both 8%) were equally perceived and cost of resource and availability of services (both 3%) were least perceived for avoided health opportunities.

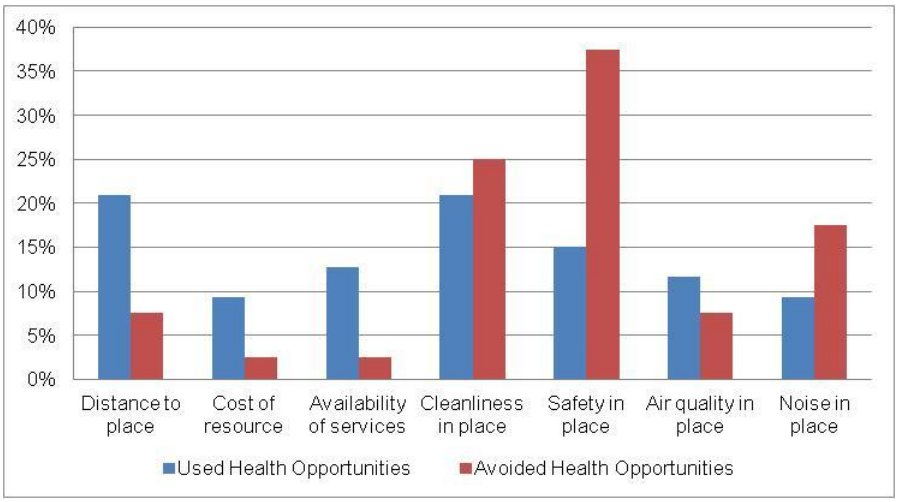


Figure 5-4 Reasons for used and avoided health opportunities in Nordstadt

Perception of respondents for different locations identified as health opportunities (used and avoided combined) are shown in maps from Figure5-5 to Figure5-11. For the easy comparison of perception for identified used and avoided health opportunities, the maps show respondents' perception for different neighbourhood characteristics (distance to place, cost of resource, availability of services, cleanliness in place, safety in place, air quality in place and noise in place). The perception was captured using 6 point Likert-scale which was regrouped as good and bad for easy interpretation of result. So, each maps shows perception as good or bad for used and avoided health opportunities. In the maps, the positive and negative perception about neighbourhood characteristics for used health opportunities are represented by 'Used_good' and 'Used_bad' respectively. Similarly, the positive and negative perception about neighbourhood characteristics for avoided health opportunities are represented by 'Avoided_good' and 'Avoided_bad' respectively.

(Note- To visualise ranking of identified locations as used and avoided health opportunities regarding different neighbourhood characteristics, see Appendix B).

The maps show that for Nordtmarkt which is inside Nordstadt, respondents had negative perception for all neighbourhood characteristics so it was avoided by most of respondents. Respondents perceived unsafety inside their neighbourhood. Likewise, air quality and noise was also perceived bad inside neighbourhood. In Borsigplatz which is situated at east side of Nordstadt, participants had negative perception about safety, cleanliness and noise. Though few respondents perceived good air quality, this location was avoided. In Leopoldpark, though people mapped it as used health opportunity, they reported negative perception on cleanliness, safety, air quality and noise. Some people even avoided this location because of feeling unsafe, unclean, expensive cost for services, unavailability of services as required. Participants were found sensitive towards noise specially for the locations nearby roads. For the locations within the neighbourhood, respondents reported about negative perception about neighbourhood characteristics.

(Note- HO means health opportunities in the following maps)

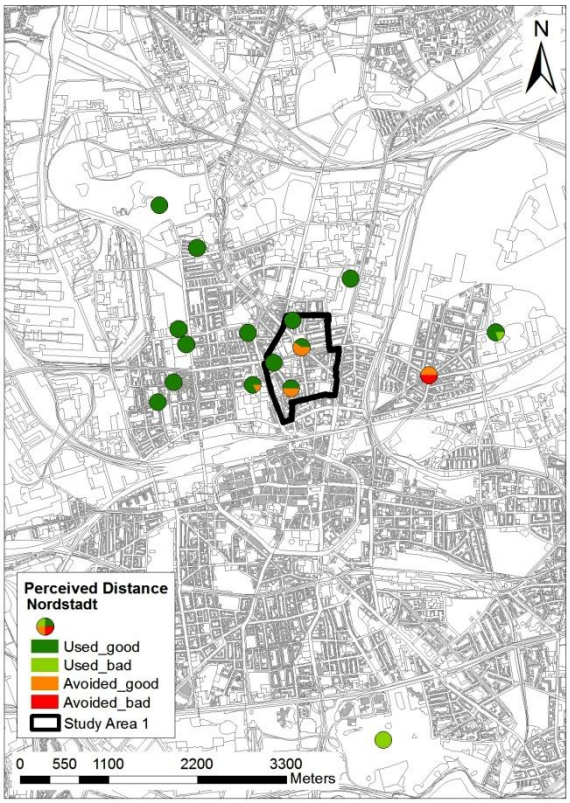


Figure 5-5 Perception of distance in HO in Nordstadt

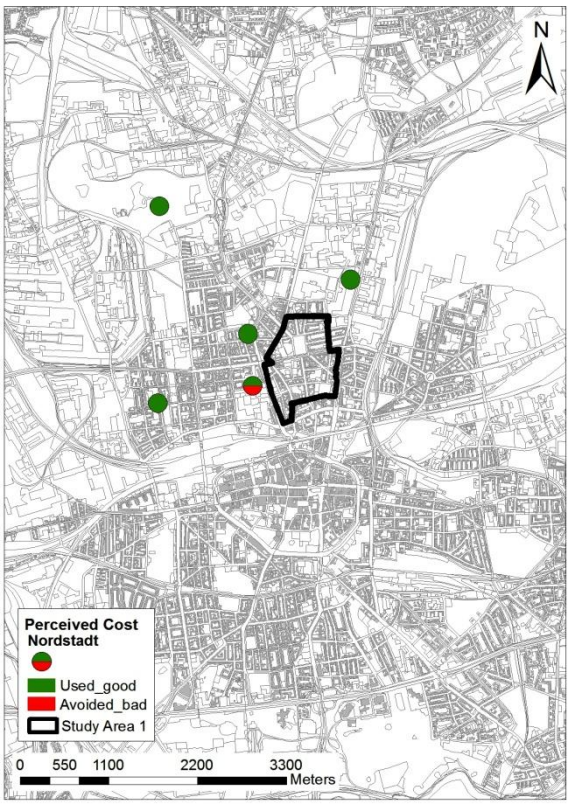


Figure 5-6 Perception of cost of resources in HO in Nordstadt

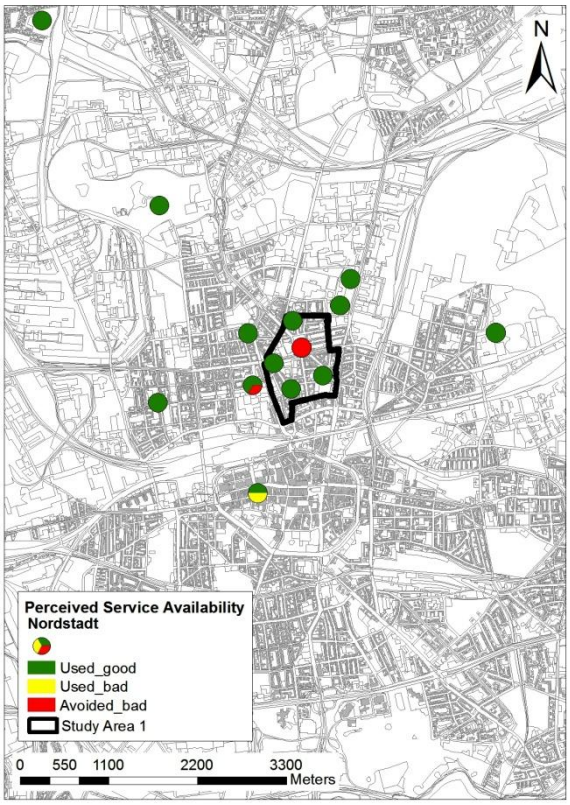


Figure 5-7 Perception of service availability in HO

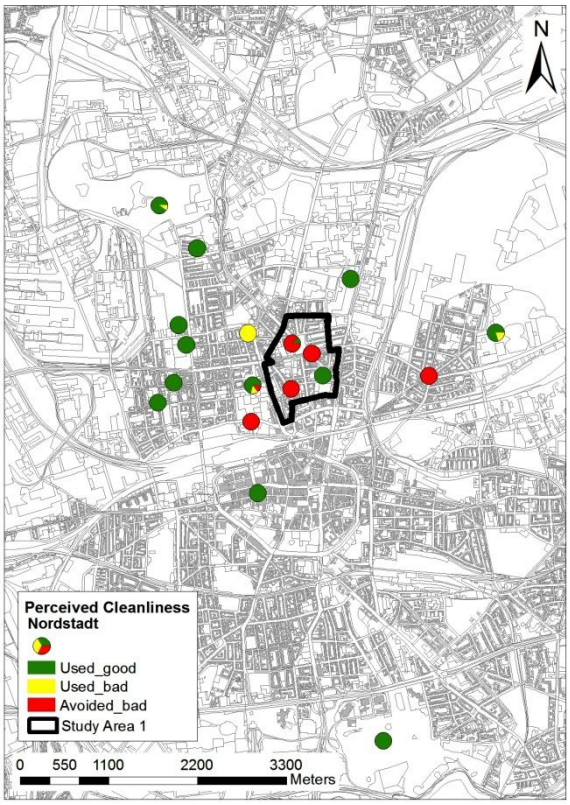


Figure 5-8 Perception of cleanliness in HO

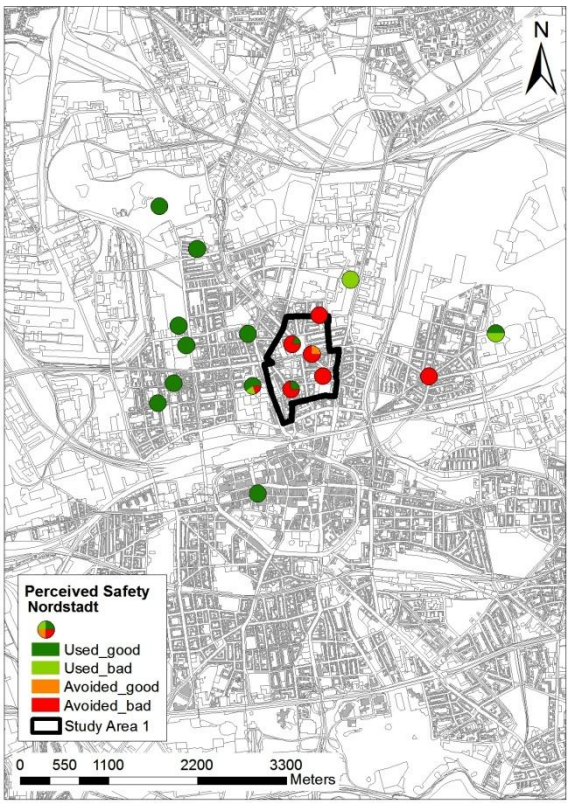


Figure 5-9 Perception of safety in HO in Nordstadt

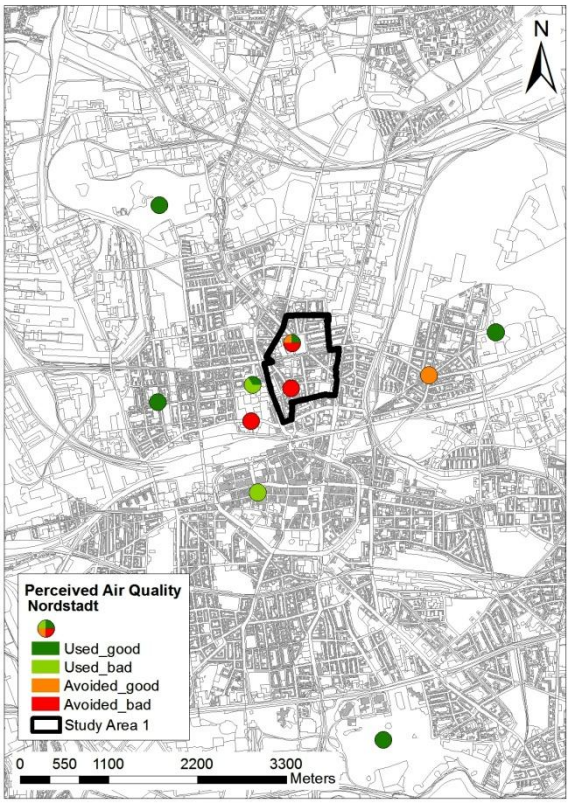


Figure 5-10 Perception of air quality in HO in Nordstadt

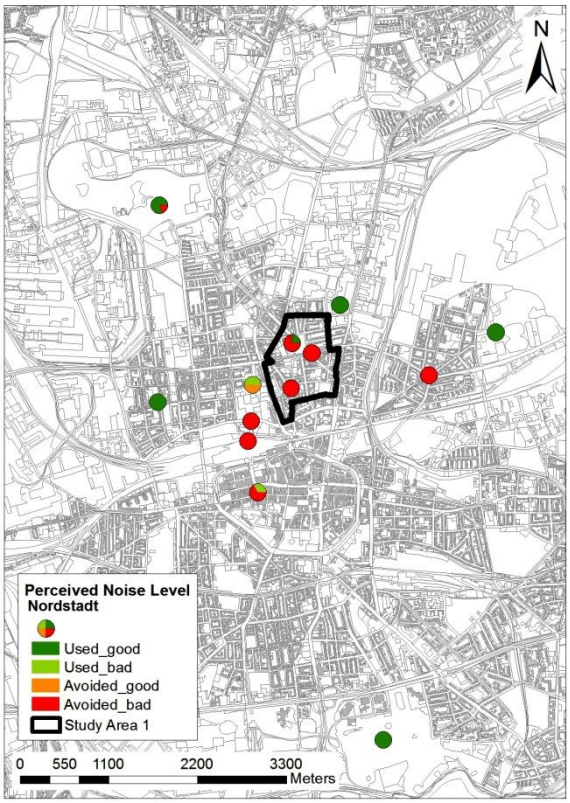


Figure 5-11Perception of noise level in HO in Nordstadt

Perception of neighbourhood characteristics for used health opportunities in Nordstadt

It has already been discussed in section 5.1 about the used health opportunities mentioned by respondents from Nordstadt. Among such locations, parks were mostly mentioned. City centre, open market area, open square were locations mentioned most after parks followed by cafes, supermarkets, fitness centres and footpaths (Table5-2). For such locations, people perceived availability of food shops, cleanliness and safety. Very few respondents mentioned physical fitness centres (3 out of total 26) and food shops (4 out of total 26) as health opportunities. Availability of services as required, closeness to place of stay and cost were positive qualities for using fitness centres. However, one respondent perceived the location where the fitness centre was situated as unsafe and other perceived slightly unclean. Respondents mentioned closeness to their place of stay, cleanliness and safety in surrounding as main reasons for using food shops. Restaurants and cafes were also mentioned as being used for meeting friends and eating for which respondents reported near to their place of stay and availability of services as main reasons for using them as health opportunities.

Perception of neighbourhood characteristics for avoided health opportunities in Nordstadt

The avoided locations has already been mentioned in section5.1 with the list of such locations in Table5-3 and spatial distribution in Figure5-2. Among such locations, Nordmarkt which is an open market area was frequently mentioned. Respondents perceived safety, cleanliness, air quality and noise negatively in Nordmarkt. Some respondents avoided using Nordmarkt though it was very near to their home because of unsafety due to drug selling activities. Borsigplatz is an open area towards the east of Nordstadt. People perceived unsafety and uncleanliness in this open area. Next avoided health opportunities include footpaths along roadways such as Mallinckrodtstrasse, Muensterstrasse, Bergmannstrasse and Quadbeckstrasse. For some of such locations, respondents had dissatisfaction regarding safety, cleanliness and environmental qualities such as noise and air quality .while for some other locations, safety was the

main concern among respondents. Mallinckrodtstrasse was reported as drug selling location and people avoid this location also because of feeling of unsafe from drunk people. Bergmannstrasse was reported to be illegal red light district so respondents avoided this location for safety reasons. Very few respondents avoided City centre because of too much noise. Similarly, the location near by bus station at Dortmund Hauptbahnhof Nord was avoided because of very dissatisfying noise. Regarding the parks, Fredenbaumpark was avoided by one male respondent because of very annoying noise due to crowd of people. Leopoldpark was reported as avoided health opportunity by one female respondent because of feeling of unsafety and uncleanliness in park.

5.3. Personal characteristics based perception of neighbourhood characteristics for used and avoided health opportunities in Nordstadt

The variation in perception can be analysed based on personal characteristics. such as gender, age, education, migration background and employment status. For the detail discussion of variation in perception of neighbourhood characteristics based on personal characteristics (gender, age, education, migration background and employment status), see Appendix D. The main points are discussed below.

Regarding avoided health opportunities, noise was perceived more than air quality by male respondents, employed, unemployed, migrant, non-migrant, young age group, less and more educated respondents. Regarding used health opportunities, both gender (male and female), young age group, both migrant and non-migrant groups, more educated group and both employed and unemployed groups' perception of distance and cleanliness in place scored highest which means those respondents used resource at certain location because of closeness and cleanliness in location. For old age group and less educated group, cleanliness was perceived important than distance. Safety was perceived only after distance and cleanliness regarding used health opportunities. However, non migrant group and more educated group perceived availability of services more important than safety. For respondents with migration background, air quality was perceived more than safety. Noise was perceived more than air quality by non migrants whereas opposite was the case for migrants, female respondents, young age group, more educated group and unemployed group.

In conclusion, respondents were found to use health opportunities because of close distance and cleanliness in place. Male participants and young age group perceived distance while migrant, employed, old age group and low educated group perceived cleanliness. Respondents reported about avoidance of location because of unsafety and noise. The results from Nordstadt show that females, young respondents, less educated, unemployed, respondents without migration background were more concerned about safety while males, more educated, unemployed and people with migration background were more concerned about noise level in a place.

5.4. Health opportunities in Kreuzviertel

In Kreuzviertel, respondents mentioned 21 locations as health opportunities. Out of these locations, sixteen were reported as used health opportunities and six were reported as avoided health opportunities (Table5-5). The health opportunities included parks, supermarkets, fitness centres, walking routes, cemetery, restaurant, footpaths along the roadways, open square, train and bus station.
Under the used health opportunities, parks were mostly mentioned for different activities associated with health such as walking, jogging, strolling, meeting friends, relaxing and viewing green nature. Supermarkets were mentioned for buying food. The food shops selling organic food were mentioned by some respondents. Restaurant was pointed out as venue for meeting friends in addition to eating food while fitness centres were also stated as place for meeting friends apart from doing physical exercises. Open square in city centre was mentioned as place for meeting friends.

Table 5-5 Health opportunities reported by respondents in Kreuzviertel

Used Health Opportunities		**Avoided Health Opportunities**
Tremoniapark	El Mundo Restaurant	Westpark
Westpark	Fredenbaumpark	Main station
Bolmker Weg	Kornhaus	Lindemannstrasse
Suedwestfriedhof	Orange Fitness Centre	Dortmund West
Westfalenpark	Pilates Arts	Falkenstrasse
Rombergpark	Reinoldikirche	Rheinische Strasse
Lidl in Kuithanstrasse	REWE at Unionstrasse	
Basic food shop	Suedbad swimming centre	

A detailed list of locations mapped as used health opportunities along with the activities are shown in Table5-6. The table represents ranking numbers for locations based on the number of respondents who mapped them. These ranked numbers in table correspond to the numbers displayed in map in Figure5-12 to identify the locations spatially.

Table 5-6 A list of locations mentioned for different activities under used health opportunities in Kreuzviertel

Rank	Locations	No. of Respondents	Activities
1	Tremoniapark	17	jogging, walking, sports activity, meeting friends, view of green nature
2	Westpark	9	jogging, walking, meeting friends, BBQ
3	Suedwestfriedhof	3	walking
4	Westfalenpark	3	walking, meeting friends and relaxing
5	Bolmker Weg	3	jogging
6	Rombergpark	2	meeting friends and family, see nature
7	Lidl in Kuithanstrasse	2	food shopping
8	Suedbad swimming centre	1	swimming
9	Fredenbaumpark	1	walking
10	El Mundo Restaurant	1	meeting friends and eating
11	Orange Fitness Centre	1	sports
12	Kornhaus	1	food shopping (organic food)
13	REWE at Unionstrasse	1	food shopping
14	Pilates Arts	1	meeting friends and sports
15	Basic food shop	1	food shopping (organic food)
16	Reinoldikirche	1	meeting friends

The table shows the activity meeting friends is mostly mentioned. Walking came out to be second reported activity by respondents. Most of the parks were used for different health related activities. Respondents were found to use shops that offer organic food products.

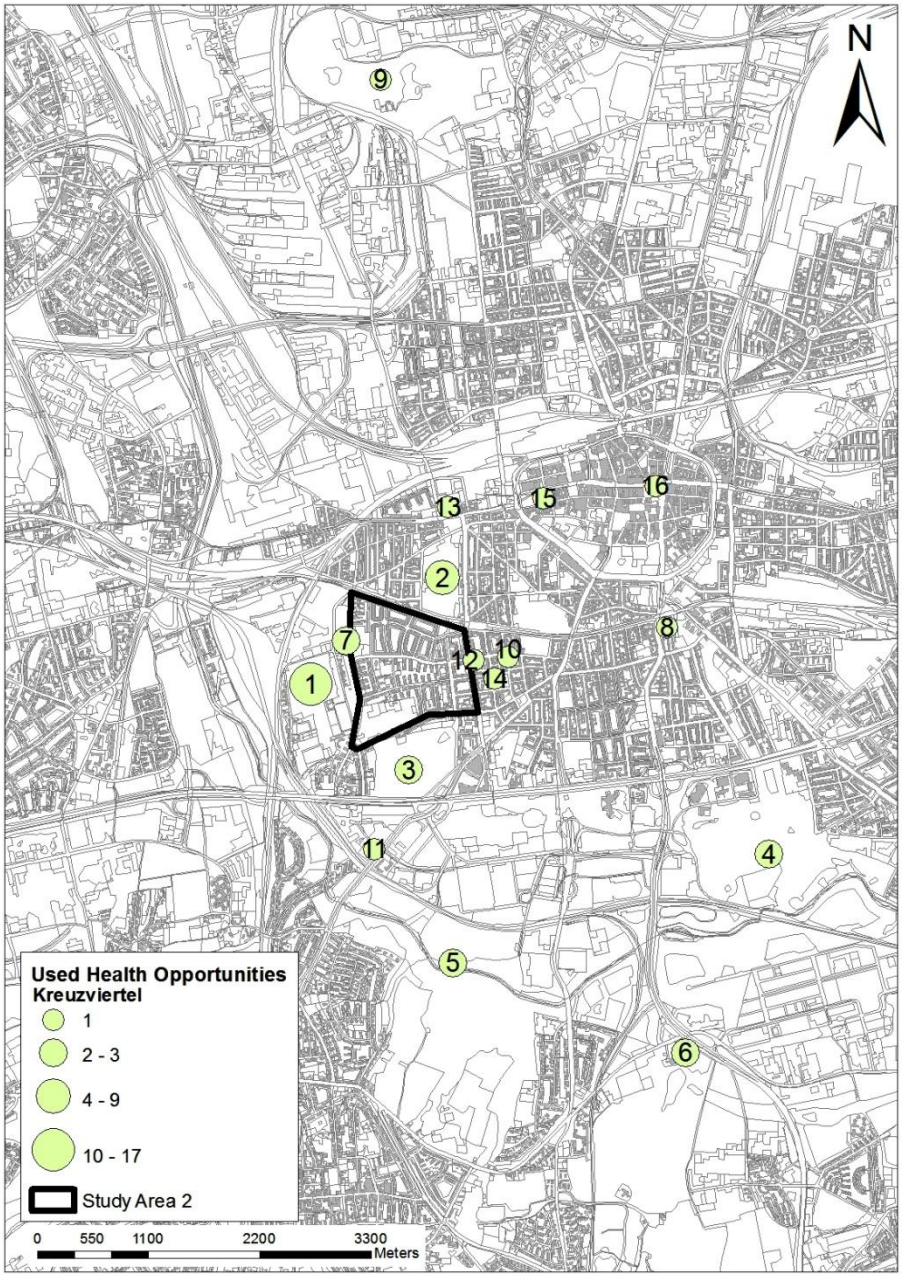


Figure 5-12 Map showing used health opportunities mentioned by respondents in Kreuzviertel

The avoided locations include park, main station in city centre, footpaths along the roadways and bus station. Among such locations, Westpark was mentioned more as avoided location for good health.
A detailed list of locations mapped as avoided health opportunities are shown in Table5-7. The table represents ranking numbers for locations based on the number of respondents who mapped them. These ranked numbers in table correspond to the numbers displayed in map in Figure5-13 to identify the locations spatially.

Table 5-7 A list of locations mentioned under avoided health opportunities in Kreuzviertel

Rank	Locations	No. of Respondents
1	Westpark	6
2	Main station	3
3	Lindemannstrasse	2
4	Dortmund West	1
5	Falkenstrasse	1
6	Rheinische Strasse	1

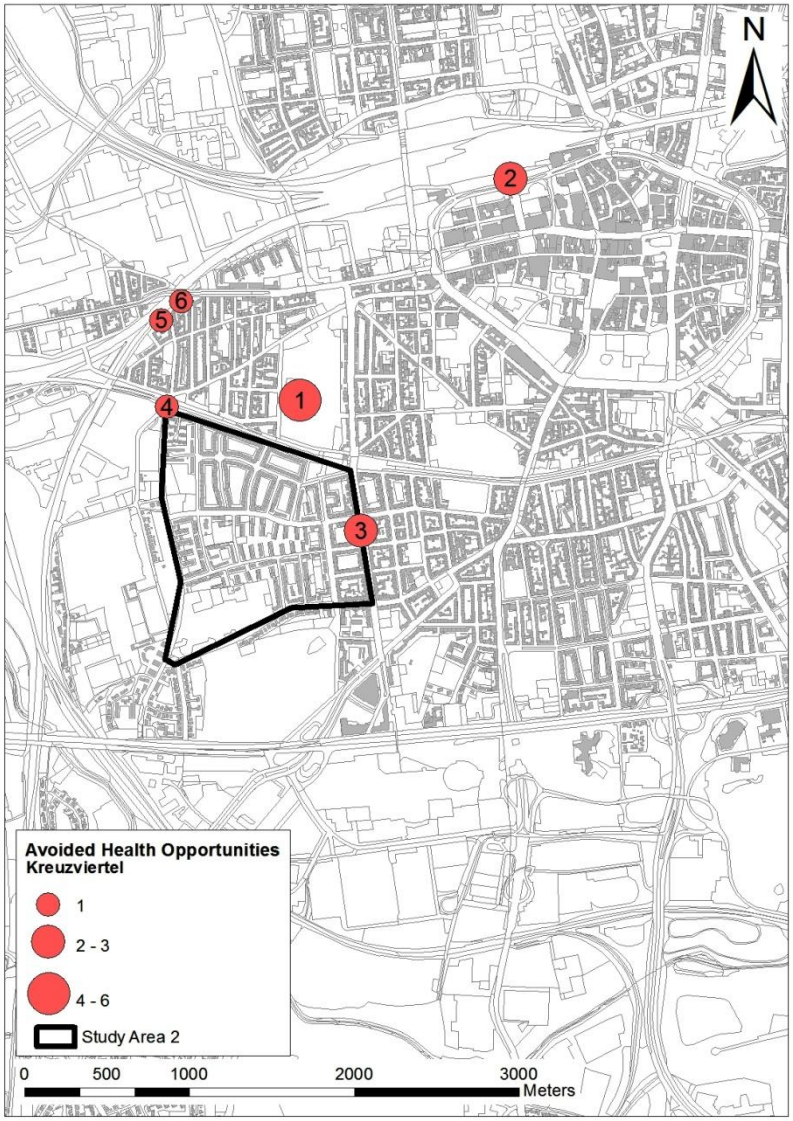


Figure 5-13 Map showing avoided health opportunities mentioned by respondents in Kreuzviertel

5.4.1. Categorization of used health opportunities in Kreuzviertel

The health opportunities that respondents mentioned under used places for good health can be further categorised. This is shown in Table5-8 and Figure5-14. The categories are explained below.

Resources related to physical activity

Under this category, nine places were stated as used health opportunity. These places include 4 parks (Tremoniapark, Westpark, Westfalenpark, Fredenbaumpark) for jogging, walking, sport activities, 2 fitness centres (Orange Fitness Centre, Pilates Arts), 1 swimming centre (Suedbad swimming centre), 1 walking route (Bolmker area) for jogging and cemetery (Suedwestfriedhof) for walking.

Resources related to food

Under this category, five places were mentioned. Four supermarkets (Lidl in Kuithanstrasse, Basic food shop, Kornhaus, REWE at Unionstrasse) were reported being used for buying food whereas one restaurant (El Mundo Restaurant) was mentioned for eating food. Respondents mentioned about food shops where they buy organic food under this category.

Resources related to social connections

Under this category, seven places were identified which included 4 parks (Tremoniapark, Westpark, Westfalenpark, Rombergpark), 1 restaurant (El Mundo Restaurant), 1 fitness centre (Pilates Arts) and open plaza in city centre (Reinoldikirche) for meeting friends.

Respondents in Kreuzviertel reported more health opportunity related to physical activity, followed by those related for social connections. None of the respondents mentioned health opportunity related to healthcare like hospitals.

Table 5-8 Categorization of used health opportunities in Kreuzviertel

Used Places	Type of health opportunity		
	related to physical activity	related to food	related to social relationships
Tremoniapark	√		√
Westpark	√		√
Bolmker Weg	√		
Suedwestfriedhof	√		
Westfalenpark	√		√
Rombergpark			√
Lidl in Kuithanstrasse		√	
Basic food shop		√	√
El Mundo Restaurant		√	√
Fredenbaumpark	√		
Kornhaus		√	
Orange Fitness Centre	√		
Pilates Arts	√		√
Reinoldikirche			√
REWE at Unionstrasse		√	
Suedbad swimming centre	√		

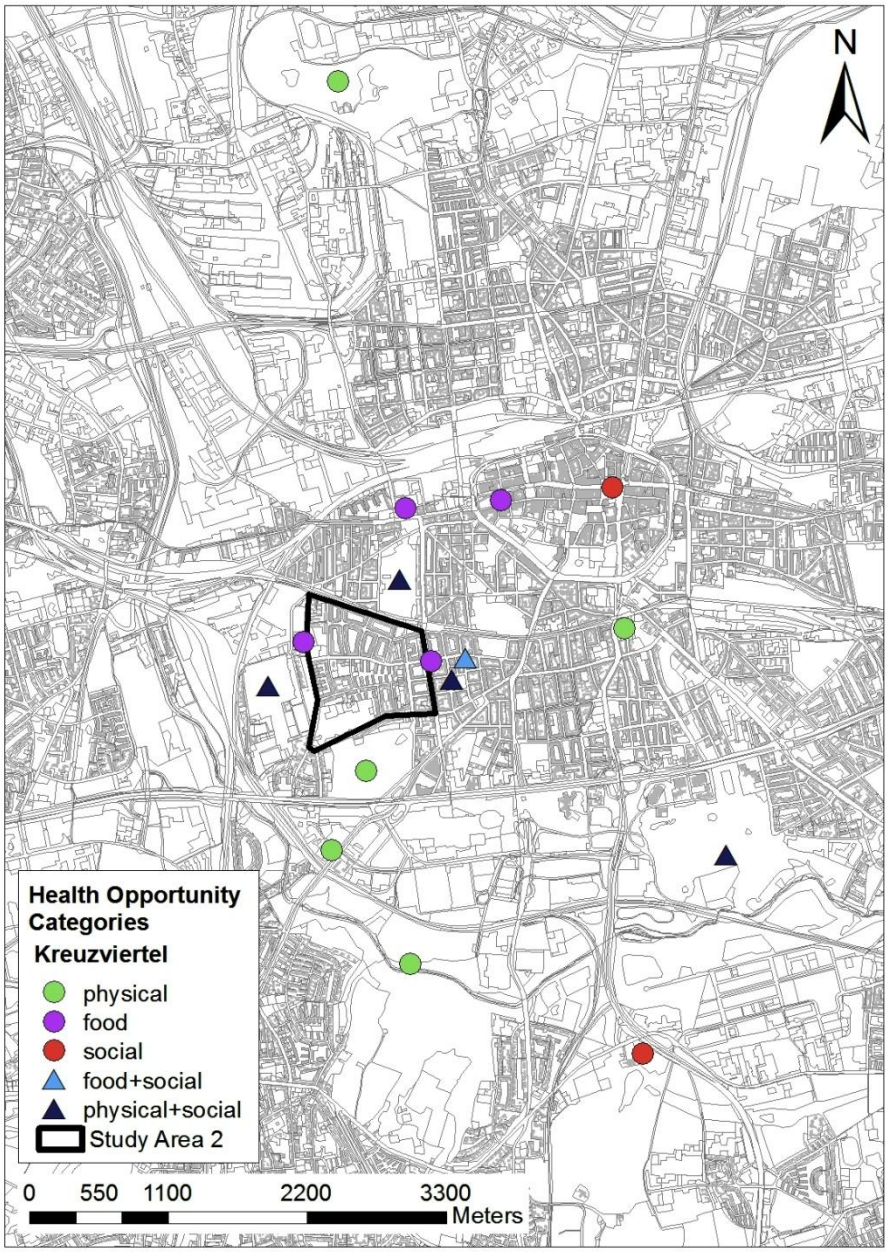


Figure 5-14 Map showing categorization of used health opportunities in Kreuzviertel

The map shows that used health opportunities are mostly located outside Kreuzviertel. Resources related to food are close to study area. Also, resources related to physical activity and social relationship (indicated by dark blue triangles) are close to study area. Resources related to physical activities are comparatively more (indicated by green circles). City centre is used for food and social relationships.

5.5. Perception of neighbourhood characteristics for used and avoided health opportunities in Kreuzviertel

In Kreuzviertel, for the used health opportunities, respondents mentioned distance to place (18% of respondents) slightly more than cleanliness in place(17%), air quality (16%), noise in place (16%) and safety in place (15%) (Figure5-15). In case of avoided health opportunities, respondents reported reasons for avoiding based on safety concerns and noise in place (30% in each), cleanliness (20%) and distance to place (10%). Respondents from Kreuzviertel didn't consider cost as reason for avoiding locations.

Availability of services and air quality (5% in each) were least mentioned as the reasons for avoiding health opportunities. Figure 5-15 below shows the variation in perception for used and avoided health opportunities in Kreuzviertel.

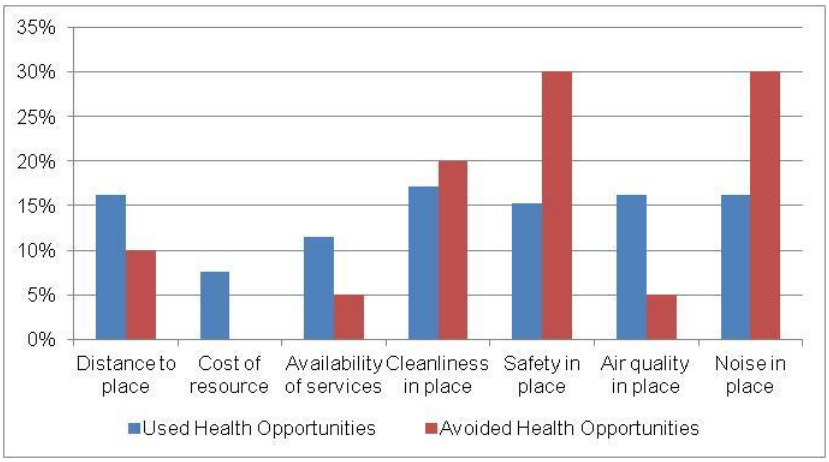


Figure 5-15 Reasons for used and avoided health opportunities in Kreuzviertel

Perception of respondents for different locations identified as health opportunities (used and avoided combined) are shown in maps from Figure5-16 to Figure5-22. For the easy comparison of perception for identified used and avoided health opportunities, Figure5-16 to Figure5-22 show respondents' perception for different neighbourhood characteristics (distance to place, cost of resource, availability of services, cleanliness in place, safety in place, air quality in place and noise in place). The perception for such different reasons captured using 6 point Likert-scale was regrouped as good and bad for easy interpretation of result. So, each maps shows perception as good or bad for used and avoided health opportunities. In the maps, the positive and negative perception about neighbourhood characteristics for used health opportunities are represented by 'Used_good' and 'Used_bad' respectively. Similarly, the positive and negative perception about neighbourhood characteristics for avoided health opportunities are represented by 'Avoided_good' and 'Avoided_bad respectively.

(Note- To visualise ranking of identified locations as used and avoided health opportunities regarding different neighbourhood characteristics, see Appendix C.)

The maps show that respondents had mixed perception regarding safety, service availability, cleanliness, air quality, and noise in Westpark located towards north of Kreuzviertel. Regarding safety, for Tremoniapark, which is close to study area towards west, participants showed mixed perception. Other unsafe and avoided health opportunities are locations near the high traffic area such as main station and Falkenstrasse. Respondents reported about uncleanliness in Falkenstrasse and parks. Bad air quality was perceived in Lindemannstrasse which is nearby study area in addition to Tremoniapark and Westpark. Noise was perceived annoying in locations close to roads and railway tracks in addition to some parks.

(Note- HO means health opportunities in the following maps)

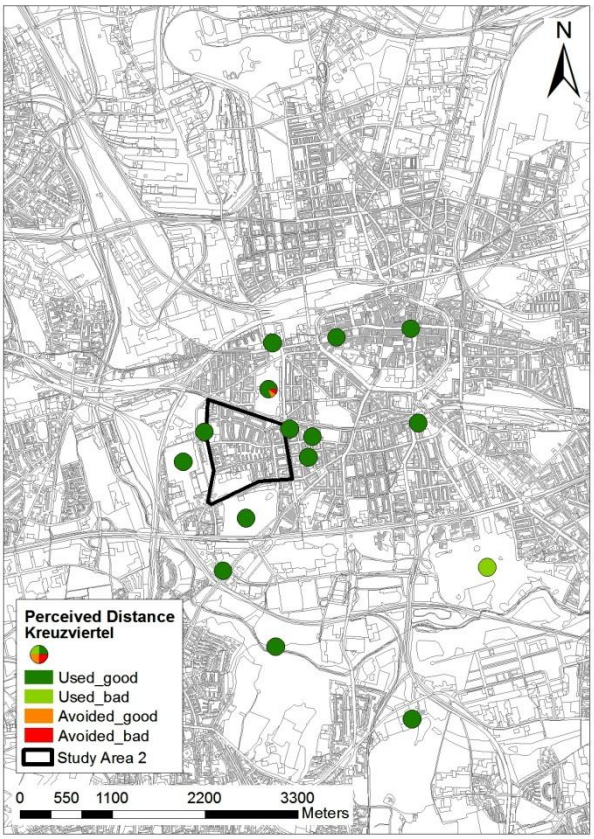


Figure 5-16 Perception of distance to resources in HO

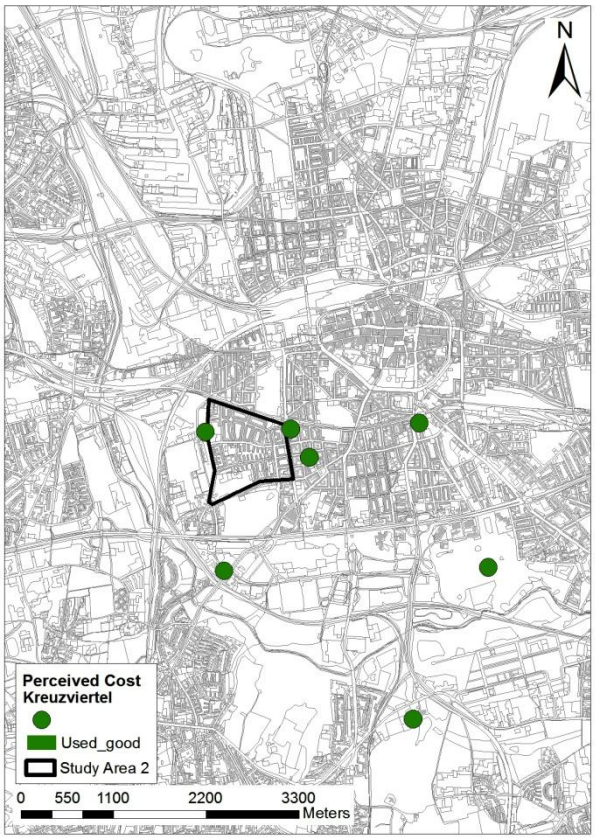


Figure 5-17 Perception of cost of resources in HO

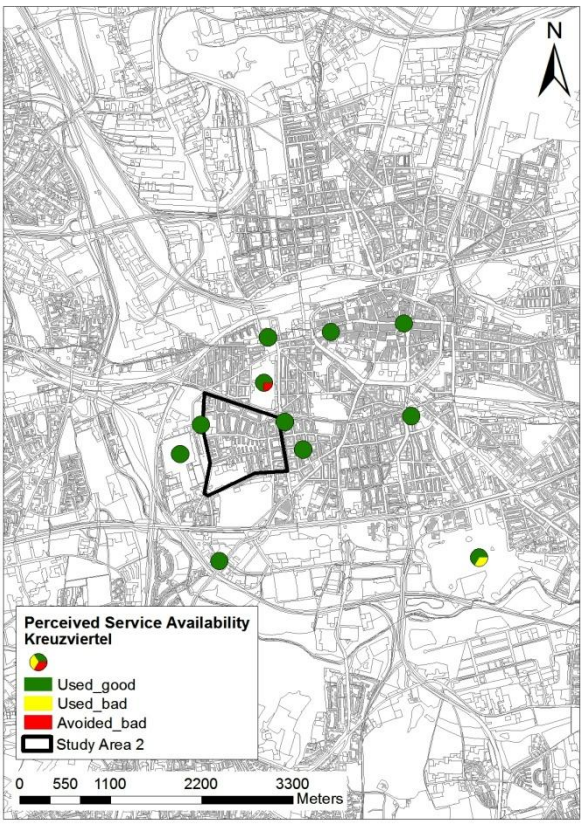


Figure 5-18 Perception of service availability in HO

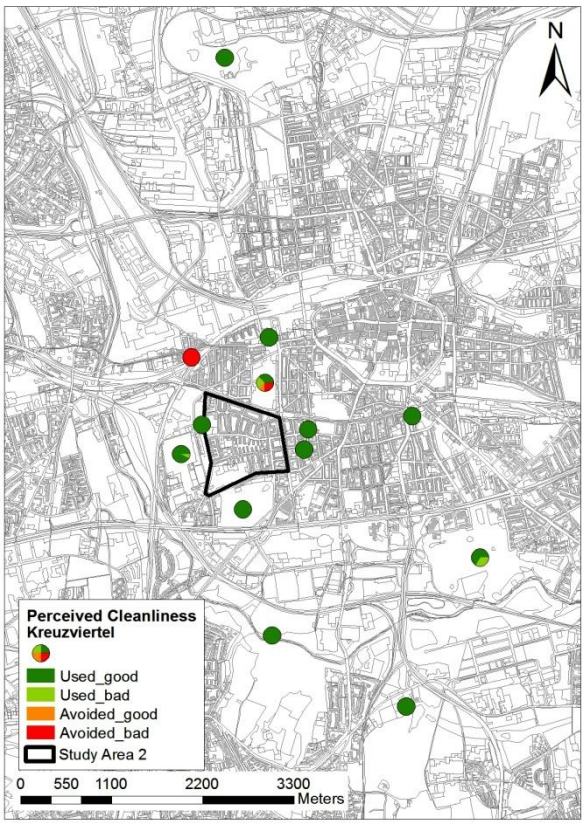


Figure 5-19 Perception of cleanliness in HO

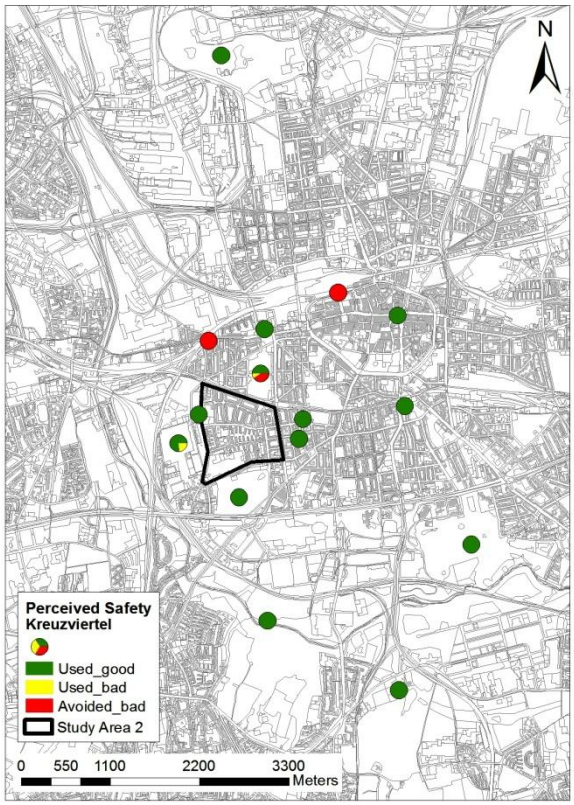


Figure 5-20 Perception of safety in identified health opportunities in Kreuzviertel

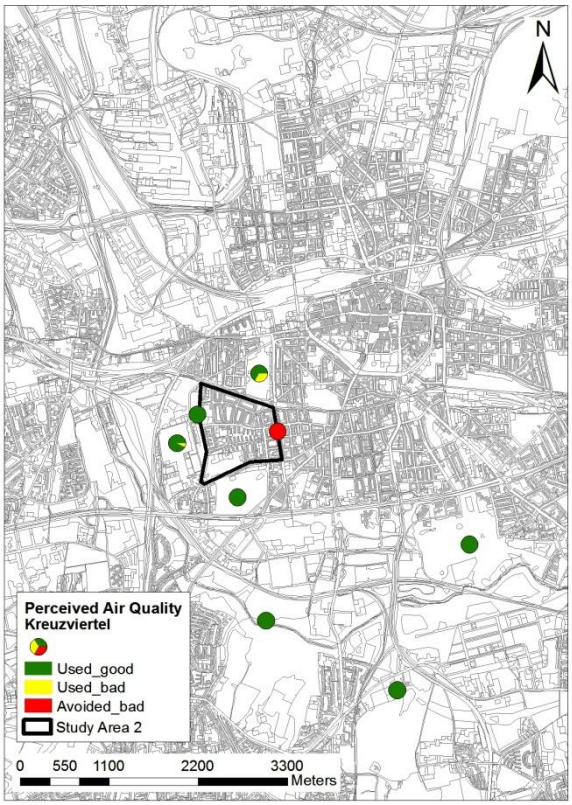


Figure 5-21 Perception of air quality in identified health opportunities in Kreuzviertel

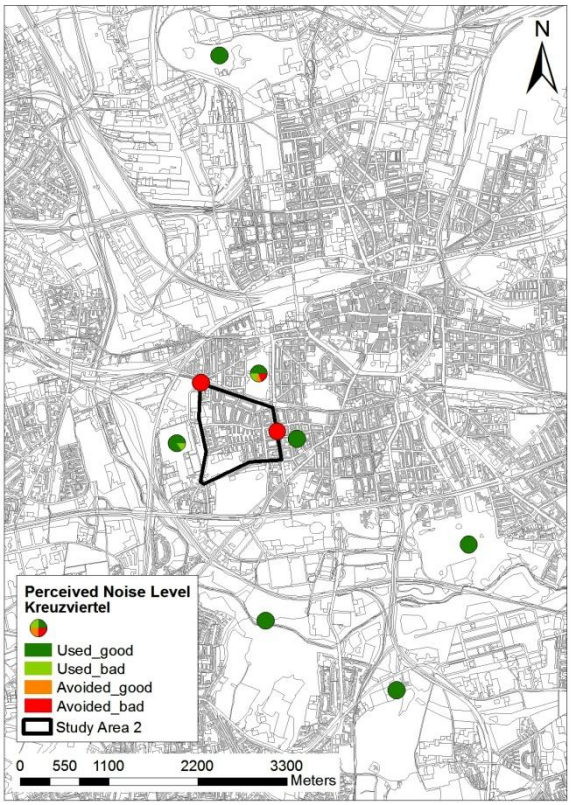


Figure 5-22 Perception of noise level in identified health opportunities in Kreuzviertel

Perception of neighbourhood characteristics for used health opportunities in Kreuzviertel

The previous section5.4 has already discussed about locations which were identified as used health opportunities in Kreuzviertel based on the interviews (Table5-6). Among such locations, parks were mostly mentioned. The places that offer physical activity such as walking, jogging and strolling were reported more after parks such as walking route and cemetery. Food shops and restaurants were also mentioned. Physical fitness centres and swimming centre were also reported as used health opportunities. Open square was also pointed out.

For locations, particularly for physical activities (such as walking route in Bolmker Weg, cemetery Suedwestfriedhof and fitness centres) respondents perceived distance to the place and cleanliness as more important reason followed by safety and noise in place. Regarding the use of food shops, closeness to place of stay, availability of services and safety were mentioned as main reasons. One female respondent mentioned the open square in city centre as venue for meeting friends who reported closeness to place of stay and safety as the reasons for using that location.

Respondents mentioned about feeling of unsafety in evening in some locations such as Tremoniapark, Westpark and Bolmker Weg. They perceived the greenery in these locations very satisfying and reported the locations as very good place to relax. This indicates respondents concerns about social as well as environmental characteristics for using locations as health opportunities. Regarding the green areas, one of the respondents from Kreuzviertel mentioned that due to lack of green space where he was residing, he bought garden plot in Tremoniapark to enjoy time in green nature.

Perception of neighbourhood characteristics for avoided health opportunities in Kreuzviertel

The locations mapped as avoided health opportunities have already been discussed in section5.4 with Figure5-2 and Table5-3. The avoided locations include park, main station in city centre, footpaths along the roadways and bus station. Among such locations, Westpark was mentioned more as avoided location for good health. Respondents perceived this location as unsafe, unclean and also perceived noise level dissatisfying. Many young people drinking in the park and also using drugs made respondent feel more unsafe in the evening than in day time. Dortmund West was also reported as avoided location because of noise level. Rheinische Strasse was mentioned as avoided location because respondents feel unsafe. The locations along Lindemannstrasse and Falkenstrasse were also avoided because of very dissatisfying noise level and bad air quality in the surrounding.

5.6. Personal characteristics based perception of neighbourhood characteristics for used and avoided health opportunities in Kreuzviertel

The variation in perception can be analysed based on personal characteristics. such as gender, age, education, migration background and employment status. For the detail discussion of variation in perception of neighbourhood characteristics based on personal characteristics (gender, age, education, migration background and employment status), see Appendix E.

The main points from the variation in the responses based on personal characteristics are discussed below.

Regarding used health opportunities, perception of distance scored highest followed by cleanliness. Environmental characteristics (air quality and noise) was perceived more than safety. Female respondents perceived distance, safety and air quality equally whereas male respondents perceived distance, cleanliness and noise equally. Low educated and old participants perceived cleanliness followed by distance. They perceived safety, air quality and noise equally important after distance. For more educated and young participants, distance was most important followed by air quality and noise. They perceived safety and cleanliness after environmental characteristics. After distance, employed respondents perceived cleanliness, safety and noise more than air quality while unemployed participants perceived environmental quality more than safety.

Regarding avoided health opportunities, safety and noise was perceived almost equally by employed, young and old aged respondents, less and more educated respondents. Female participants and respondents without migration background perceived social characteristics, i.e., safety most. While, male respondents and unemployed respondents perceived noise most. Low and more educated, young and old and employed respondents perceived safety and noise equally important.

In conclusion, respondents were found to use health opportunities because of close distance and cleanliness in place. Males were more concerned about distance and cleanliness than females. Low educated participants perceived cleanliness more than high educated. Younger participants perceived distance more than older participants while older participants perceived cleanliness more than younger participants. Employed participants perceived distance more than those unemployed. Respondents with migration background perceived distance and cleanliness more than those without migration background. Respondents reported about avoidance of location because of safety and noise. Female perceived safety more than male and male perceived noise more than female. Younger respondents perceived safety and noise more than older respondents. Employed participants were more concerned about safety whereas unemployed participants were more concerned about noise.

5.7. Comparative analysis of results from deprived area (Nordstadt) and affluent area (Kreuzviertel)

Comparison between the perceptions of respondents from two areas can be done first for used health opportunities and second for avoided health opportunities. This variation in perception of neighbourhood characteristics between respondents from Nordstadt and Kreuzviertel has been illustrated in Figure5-23 where one radar chart illustrates the difference in perception of neighbourhood characteristics for used health opportunities and the other illustrating difference for avoided health opportunities.

In case of used health opportunities, respondents from both areas- Nordstadt and Kreuzviertel, perceived distance and cleanliness most important followed by safety in case of Nordstadt and by environmental characteristics (air quality and noise) in case of Kreuzviertel. This means safety is matter of concern for those from Nordstadt whereas environmental quality is more important for those from Kreuzviertel. Comparatively, respondents from Nordstadt were more concerned about both distance and cleanliness than those from Kreuzviertel. However, perception of safety was equal. The chart shows that availability of services and cost were considered more by participants from Nordstadt.
Regarding, avoided health opportunities, safety was the main concern in both areas. Noise was perceived after safety in Kreuzviertel whereas for respondents in Nordstadt, cleanliness was important than noise after safety. Figure5-23 shows that respondents in Kreuzviertel perceived noise more than those in Nordstadt. whereas respondents in Nordstadt perceived safety and cleanliness more than participants in Kreuzviertel.

This comparison between responses shows that distance and cleanliness were important for using health opportunities for the participants from both areas. Participants from Kreuzviertel perceived environmental characteristics more while participants from Nordstadt perceived unsafety more than noise and air quality and avoided health opportunities.

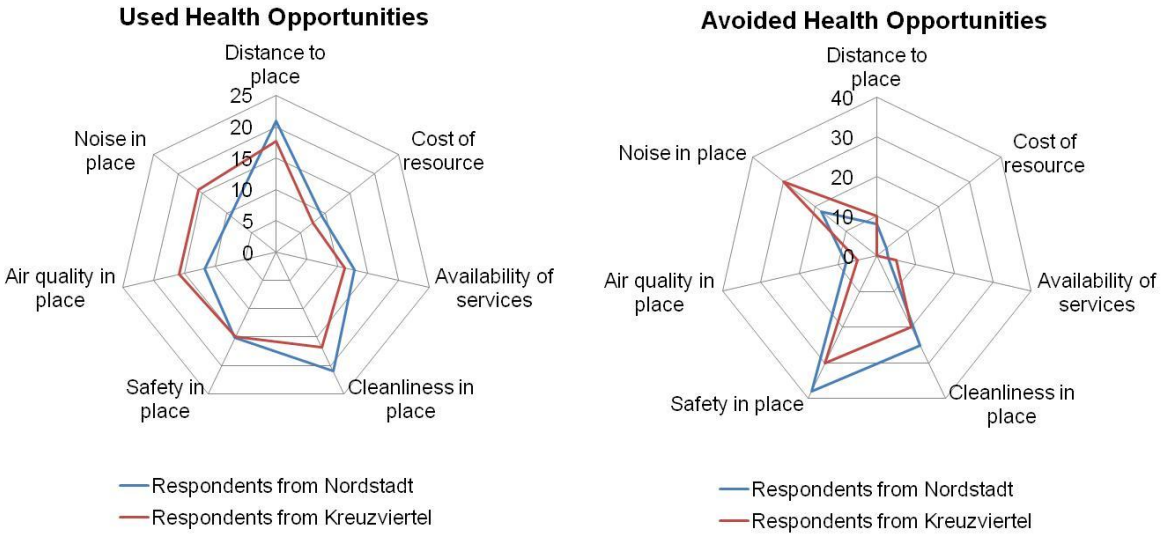


Figure 5-23 Reasons for using and avoiding health opportunities in Nordstadt and Kreuzviertel

Respondents from Nordstadt were mostly male, young age, with low education level, migrants and unemployed whereas it was just opposite in case of Kreuzviertel. People were highly educated, non-migrants and mostly retired in Kreuzviertel. The variation in the perception can be explained based on this compositional characteristics.

Regarding used health opportunities in both areas, male respondents, younger respondents, those with migration background, low and more educated respondents and employed respondents perceived distance to place. Also, cleanliness was perceived in both areas by older respondents, those with migration background, with low education level in both areas. There was variation in perception of cleanliness based on gender and employment status. In Nordstadt, both male and female participants and employed respondents perceived cleanliness whereas in Kreuzviertel, male participants and unemployed participants perceived cleanliness.
Regarding avoided health opportunities in both areas, there was a variation in perception of safety based on education level and employment status between two areas. In Nordstadt, low educated and unemployed respondents were found to avoid locations because of safety issues whereas in Kreuzviertel employed respondents and regardless of education level avoided locations because of feeling of unsafe. Female, young age, and non-migrant respondents from both areas reported feeling of unsafe and avoided locations. Noise was perceived by male, young age, and unemployed respondents in both areas. In Nordstadt, more educated and respondents with migration background were concerned more about noise level while in Kreuzviertel, respondents without migration background and both low and high educated participants were sensitive to noise.

Researches have shown that perceptions of people vary by education, nativity, family structure and gender (Roosa et al., 2009). Immigrants are more sensitive towards safety, mainly women. Also, less educated men and women perceive danger more than those more educated. However, in Nordstadt where migrant population is higher, respondents without migration background were sensitive towards safety. Perhaps, this is because, as mentioned in some research that, for people living in neighbourhood with socioeconomic or ethnic mix different from their own have fewer social relationships locally which can create distrust and feeling of unsafety (Parkes, Kearns, & Atkinson, 2002). The study also mentioned that people who are unemployed and with low income who cannot easily protect themselves from neighbourhood problems, have more dissatisfaction with neighbourhood problem. This can be the case for respondents with migration background from Nordstadt who reported dissatisfaction with noise level.

The dissatisfaction with noise for the respondents from Kreuzviertel can be supported by research (Kruize, 2007, p. 212) which mentions that those living in higher income area or more educated people are concerned with absence of noise in neighbourhood in comparison to those living in low income area or low educational level.

Respondents from both areas mentioned parks as the used health opportunities. In both areas, parks were used for multiple activities such as physical activities (such as walking, jogging, strolling, playing, biking and sport activities) and social interaction (such as meeting friends). Apart from these, respondents from Nordstadt mentioned use of parks for reading whereas respondents from Kreuzviertel mentioned use of parks for organising events like BBQ , picnicking and for relaxing and enjoying the green nature.
Respondents from both areas mentioned parks as venue for meeting and communication, particularly by female respondents. Many researchers have found out that people perceive green areas for socialization, relaxation, enjoyment of nature in addition to physical activity (Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Chappell & Funk, 2004; Chiesura, 2004; Weber & Anderson, 2010; Brown, Schebella, & Weber, 2014).

Parks were attributed to qualities of physical environment (such as availability of services as required, cleanliness, good air quality and satisfying noise level) and social environment (such as safe place). Respondents from both areas reported about distance to park and cleanliness as the main reasons for using parks. However, safety was perceived more than environmental characteristics by respondents in Nordstadt while environmental characteristics was perceived more than safety by participants from Kreuzviertel (Figure5-24).

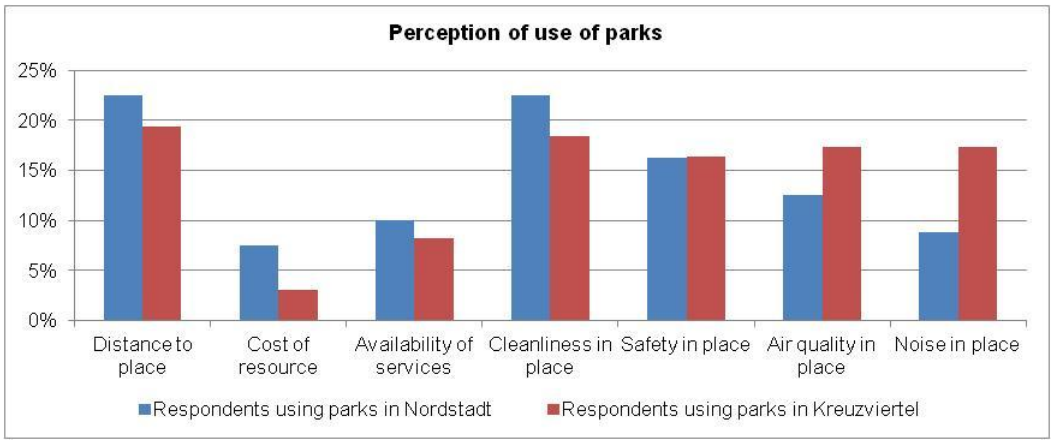


Figure 5-24 Reasons for using parks in Nordstadt and Kreuzviertel

In Kreuzviertel, some respondents reported about feeling of unsafe in park in the evening than in a day time. Also, some female respondents mentioned about feeling of unsafe in parks due to drugs using activities. Further research can be directed to find out reasons behind feeling unsafe in parks. However, it has been mentioned in other studies that people perceive fear of crime in parks because of poor lighting, physical incivilities, unmanaged vegetation and presence of few people in parks that create more fear among women and physically vulnerable group such as elderly (Painter, 1996; Jorgensen, Ellis, & Ruddell, 2012). Some studies have also found out that people may feel unsafe in parks due to the presence of certain groups who sell or use drugs and drink publicly and activities as such disturb and threaten other users of parks (Knutsson, 1997). Other researchers have found out that people avoid being in parks because of crime and activities like littering, dog fouling, alcohol and drug abuse and public sex (Hilborn, 2009, p. 6).

5.8. Analysis of actual environmental quality associated with health opportunities

This section presents the actual environmental situation regarding noise and air quality in locations that were mentioned as health opportunities by the respondents from Nordstadt and Kreuzviertel. The main purpose of doing such examination is to see if the locations can be considered as health promoting based on the environmental characteristics. Since, the respondents from both areas reported air quality and noise to be the reason for using and avoiding different locations as health opportunities, these qualities will be assessed.

As mentioned in literature review, air pollutants such as NO2 and PM10 cause air pollution. Such pollutants are harmful to health. Similarly, noise from different sources such as road traffic, railways, industries can also have adverse health effects. For Dortmund, threshold value for the annual average concentration of both NO_2 and PM_{10} are set as 40μg/m³ each (SimuPLAN, 2013, p. 11). The threshold value for total noise from various sources is considered 55dB (decibel) in Dortmund (SimuPLAN, 2013, p. 11).

The total noise level not exceeding 55dB is considered as good whereas annual average concentration of PM_{10} and NO_2, each not exceeding 40μg/m³ is considered good. The total noise level combines the noise from street, train, tram and industries. Table5-9 and 5-10 show the actual values for noise and air quality at different locations mentioned by respondents residing in Nordstadt.. The values exceeding the standard threshold values are highlighted in Table5-9 and Table5-10.

Table5-9 shows that in all parks except Hoeschpark and Bliicherstrassenpark, noise level is more than threshold value. The locations of the Depot has noise level of about 64.2dB. Similarly, some other locations such as around Helmholtz gymnasium, fitness centre, food shop-Kaufland in Bornstrasse and Schiitzenstrasse also seem to be noisy. Regarding PM_{10} and NO_2 values, all the listed locations are within the threshold value except for location in Muensterstrasse where restaurant Nordpol is located where NO_2 concentration is 44μg/m³ which slightly exceed threshold value. Table5-10 shows that locations avoided by respondents in Nordstadt have higher noise level and NO_2 concentration. This result shows that most of the locations pointed by respondents from Nordstadt have good environmental quality, particularly the parks except two parks. The locations within the study area such as Muensterstrasse has high NO_2 concentration.

Table 5-9 Average values of noise , PM_{10} and NO_2 concentration per year, based on emission grid for locations listed as used health opportunities by respondents in Nordstadt

Locations	Noise level (dB)	PM_{10} (μg/m³)	NO_2 (μg/m³)
Fredenbaumpark	53.0	25.6	29.3
Leopoldpark	52.2	27.5	38.7
Hoeschpark	59.4	25.2	33
City Centre	40.6	25.3	34
Muensterstrasse	52	28.4	38.7
Nordmarkt	54	26.4	36.5
Westfalenpark	54.4	25.4	35.5
Subrosa cafe	46.9	25.4	33.2
Depot	64.2	27.2	37.9
All Fitness	62.6	26.1	35.9
Kaufland in Bornstrasse	62.6	26.1	35.9
Langer August Club	53.5	25	32.9
Helmholtz gymnasium	59.4	26.4	35.9

Nordpol in Muensterstrasse	45.0	29.6	44
Rewe in Schiitzenstrasse	51	27	36.5
Lidl in Schiitzenstrasse	55.1	26.2	35.3
Bliicherstrassenpark	57.2	26.9	37.5
Swimming Centre in EMS Kanal	46.6	30.3	27.2
Dippelstrassenpark	51.6	25.7	34.8

Table 5-10 Average values of noise, PM_{10} and NO_2 concentration per year, based on emission grid for locations listed as avoided health opportunities by respondents in Nordstadt

Locations	Noise level (dB)	PM_{10} (µg/m³)	NO_2 (µg/m³)
Borsigplatz	58.9	29.4	43.5
Mallinckrodtstrasse	56	28.8	41.9
Bergmannstrasse	56.1	25.4	34.0
Dortmund Hauptbahnhof Nord	57.4	29.5	39.8
Quadbeckstrasse	58.4	30.5	42.3

Table5-11 and 5-12 show actual values for noise and air quality at different locations pointed out by respondents in Kreuzviertel. The values exceeding standard threshold value are highlighted in both tables. Table5-11 shows that all parks have noise level within threshold value except Rombergpark with value 58.2dB. For Westpark, noise came out to be 55.2 dB which is almost threshold value. The area where respondents mentioned food shops seem to have high noise level, such as for location where Basic food is located, noise level is 59.1dB and for area around REWE at Unionstrasse, noise level is 64.1dB. The cemetery area, Suedwestfriedhof which people mentioned for physical activity has high noise level of 63.1dB. Other locations mentioned for physical activities such as Suedbad swimming centre and Orange Fitness Centre also have noise level exceeding threshold value. With regard to NO_2, the values are high in areas around cemetery, REWE in Unionstrasse, Orange Fitness Centre and Suedbad swimming centre. The avoided locations which are the locations along the street have high noise level (Table5-12). NO_2 value is high (44.9 µg/m³) in the area around Lindemannstrasse.

Table 5-11 Average values of noise, PM_{10} and NO_2 concentration per year, based on emission grid for locations listed as used health opportunities by respondents in Kreuzviertel

Locations	Noise level (dB)	PM_{10} (µg/m³)	NO_2 (µg/m³)
Tremoniapark	53	25.1	33.8
Westpark	55.2	25.4	34.4
Suedwestfriedhof	63.1	29.8	46.5
Westfalenpark	53.8	25.1	34.8
Bolmker Weg	52.8	24.7	32.9
Rombergpark	58.2	24.4	31.7
Lidl in Kuithanstrasse	52	24.4	31.7
Suedbad swimming centre	62.6	27.3	40.4
El Mundo Restaurant	44.8	24.7	33.5
Orange Fitness Centre	60.7	27	40.4
Kornhaus	55.9	26.9	38.3
REWE at Unionstrasse	64.1	29.2	40.7
Pilates Arts	42.6	25.0	34.4
Basic food shop	59.1	26.9	38.2

Reinoldikirche	45.2	25.0	33.8

Table 5-12 Average values of noise and PM_{10} based on emission grid for locations listed as avoided health opportunities by respondents in Kreuzviertel

Locations	Noise level (dB)	PM_{10} (µg/m³)	NO_2 (µg/m³)
Lindemannstrasse	62.7	29.6	44.9
Dortmund West	60.7	25.1	33.8
Falkenstrasse	59	30	36.5
Rheinische Strasse	59	30	36.5

In both areas (Nordstadt and Kreuzviertel), the avoided locations have high noise level and some locations have NO_2 value exceeding threshold value. Most of the avoided locations in both areas are along streets.

5.9. Comparison of match or mismatch between actual and perceived environmental quality

The differences between actual and perceived environmental quality were assessed only for the locations where respondents considered noise and air quality as the reasons for using and avoiding those locations. For such locations mentioned as health opportunities, the differences were examined for both study areas (Nordstadt and Kreuzviertel). This assessment used a 2x2 quadrant as mentioned in section4.5.1.4. with four combinations of actual and perceived environmental quality as:

- situation A(actual) g(good) P(perceived) g(good): the actual and perceived environmental quality are both good which is a match between actual and perceived environmental quality.
- situation A(actual)b(bad)P(perceived)g(good): the actual environmental quality is bad, but perceived environmental quality is good which is a mismatch between actual and perceived environmental quality.
- situation AgPb: the actual environmental situation is good, but perceived environmental quality is bad which is a mismatch between actual and perceived environmental quality.
- situation AbPb: the actual and perceived environmental quality are both bad which is a match between actual and perceived environmental quality.

5.9.1. Comparison of match or mismatch between actual and perceived environmental quality in Nordstadt

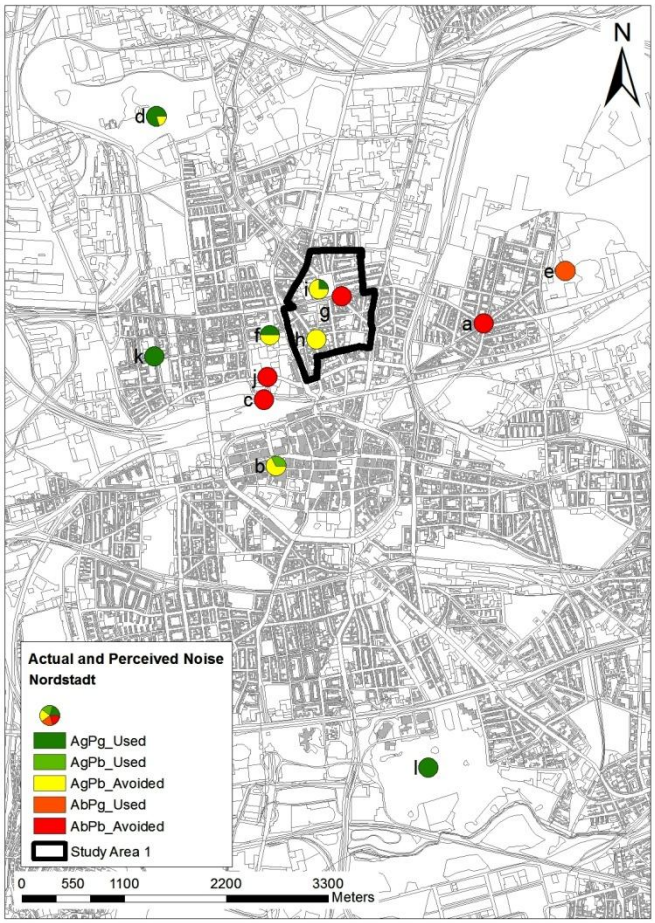
A 2x2 quadrant for noise is shown for locations pointed out by respondents in Nordstadt in Table5-13. Air quality is shown in Table5-14 and Table5-15 for NO_2 and PM_{10} respectively. In each tables, the alphabets (such as a, b, c, d...)indicates the locations and the numbers inside bracket represent the number of respondents who considered the noise and air quality at particular location. As mentioned earlier in section4.5.1.4, locations either used or avoided are indicated by U and A respectively. The results from the 2x2 quadrant are presented in maps also.

Figure5-25 shows the information in Table5-13 spatially. The result shows five locations for match situation AgPg and mismatch situation AgPb, one location for mismatch situation AbPg and four locations for match situation AbPb. More respondents were found reporting dissatisfaction and avoiding health opportunities under mismatch situation AgPb.

Table 5-13 A 2x2 quadrant showing actual and perceived noise level for identified health opportunities in Nordstadt

			Actual environmental quality			
			+		-	
			Noise≤55dB		Noise>55dB	
	+	slightly satisfying	**AgPg**		**AbPg**	
		satisfying	d(4)	U	e(2)	U
		very satisfying	f(1)	U		
			i(1)	U		
			k(1)	U		
			l(1)	U		
Perceived environmental quality	-	very dissatisfying	**AgPb**		**AbPb**	
		dissatisfying	b(1)	U	a(2)	A
		slightly dissatisfying	b(2)	A	c(1)	A
			d(1)	A	g(1)	A
			f(1)	A	j(1)	A
			h(1)	A		
			i(3)	A		

a Borsigplatz, **b** City centre, **c** Dortmund Hauptbahnhof, **d** Fredenbaumpark, **e** Hoeschpark, **f** Leopoldpark, **g** Mallinckrodtstrasse, **h** Muensterstrasse, **i** Nordmarkt, **j** Quadbeckstrasse, **k** Subrosa Cafe, **l** Westfalenpark



Among those locations, Nordmarkt and Muensterstrasse are located inside Nordstadt. The locations marked with red points in the map show those locations which were avoided as people perceived noise level dissatisfying and also the actual noise level is exceeding threshold value in such locations. Among such locations, Mallinckrodtstrasse lies inside study area.

Figure 5-25 Actual and Perceived Noise for the identified health opportunities by respondents in Nordstadt

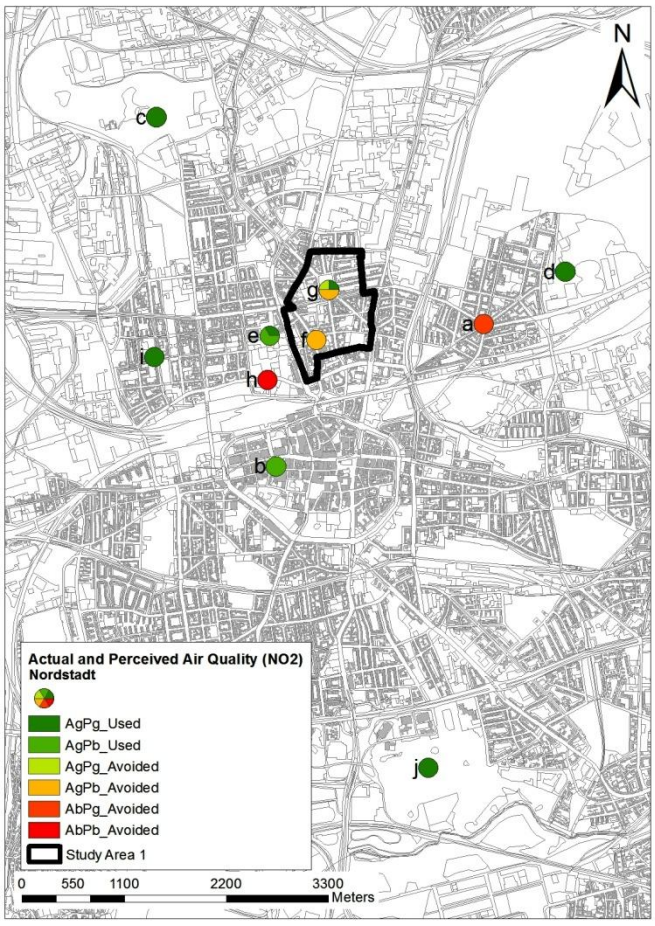
(Note- AgPg= Actual good and perceived good, AgPb= Actual good and perceived bad, AbPb= Actual bad and perceived bad. '_Used' represents used health opportunities and '_Avoided' represents avoided health opportunities)

Table 5-14 A 2x2 quadrant showing actual and perceived air quality (NO_2 concentration) for identified health opportunities in Nordstadt (below)

			Actual environmental quality			
			+		-	
			NO_2 ≤40 µg/m³		**NO_2 >40 µg/m³**	
	+	slightly good	**AgPg**		**AbPg**	
		good	c(5)	U	a(1)	A
		very good	d(4)	U		
			e(1)	U		
			g(1)	U		
Perceived environmental quality			g(1)	A		
			i(1)	U		
			j(2)	U		
	-	very bad	**AgPb**		**AbPb**	
		bad	b(1)	U	h(1)	A
		slightly bad	e(2)	U		
			f(1)	A		
			g(2)	A		

a Borsigplatz, **b** City centre, **c** Fredenbaumpark, **d** Hoeschpark, **e** Leopoldpark, **f** Muensterstrasse, **g** Nordmarkt, **h** Quadbeckstrasse, **i** Subrosa Cafe, **j** Westfalenpark

Figure5-26 shows information in Table5-14 spatially. The result shows six locations for match situation AgPg, four locations for match situation AbPb, one location for both match situation AbPb and mismatch situation AbPg. More respondents were found reporting about used health opportunities under quadrant AgPg. For the locations inside Nordstadt, Muensterstrasse was avoided despite of good air quality while for Nordmarkt, mixed perception can be seen though actual air quality is good. In most of the parks, air quality is perceived as good.



(Note- AgPg= Actual good and perceived good, AgPb= Actual good and perceived bad, AbPg= Actual bad and perceived good, AbPb= Actual bad and perceived bad. '_Used' represents used health opportunities and '_Avoided' represents avoided health opportunities)

Figure 5-26 Actual and perceived air quality (NO_2) for the identified health opportunities by respondents in Nordstadt

Table 5-15 A 2x2 quadrant showing actual and perceived air quality (PM_{10} concentration) for identified health opportunities in Nordstadt

			Actual environmental quality		
			+		-
			PM_{10} ≤40 µg/m³		**PM_{10} >40 µg/m³**
	+	slightly good	**AgPg**		**AbPg**
		good	a(1)	A	
		very good	c(5)	U	
			d(4)	U	
			e(1)	U	
			g(1)	U	
Perceived environmental quality			g(1)	A	
			i(1)	U	
			j(2)	U	
	-	very bad	**AgPb**		**AbPb**
		bad	b(1)	U	
		slightly bad	e(2)	U	
			f(1)	A	
			g(2)	A	
			h(1)	A	

a Borsigplatz, **b** City centre, **c** Fredenbaumpark, **d** Hoeschpark, **e** Leopoldpark, **f** Muensterstrasse, **g** Nordmarkt, **h** Quadbeckstrasse, **i** Subrosa Cafe, **j** Westfalenpark

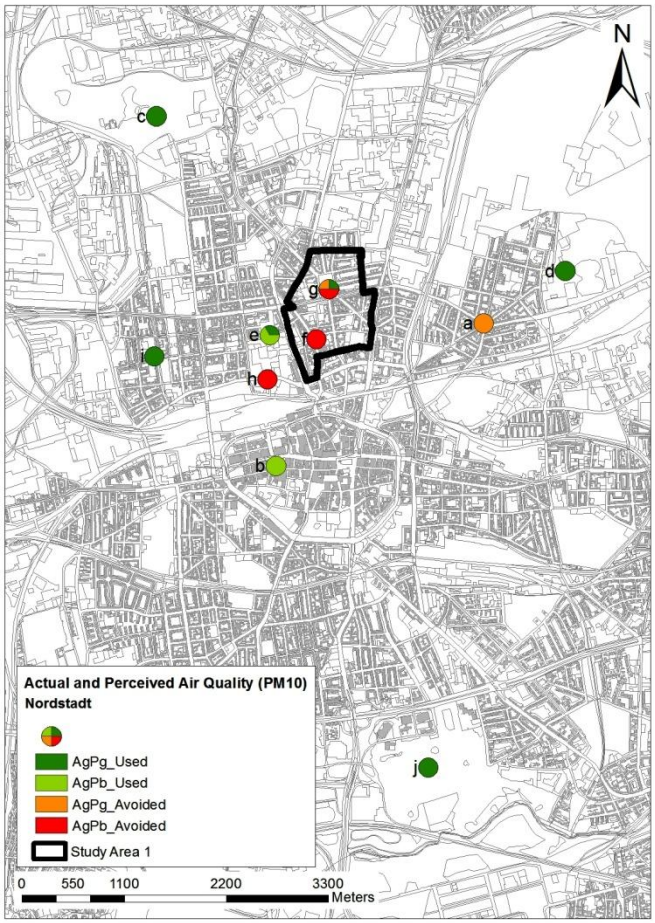


Figure5-27 shows information in Table5-15 spatially. The result shows seven locations for match situation AgPg and five locations for mismatch situation AgPb. More respondents mentioned about avoided health opportunities under quadrant AgPb. Among those, Muensterstrasse and Nordmarkt lie inside Nordstadt. mixed perception can be seen for Nordmarkt and Leopoldpark. For other parks, people showed positive perception about air quality.

Figure 5-27 Actual and perceived air quality (PM_{10}) for the identified health opportunities by respondents in Nordstadt

(Note- AgPg= Actual good and perceived good, AgPb= Actual good and perceived bad. '_Used' represents used health opportunities and '_Avoided' represents avoided health opportunities)

Summarising the result from above analysis, more mismatch was found between actual and perceived noise under quadrant AgPb (actual good but perceived bad)and five locations were avoided. Referring to the maps (Figure5-25 to Figure5-27), the avoided locations for mismatch situation AgPb for noise and air quality include Nordmarkt and Muensterstrasse which lie inside Nordstadt. There were also used health opportunities for AgPb situation such as city centre and Leopoldpark. Perhaps, positive perception about other neighbourhood characteristics can be considered as reason for using locations despite of bad perception about environmental quality. For instance, for city centre, participants had positive perception regarding service availability, cleanliness, and safety. For Leopoldpark, participants had positive perception about distance, cost, service availability, safety and cleanliness (refer Figure5-5 to Figure5-11in section5.2). For other mismatch situation AbPg (actual bad and perceived good), Hoeschpark was identified as used health opportunity regarding noise and Borsigplatz was identified as avoided health opportunity regarding NO_2. The match situation, AbPb (both actual and perceived bad) was found more for noise and four locations were avoided. namely, Borsigplatz, Mallinckrodtstrasse, Quadbeckstrasse and Dortmund Hauptbahnhof. Only one location, Quadbeckstrasse was identified under match situation, AbPb, regarding NO_2 These locations are along the roadways. Road traffic can perhaps be the reason for dissatisfaction for noise level. Another match situation AgPg (both actual and perceived good) was found for all three indicators.

5.9.2. Comparison of match or mismatch between actual and perceived environmental quality in Kreuzviertel

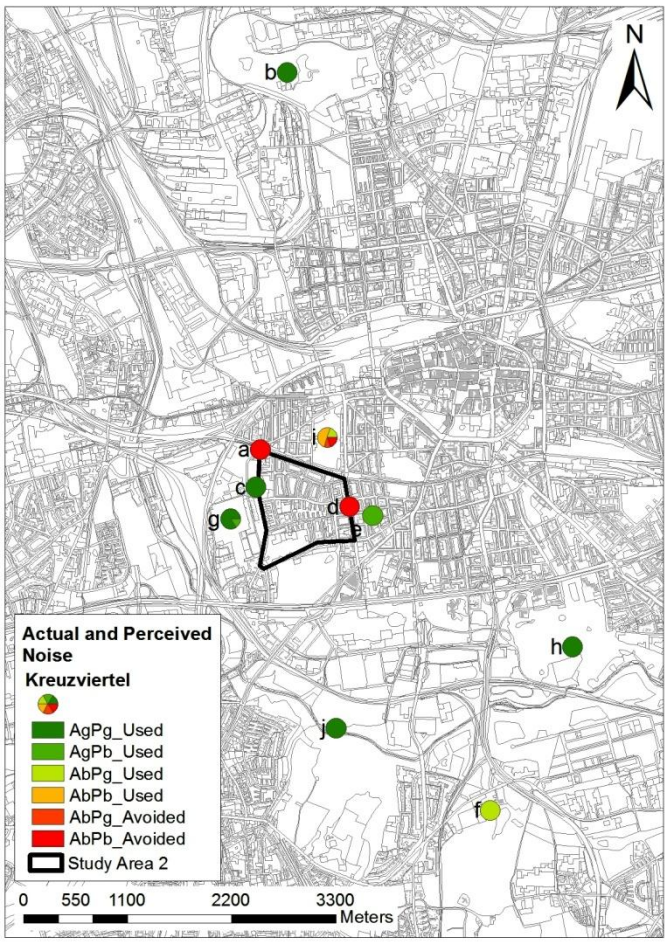
A 2x2 quadrant for noise is shown for locations pointed out as used health opportunities by respondents in Kreuzviertel in Table5-16. Table5-17(NO_2) and Table5-18(PM_{10}) show match and mismatch situation for actual and perceived air quality.

Table 5-16 A 2x2 quadrant showing actual and perceived noise level for identified health opportunities in Kreuzviertel

			Actual environmental quality			
			+		-	
			Noise≤55dB		**Noise>55dB**	
	+	slightly satisfying	**AgPg**		**AbPg**	
		satisfying	b(1)	U	f(1)	U
		very satisfying	c(1)	U	i(2)	U
			g(11)	U	i(1)	A
Perceived environmental quality			h(3)	U		
			j(2)	U		
	-	very dissatisfying	**AgPb**		**AbPb**	
		dissatisfying	e(1)	U	a (1)	A
		slightly dissatisfying	g(2)	U	d(2)	A
					i(5)	U
					i(2)	A

a Dortmund West, **b** Fredenbaumpark, **c** Lidl in Kuithanstrasse, **d** Lindemannstrasse, **e** Pilates Arts, **f** Rombergpark, **g** Tremoniapark, **h** Westfalenpark, **i** Westpark, **j** Bolmker Weg

Figure5-28 explains the information in Table5-16 spatially. The result shows five locations for match situation AgPg, two locations for both mismatch situation AgPb and match situation AbPg and three locations for match situation AbPb. More respondents reported about used health opportunities under quadrant AgPg. The locations marked with red points in the map represent mismatch situation AbPb. Among such locations, Dortmund West and Lindemannstrasse are locations along roads.



Perhaps, road traffic can be reason for dissatisfying noise. Respondents showed mixed perception for Westpark where actual noise level is bad. Some perceived satisfying noise level. Likewise, respondents also mentioned satisfying noise level in Rombergpark where actual noise level is more than threshold value.

Figure 5-28 Actual and Perceived Noise for the identified health opportunities by respondents in Kreuzviertel

(Note- AgPg= Actual good and perceived good, AgPb= Actual good and perceived bad, AbPg= Actual bad and perceived good, AbPb= Actual bad and perceived bad. '_Used' represents used health opportunities and '_Avoided' represents avoided health opportunities)

Table 5-17 A 2x2 quadrant showing actual and perceived air quality (NO_2 concentration) for identified health opportunities in Kreuzviertel

			Actual environmental quality			
			+		-	
			NO_2 ≤40 µg/m³		**NO_2 >40 µg/m³**	
	+	slightly good	**AgPg**		**AbPg**	
		good	a(1)	U	d(1)	U
		very good	c(2)	U		
			e(12)	U		
Perceived environmental quality			f(3)	U		
			g(4)	U		
			h(1)	U		
	-	very bad	**AgPb**		**AbPb**	
		bad	e(1)	U	b(1)	A
		slightly bad	g(2)	U		

a Lidl in Kuithanstrasse, **b** Lindemannstrasse, c Rombergpark, d Suedwestfriedhof, **e** Tremoniapark, **f** Westfalenpark, **g** Westpark, **h** Bolmker Weg

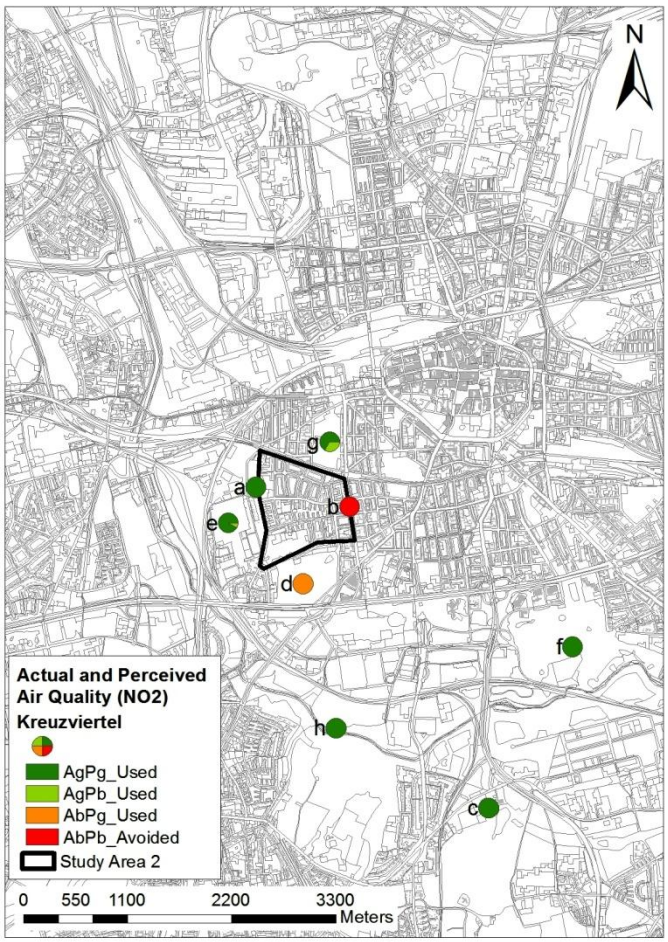


Figure5-29 shows information in Table5-17 spatially. The result shows six locations for match situation AgPg, two locations for mismatch situation AgPb and one location for both match situation AbPb and AbPg. More respondents reported about good air quality under quadrant AbPg. The map shows Lindemannstrasse, indicated by red circle as the only location for both actual and perceived air quality (NO_2) as bad. Suedwestfriedhof marked by orange circle in map was reported as used health opportunity for mismatch situation AbPg. Mixed perception can be seen in Tremoniapark and Westpark where actual air quality is good. Though some respondents perceived air quality as bad, they reported these locations as used health opportunities.

(Note- AgPg= Actual good and perceived good, AgPb= Actual good and perceived bad, AbPg= Actual bad and perceived good, AbPb= Actual bad and perceived bad. '_Used' represents used health opportunities and '_Avoided' represents avoided health opportunities)

Figure 5-29 Actual and perceived air quality (NO_2) for the identified health opportunities by respondents in Kreuzviertel

Table 5-18 A 2x2 quadrant showing actual and perceived air quality (PM_{10} concentration) for identified health opportunities in Kreuzviertel

			Actual environmental quality		
			+		-
			PM_{10} ≤40 µg/m³		**PM_{10} >40 µg/m³**
Perceived environmental quality	+	slightly good	**AgPg**		**AbPg**
		good	a(1)	U	
		very good	c(2)	U	
			d(1)	U	
			e(12)	U	
			f(3)	U	
			g(4)	U	
			h(1)	U	
	-	very bad	**AgPb**		**AbPb**
		bad	b(1)	A	
		slightly bad	e(1)	U	
			g(2)	U	

a Lidl in Kuithanstrasse, **b** Lindemannstrasse, **c** Rombergpark, **d** Suedwestfriedhof, **e** Tremoniapark, **f** Westfalenpark, **g** Westpark, **h** Bolmker Weg

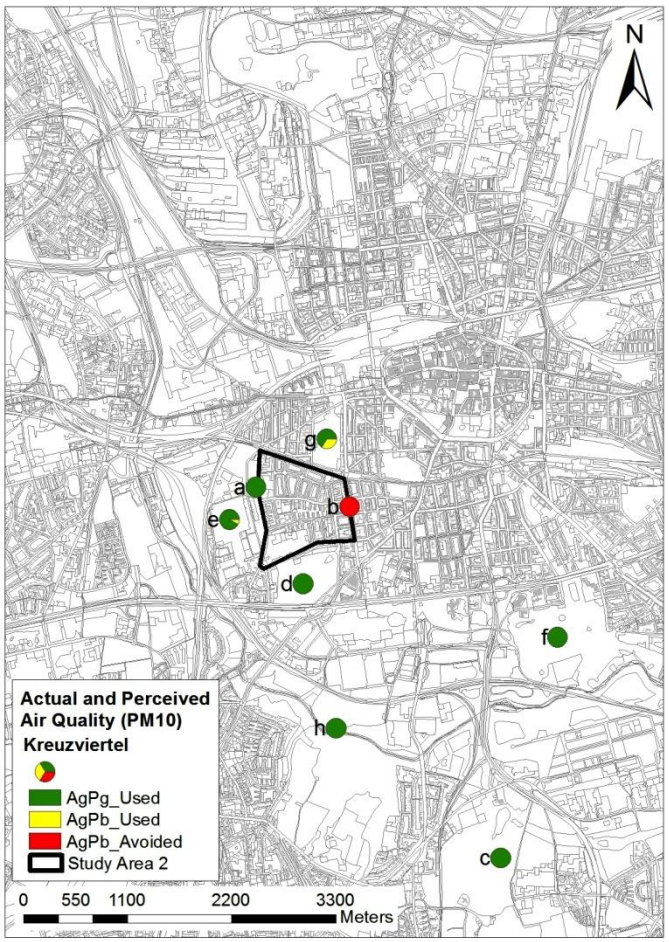


Figure5-30 shows information in Table5-18. The result shows seven locations for match situation AgPg and three locations for mismatch situation AgPb. More respondents reported about used health opportunities under quadrant AgPg. Some respondents perceived bad air quality in Tremoniapark and Westpark despite of good actual value. For Westpark, most of the respondents perceived good air quality and reported as used health opportunity.

Figure 5-30 Actual and perceived air quality (PM_{10}) for the identified health opportunities by respondents in Kreuzviertel

(Note- AgPg= Actual good and perceived good, AgPb= Actual good and perceived bad. '_Used' represents used health opportunities and '_Avoided' represents avoided health opportunities)

Summarising the result from above analysis, mismatch situation AgPb (actual good but perceived bad) was found regarding noise, NO_2 and PM_{10} whereas other mismatch situation AbPg (actual bad but perceived good) was not found regarding PM_{10}. Match situation AgPg was found for all three indicators of environmental quality whereas other match situation AbPb was not found for PM_{10}. More mismatch was found under quadrant AbPg regarding noise for which Rombergpark and Westpark were identified as used health opportunities. Westpark was also reported as avoided health opportunity. Regarding noise, for situation AgPb, location where Pilates Arts was situated and also Tremonipark were reported as used health opportunities.

Regarding NO2, Suedwestfriedhof was found as used by respondents under mismatch situation AbPg. Mismatch situation AgPb regarding PM10 was found in Tremoniapark and Westpark which were mentioned as used health opportunities while Lindemannstrasse was mentioned as avoided health opportunity under this situation. Regarding NO_2, Tremoniapark and Westpark were again mentioned as used health opportunities for mismatch situation AgPb.

Lindemannstrasse was the only location reported as avoided for AbPb situation regarding NO_2. Three locations (Dortmund West, Lindemannstrasse and Westpark) were found as avoided for AbPb situation regarding noise. Westpark was also mentioned as used health opportunity under this situation for noise.

Respondents seemed to have mixed perception of noise and air quality for Westpark though the actual value for both noise and air quality is good. Similarly, for Tremoniapark, mixed perception of noise was seen. Perhaps, positive perception about other neighbourhood characteristics can be considered as reason for using locations despite of bad perception about environmental quality.

Conclusion

In both areas, there was a match situation AbPb which need urgent attention. In Nordstadt and Kreuzviertel, four and three locations were reported respectively under this situation regarding noise and one location was reported in both areas. This shows that locations in Nordstadt were more unsuitable to be used as health opportunity because of high noise level. Nordstadt and Kreuzviertel had mismatch situation AgPb in five and two locations respectively regarding noise, four and two locations respectively regarding NO_2 and five and three locations respectively regarding PM_{10}. This shows that more locations in Nordstadt were reported with negative perception of noise and air quality despite of good measured environmental quality in comparison to Kreuzviertel. In Nordstadt, some locations were avoided despite of good environmental quality. For the mismatch situation AbPg, in Nordstadt and Kreuzviertel, one and two locations were reported respectively regarding noise and one location was reported in both areas regarding NO_2. These locations were reported as used health opportunity. This shows that more locations in Kreuzviertel were reported with satisfaction with noise level while the actual value is bad.

It has been mentioned in other research that people residing in higher income areas perceive their neighbourhood positively and they have capacity and possibilities to influence the decision-making regarding their neighbourhood (Kruize, 2007). Perhaps, this can be one of the reasons for less locations with mismatch situation AgPb reported by respondents in Kreuzviertel than in Nordstadt.

This study did not deal with finding reasons behind satisfaction or dissatisfaction regarding neighbourhood characteristics. The reasons behind using locations with mismatch situation AbPg can be given based on positive perception of other neighbourhood characteristics. The reason can be that people are satisfied with some other neighbourhood characteristics despite of bad environmental quality. For instance, for city centre, participants had positive perception regarding service availability, cleanliness, and safety. For Leopoldpark, participants had positive perception about distance, cost, service availability, safety and cleanliness (refer Figure5-5 to Figure5-11 in section5.2). For Suedwestfriedhof (cemetery), respondent had positive perception about safety and closeness to home (refer Figure5-16 to Figure5-22 in section5.5). There can be other reasons which made people avoid some locations in addition to perceived bad environmental quality. Such as Muensterstrasse was avoided because respondents perceived it as unsafe. nordmarkt was also perceived as being unsafe in addition to unavailability of services as required by respondents. Quadbeckstrasse was avoided as respondents reported location to be unsafe.

5.10. Relevance of comparison of match or mismatch between actual and perceived environmental quality for planning

The comparative study of actual and perceived environmental quality helped in identifying the locations in both areas where the match and mismatch existed. The result showed that deprived area had more locations with match situation, AbPb regarding noise in comparison to affluent area. Likewise, more locations were identified with mismatch situation, AgPb regarding all three indicators of environmental quality in Nordstadt. However, for mismatch situation AbPg regarding noise, more locations were identified in Kreuzviertel. The study also indicated that more locations identified as health opportunities were avoided by respondents from Nordstadt because of bad perception of environmental quality. It was also found that respondents from Nordstadt were dissatisfied with the environmental quality of the locations inside their neighbourhood and they avoided health opportunities in such locations.

This information can be helpful for planners and policy makers for designing development programs. This comparative study can make planners aware about how people take their local environmental situation. The information about different situations in different locations can be known and accordingly, necessary actions can be taken. This information shows the need for improvement of environment of neighbourhood as it is acting as a barrier for using health opportunities. This is preventing people from

getting benefits from the health opportunities. The result shows that Nordstadt need more attention. To find out more detailed explanations for differences between actual and perceived environmental situation, more in-depth research is needed. This result shows that upon acknowledging the opinion of people can reveal the real situation of their neighbourhood. Undoubtedly, this can help in better decision-making process.

6. CONCLUSION AND RECOMMENDATION

This chapter presents the discussion of the results obtained by addressing sub objectives of this study. Main findings related to each research questions are explained in this section For this purpose, sub objectives and related research questions are stated followed with findings. The chapter ends with limitations and possible recommendations.

6.1. Conclusion

Sub objective 1: To identify the health-related local resources in deprived and affluent neighbourhoods.

1. *How to get people's perception on health-related resources?*

Section 2.4 presents the different methods that had been applied in researches to capture perception of neighbourhood. Chapter 4 describes the method adopted in this research which is directly asking people about their opinions on health-related resources. The interpretation of result had been done based on the response collected using Likert scale.

2. *What are different types of health-related resources that are used by people residing in deprived neighbourhood?*
3. *What are different types of health-related resources that are avoided by people residing in deprived neighbourhood?*

Research questions 2 and 3 address the health opportunities identified in Nordstadt. As mentioned in section5.1, respondents from Nordstadt mentioned parks, supermarkets, cafes, restaurants, fitness centres, open square, footpaths being used for health related activities. Table5-2 and Figure5-1 represent the used health opportunities pointed out by respondents. The health-related resources that are avoided include open market area, open public space, footpaths, open square, city centre, bus station and parks. Table5-3 and Figure5-2 show the avoided health opportunities mapped by respondents. Further, the used health opportunities had been categorised based on literatures as mention in section2.1. Under section5.1.1, in Table5-4 and Figure5-3, this categorisation had been clearly shown. In Nordstadt, used health opportunities were concentrated towards the north side. Respondents use resources for social relationships and food comparatively close to their neighbourhood than those for physical activities.

4. *What are different types of health-related resources that are used by people residing in affluent neighbourhood?*
5. *What are different types of health-related resources that are avoided by people residing in affluent neighbourhood?*

Regarding research questions 4 and 5, section 5.4 had described about health opportunities identified in Kreuzviertel. Respondents from Kreuzviertel pointed parks, supermarkets, fitness centres, walking routes, cemetery, restaurant, footpaths along the roadways, open square, train and bus station. Table5-6 lists out different locations mentioned for different health related activities and Figure5-12 shows such locations spatially. The locations that are avoided include park, main station in city centre, footpaths along the roadways and bus stations. Table5-7 and Figure5-13 show the avoided health opportunities mapped by respondents from Kreuzviertel. The categorisation of used health opportunities based on literatures are shown in Table5-8 and Figure5-14 under section5.4.1. In Kreuzviertel, most of the health opportunities

were situated outside the neighbourhood. Resources related to food and social relationships were close to neighbourhood.

In both the study areas, respondents have mentioned about parks, public open spaces and neighbourhood streets for different activities. Studies have shown that people use outdoor and freely available facilities most frequently for physical activity than gyms, exercise centres and health clubs (C. Lee & Moudon, 2004; Giles-Corti & Donovan, 2002). If the comparison is made between the results of two different areas, it can be said that most of the respondents from Nordstadt and Kreuzviertel pointed parks as the used health opportunities especially for physical activity and social relationship. This result is no different from the findings of research (Chappell & Funk, 2004) that mentions use of green areas such as parks for socialization and physical activities. Social connection seems to be more important for respondents in Nordstadt as they have mentioned use of different locations where they could perform health related activities in combination with meeting friends. They had pointed out parks, market areas, food shops, restaurants and fitness centres where they meet friends apart from other activities. It is mentioned somewhere (Maas et al., 2009) that for people with low income and low education, like in Nordstadt, social contacts are important and for this they use green space in their living environment. Most of the respondents avoided footpaths or routes. Regarding the street ways or footpaths and the route, qualities like perceived safety, convenience, visual quality of the roadway and roadside environments, street-crossing conditions can play role that influence one's decision to use or not to use that route for different activities like walking (C. Lee & Moudon, 2004). The use or avoidance of community resource is influenced by its quality also.

When comparing spatial distribution of mapped locations, respondents from Nordstadt mentioned resources which were within their neighbourhood and nearby locations. as health opportunities. But in case of Kreuzviertel, respondents pointed out locations distant from their place of stay as health opportunities. This can be supported by research (Cohen et al., 2003) which mentions local neighbourhood resources are more important for low socioeconomic people than high socioeconomic people as rich people have ability to travel to distant places for beneficial health.

In Nordstadt and Kreuzviertel, female, more educated and unemployed reported use of parks. The difference in two areas is that in Nordstadt migrants and younger respondents mentioned use of parks whereas in Kreuzviertel, non-migrants and older respondents mentioned use of parks. Use of parks by female regardless of age for social contacts can be supported by research that mentions that women of all ages tend to participate in social contacts and for this they prefer green areas (Coley et al., 1997).

Sub objective 2: To identify the perception of people on neighbourhood characteristics for used and avoided health-related resources in two neighbourhoods.

6. *Which neighbourhood characteristics (social, environmental) are perceived for used health-related resources by people residing in deprived neighbourhood?*
7. *Which neighbourhood characteristics (social, environmental) are perceived for avoided health-related resources by people residing in deprived neighbourhood?*

Answers to research questions 6 and 7 had been discussed in sections 5.2 and 5.3. People in Nordstadt were found to use different locations because they found those places near to their home, clean and safe. People reported feeling of unsafe and noise as barrier which they considered as reasons to avoid some locations. Figure5-4 in section 5.2 gives the overview of respondents' perception for used and avoided health opportunities in Nordstadt. The maps (Figure5-5 to Figure5-11) in section 5.2 indicate that

respondents avoided health opportunities inside their neighbourhood because of negative perception of neighbourhood characteristics (cleanliness, safety, air quality and noise). This result calls for further study to find reasons behind positive and negative perception so that neighbourhood characteristics can be improved and people can benefit by using the resources in their neighbourhood.
Section 5.3 had discussed about perception of neighbourhood characteristics based on personal characteristics. Table6-1 below shows neighbourhood characteristics that participants mentioned most for using and avoiding health opportunities with personal characteristics that were found to perceive these most mentioned neighbourhood characteristics.

Table 6-1 Personal characteristics based perception of neighbourhood characteristics in used and avoided health opportunities in Nordstadt

Used Health Opportunities in Nordstadt		Avoided Health Opportunities in Nordstadt	
Distance to place	Cleanliness in place	Safety in place	Noise in place
Male	Male and female	Female	Male
Young age with migration background	Old age with migration background	Young Age without migration background	Young age with migration background
low and more educated	low educated	low educated	more educated
employed	employed	unemployed	unemployed

The results from Nordstadt show that women are more concerned about safety while men are more concerned about noise level in a place. It has been mentioned in research somewhere (Carp & Carp, 1982) that men are less satisfied with noise and women are less positive about safety. Also, women participate more frequently for social contacts (Walker & Hiller, 2007). People residing in Nordstadt were found to use parks for their health comparatively more than other resources. It was also found that safety has been the main concern in Nordstadt for using local resources for health. People were also found to avoid some locations due to bad air quality and noise. The footpaths along the streets were mentioned as being avoided because of feeling of unsafe and also because of noise.

8. *Which neighbourhood characteristics (social, environmental) are perceived for used health-related resources by people residing in affluent neighbourhood?*
9. *Which neighbourhood characteristics (social, environmental) are perceived for avoided health-related resources by people residing in affluent neighbourhood?*

Section 5.5 and section 5.6 shows the discussions related to research questions 8 and 9. In Kreuzviertel, respondents perceived cleanliness in place and closeness to the resource from their place of stay as the main reasons for using health opportunities. On the other hand, social characteristics such as safety and environmental characteristics noise were perceived negatively and were reported as the main reasons for avoiding health opportunities. The maps (Figure5-16 to Figure5-22) in section 5.5 indicate that respondents avoided health opportunities because of their concern for safety, cleanliness, air quality and noise. Respondents mentioned greenery in parks to be very satisfying and reported green areas as very good place to relax.
Section 5.6 had discussed about perception of neighbourhood characteristics based on personal characteristics. Table6-2 below shows neighbourhood characteristics that participants mentioned most for using and avoiding health opportunities with personal characteristics that were found to perceive these most mentioned neighbourhood characteristics.

Table 6-2 Personal characteristics based perception of neighbourhood characteristics in used and avoided health opportunities in Kreuzviertel

Used Health Opportunities in Kreuzviertel		Avoided Health Opportunities in Kreuzviertel	
Distance to place	Cleanliness in place	Safety in place	Noise in place
Male	Male	Female	Male
Young age	Old age	Young Age	Young age
with migration background	with migration background	without migration background	without migration background
low and more educated	low educated	low and more educated	low and more educated
employed	unemployed	employed	unemployed

Comparison of the results from two areas, Nordstadt and Kreuzviertel had been discussed in section 5.7. Neighbourhood characteristics- distance and cleanliness were important for using health opportunities for the participants from both areas. However, respondents from Nordstadt perceived distance and cleanliness more than those from Kreuzviertel. Participants from Kreuzviertel perceived environmental characteristics-noise more while participants from Nordstadt gave importance to safety more than environmental quality.

Due to the difference in personal characteristics, the variation in perception can be explained. From Table6-1 and Table6-2, gender-based perception shows that women perceived social characteristics (safety) and men perceived environmental quality (noise) in both deprived and affluent areas. Age-based perception shows younger respondents were concerned with safety and noise in both areas. Respondents without migration background perceived safety in both areas whereas for noise, those with migration background were sensitive in deprived area (Nordstadt) and non-migrants were found sensitive to noise in affluent area (Kreuzviertel). Low educated participants reported safety and more educated were concerned about noise level in Nordstadt. In Kreuzviertel respondents regardless of education level, mentioned safety and noise as important neighbourhood characteristics. Unemployed respondents from both areas perceived noise. Employed people reported about safety in Kreuzviertel but unemployed were concerned in Nordstadt. Men, younger respondents, employed, migrants, regardless of education level perceived distance for using health opportunities in both areas. Older, migrants, low educated, employed, both men and women in Nordstadt perceived cleanliness. In Kreuzviertel, older, migrants, low educated, unemployed and men perceived cleanliness for using health opportunities.

Sub objective 3: To check the match or mismatch between the objective and subjective neighbourhood characteristics of the locations of health-related resources.

10. *Does the objectively measured situation or actual environmental quality show the health-related resource to be health-promoting?*

Section 5.8 shows the results for research question 10 in Table5-9 to Table5-12. Some of the locations identified as used health opportunities showed noise level exceeding the standard threshold value in both areas. Comparatively, more locations had exceeding values for noise than NO_2 while PM_{10} value was within threshold value in both areas. One location (Mallinckrodtstrasse) inside Nordstadt was found with noise level exceeding threshold value. In both areas, the avoided health opportunities had high noise level

and some of the locations had NO_2 value more than threshold value. The locations that had high noise level were located along the streets.

11. To what extent the actual and perceived environmental quality of health-related resources match?

For Nordstadt, section 5.9.1 explains the match and mismatch between actual and perceived environmental quality in Table5-13 to Table5-15 and Figure5-25 to Figure5-27. For Kreuzviertel, section 5.9.2 explains the result in Table 5-16 to Table 5-18 and Figure 5-28 to Figure 5-30. The result showed that deprived area had more locations with match situation, AbPb regarding noise in comparison to affluent area. Likewise, more locations were identified with mismatch situation, AgPb regarding all three indicators of environmental quality in Nordstadt. However, for mismatch situation AbPg regarding noise, more locations were identified in Kreuzviertel. The study also indicated that more locations identified as health opportunities were avoided by respondents from Nordstadt because of bad perception of environmental quality. It was also found that respondents from Nordstadt were dissatisfied with the environmental quality of the locations inside their neighbourhood and they avoided health opportunities in such locations.

In the quadrant with AgPb (actual good and perceived bad) environmental quality, more avoided locations mean such locations need more attention and call for further in-depth analysis for such differences. In the quadrant AbPg (actual bad and perceived good) environmental quality, more used locations mean people are adapting the conditions that are not actually acceptable. There may be many reasons for such situations. For instance, in this research the perception of distance, cost, service availability, safety were also mentioned. Perhaps, those who are adapting to the actual bad environmental quality, any of these factors could be more important than environmental quality. These perceptions can be visualised for different locations mapped by participants from Nordstadt and Kreuzviertel in Figure5-5 to Figure5-11 and Figure5-16 to Figure5-22 respectively. Other further reasons can be find out by in-depth interview with respondents.

Concluding Remarks

The main findings from this research can be summarised comparatively for two areas; Nordstadt and Kreuzviertel. There were similarities and differences in the results. Participants from both areas mentioned social relationship mostly as health-related activity. Walking as physical activity was reported most after meeting friends. Parks came out to be the location mostly used as health opportunities for different health related activities by respondents from both areas. Use of parks was associated with safety more than with air quality and noise level for respondents from Nordstadt. On the contrary, for participants from Kreuzviertel, use of parks was more associated with environmental qualities (air quality and noise) than with safety.

Regarding used health opportunities, respondents from both areas perceived predominantly distance to location and cleanliness. Safety came out to be matter of concern for using health opportunities after distance and cleanliness. Environment qualities were reported comparatively less in Nordstadt. In both areas, avoided health opportunities were mostly footpaths along the roadways. More respondents mentioned unsafety than noise for avoiding health opportunities in Nordstadt whereas, in Kreuzviertel safety concerns and noise was equally reported as the reason for avoiding health opportunities. Perception of neighbourhood characteristics varied for different personal characteristics. Female, young age, and non-migrant respondents from both areas reported feeling of unsafe and avoided locations. In Nordstadt, low educated and unemployed respondents were found to avoid locations because of safety issues whereas in Kreuzviertel employed respondents and regardless of education level avoided locations because of feeling of unsafe. Noise was perceived by male, young age, and unemployed respondents in both areas. In

Nordstadt, more educated and respondents with migration background were concerned more about noise level while in Kreuzviertel, respondents without migration background and both low and high educated participants were sensitive to noise.
In Nordstadt, resources within the neighbourhood and nearby locations were mentioned as used health opportunity which indicates importance of local neighbourhood resources for respondents of deprived area. However, the respondents had negative perception on neighbourhood characteristics for the locations within Nordstadt. Also, actual environmental data (noise) was more than threshold value for one of such locations. Further analysis of actual and perceived environmental qualities showed more locations in Nordstadt had mismatch between actual and perceived environmental quality in comparison to Kreuzviertel. More health opportunities were avoided in Nordstadt in spite of actual good environment qualities.

This research has given an understanding of resources that people are using and avoiding. The use of parks has shown importance of green areas. The study has also put forward negative and positive perception of neighbourhood characteristics associated with different locations. Such information can be taken as useful insights as planners and decision-makers can further plan development programs based on peoples' need. The research provides an opportunity to formulate policies that address main problems acting as barriers to get benefits from health opportunities.

The map in section shows that green areas are fewer within Nordstadt in comparison to Kreuzviertel. Also, green areas are available in the immediate surroundings in Kreuzviertel.

6.2. Recommendations

This section presents the limitations and recommendations for future research.

It has to be kept in mind that the answers gathered from two different areas were not representative for those areas. The conclusions drawn are based on a limited respondents from two areas. Future studies should use a sample that can be representative. A questionnaire survey was conducted during the working days of the week. So, response could not be collected from the employed members of the study areas. Therefore, timing of data collection is also important consideration for future research. Researcher's unfamiliarity with study areas and language barrier were challenges during fieldwork. This created methodological limitation. The studies related to neighbourhood perception had been conducted through focus group discussion, walking interviews to get primary data. But in the present research only closed questionnaire survey had to be conducted with the help of local surveyors which limited the information from people. Because of time and cost constraint, sample size had to be limited.
The present research has implications for neighbourhood improvement for better health of its residents. The findings make aware about different locations that people consider as good and bad for their health. Most importantly, the results suggest a need for attention to improve social and environmental quality. As safety was major issue pointed out by most of the respondents in both study areas, further research can be conducted to address perceptions of neighbourhood safety. In Nordstadt, some respondents mentioned about feeling unsafe in some locations because of traffic, lack of street lights, street crimes(because of drunk people). Also, some respondents from Kreuzviertel reported about unsafe in the evening than in the daytime. For the present issues of safety, recommendations can be given as mentioned in studies that have shown that design features are associated with improving safety such as walkways, safe footpaths, street lighting and measures to control traffic and these measures are associated with physical activity which have influence in health of people. Such measures might enhance people's perception of safety. Study on safety can be based on crime data combined with perception of people. If root causes for feeling unsafe are distinguished at different locations, appropriate safety measures can be undertaken. In short,

urban planning should consider safety. The analysis of actual and perceived environmental quality showed variations in different locations. The locations representing environmental quality as actual good and perceived bad (AgPb) and actual bad and perceived good (AbPg) requires special attention. In this research, dissatisfaction with environmental quality can be associated with traffic and rail as most of the locations where people expressed their dissatisfaction were near to the roads and railway tracks. However, the reasons behind mismatch situations need to be further examined for necessary measures to overcome such situations. For further research, qualitative process can be adopted to have fuller understanding of perception of people which may reveal varieties of reasons other than the ones used in this research for positive and negative perception of neighbourhood. In addition, solutions can be sought out from people such as by asking for their opinions for improvement in their neighbourhood to make it healthy place.

Further research can be done to understand distribution of environmental characteristics such as air pollution, noise, location of industrial facilities, provision of green space, etc which will help in knowing if the distribution is equally beneficial to socially advantaged and disadvantage neighbourhoods. The result of this research has opened doorways for further researches regarding neighbourhood study.

LIST OF REFERENCES

Aneshensel, C. S., & Sucoff, C. A. (1996). The Neighborhood Context of Adolescent Mental Health. *Journal of Health and Social Behavior*, *37*(4), 293–310. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0030339447&partnerID=tZOtx3y1

Babbie, E. (2004). *The Practice of Social Research* (10th ed.). Belmont, USA: Thomson learning, Inc.

Balfour, J. L. (2002). Neighborhood Environment and Loss of Physical Function in Older Adults: Evidence from the Alameda County Study. *American Journal of Epidemiology*, *155*(6), 507–515. doi:10.1093/aje/155.6.507

Barton, H., & Grant, M. (2013). Urban planning for healthy cities. A review of the progress of the European Healthy Cities Programme. *Journal of Urban Health : Bulletin of the New York Academy of Medicine*, *90 Suppl 1*(1), 129–41. doi:10.1007/s11524-011-9649-3

Baum, F. (2002). "Opportunity structures": urban landscape, social capital and health promotion in Australia. *Health Promotion International*, *17*(4), 351–361. doi:10.1093/heapro/17.4.351

Bengoechea, E., Spence, J. C., & McGannon, K. R. (2005). Gender differences in perceived environmental correlates of physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, *2*(1), 12. doi:10.1186/1479-5868-2-12

Booth, M. L., Bauman, A., Owen, N., & Gore, C. J. (1997). Physical activity preferences, preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Preventive Medicine*, *26*(1), 131–7. doi:10.1006/pmed.1996.9982

Braveman, P. (2003). Defining equity in health. *Journal of Epidemiology & Community Health*, *57*(4), 254–258. doi:10.1136/jech.57.4.254

Briggs, D. J. (2003). *Making a Difference: Indicators to Improve Children's Environmental Health*. Geneva.

Brown, G., Schebella, M. F., & Weber, D. (2014). Using participatory GIS to measure physical activity and urban park benefits. *Landscape and Urban Planning*, *121*, 34–44. doi:10.1016/j.landurbplan.2013.09.006

Carp, F. M., & Carp, A. (1982). Perceived environmental quality of neighborhoods: Development of assessment scales and their relation to age and gender. *Journal of Environmental Psychology*, *2*(4), 295–312. doi:10.1016/S0272-4944(82)80029-7

Ceccato, V., & Hansson, M. (2013). Experiences from Assessing Safety in Vingis Park, Vilnius, Lithuania. *Review of European Studies*, *5*(5), 1. doi:10.5539/res.v5n5p1

Chappell, N., & Funk, L. (2004). Lay perceptions of neighbourhood health. *Health and Social Care in the Community*, *12*(3), 243–253. doi:10.1111/j.1365-2524.2004.00493.x

Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, *68*(1), 129–138. doi:10.1016/j.landurbplan.2003.08.003

City History - Home. (n.d.). Retrieved August 23, 2015, from http://www.dortmund.de/de/leben_in_dortmund/stadtportraet/stadtgeschichte/startseite_stg/index.html

Cohen, D. A., Mason, K., Bedimo, A., Scribner, R., Basolo, V., & Farley, T. A. (2003). Neighborhood Physical Conditions and Health. *American Journal of Public Health*, *93*(3), 467–471. doi:10.2105/AJPH.93.3.467

Coley, R. L., Sullivan, W. C., & Kuo, F. E. (1997). Where Does Community Grow?: The Social Context Created by Nature in Urban Public Housing. *Environment and Behavior*, *29*(4), 468–494. doi:10.1177/001391659702900402

Corbett, J. (2009). *Good practices in participatory mapping*. *IFAD*. Rome.

EEA. (2014). *Noise in Europe 2014*. Denmark. doi:10.2800/763331

EEA. (2015). *Air quality in Europe-2015 report*. Denmark. doi:10.2800/62459

Ellaway, A., Macintyre, S., & Kearns, A. (2001a). Perceptions of place and health in socially contrasting neighbourhoods. *Urban Studies*, *38*(12), 2299–2316. doi:10.1080/00420980120087171

Ellaway, A., Macintyre, S., & Kearns, A. (2001b). Perceptions of Place and Health in Socially Contrasting Neighbourhoods. *Urban Studies*, *38*(12), 2299–2316. doi:10.1080/00420980120087171

Estabrooks, P. A., Lee, R. E., & Gyurcsik, N. C. (2003). Resources for physical activity participation: Does availability and accessibility differ by neighborhood socioeconomic status? *Annals of Behavioral Medicine*, *25*(2), 100–104. doi:10.1207/S15324796ABM2502_05

Evenson, K. R., Birnbaum, A. S., Bedimo-Rung, A. L., Sallis, J. F., Voorhees, C. C., Ring, K., & Elder, J. P. (2006). Girls' perception of physical environmental factors and transportation: reliability and

association with physical activity and active transport to school. *The International Journal of Behavioral Nutrition and Physical Activity*, *3*(1), 28. doi:10.1186/1479-5868-3-28

Flacke, J., & Kockler, H. (2015). Spatial urban health equity indicators- a framework-based approach supporting spatial decision making. In O. Ozcevik, C. A. Brebbia, & S. M. Sener (Eds.), *Sustainable Development and Planning VII* (pp. 365–376). WIT Press.

Giles-Corti, B., Broomhall, M. H., Knuiman, M., Collins, C., Douglas, K., Ng, K., … Donovan, R. J. (2005). Increasing walking: how important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine*, *28*(2 Suppl 2), 169–76. doi:10.1016/j.amepre.2004.10.018

Giles-Corti, B., & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social Science & Medicine*, *54*(12), 1793–1812. doi:10.1016/S0277-9536(01)00150-2

Hannscott, L. (2015). Individual and contextual socioeconomic status and community satisfaction. *Urban Studies*. doi:10.1177/0042098015574811

Hilborn, J. (2009). *Dealing with crime and disorder in urban parks*. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.422.32&rep=rep1&type=pdf

Hipp, J. (2010). What is the "Neighbourhood" in Neighbourhood Satisfaction? Comparing the Effects of Structural Characteristics Measured at the Micro-neighbourhood and Tract Levels. *Urban Studies*, *47*(12), 2517–2536. doi:10.1177/0042098009359950

Honold, J., Beyer, R., Lakes, T., & van der Meer, E. (2012). Multiple environmental burdens and neighborhood-related health of city residents. *Journal of Environmental Psychology*, *32*(4), 305–317. doi:10.1016/j.jenvp.2012.05.002

Jorgensen, L. J., Ellis, G. D., & Ruddell, E. (2012). Fear Perceptions in Public Parks: Interactions of Environmental Concealment, the Presence of People Recreating, and Gender. *Environment and Behavior*, *45*(7), 803–820. doi:10.1177/0013916512446334

Kawakami, N., Winkleby, M., Skog, L., Szulkin, R., & Sundquist, K. (2011). Differences in neighborhood accessibility to health-related resources: a nationwide comparison between deprived and affluent neighborhoods in Sweden. *Health & Place*, *17*(1), 132–9. doi:10.1016/j.healthplace.2010.09.005

Kirwan Institute for the study of Race and Ethnicity. (n.d.). OPPORTUNITY MAPPING INITIATIVE AND PROJECT LISTING. Retrieved August 12, 2015, from http://kirwaninstitute.osu.edu/initiatives/opportunity-communities/mapping/

Knutsson, J. (1997). Restoring public order in a city park. *Policing for Prevention: Reducing Crime, Public* …. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.375.7314&rep=rep1&type=pdf

Kruize, H. (2007). *On ennvironmental equity: Exploring the distribution of environmental quality among socio-economic categories in the Netherlands*. Copernicus Institute for Sustainable Development and Innovation.

Kweon, B.-S., Sullivan, W. C., & Wiley, A. R. (1998). Green Common Spaces and the Social Integration of Inner-City Older Adults. *Environment and Behavior*, *30*(6), 832–858. doi:10.1177/001391659803000605

Lee, C., & Moudon, A. (2004). Physical activity and environment research in the health field: implications for urban and transportation planning practice and research. *Journal of Planning Literature*. Retrieved from http://jpl.sagepub.com/content/19/2/147.short

Lee, Y.-J. (2008). Subjective quality of life measurement in Taipei. *Building and Environment*, *43*(7), 1205–1215. doi:10.1016/j.buildenv.2006.11.023

Links - History - Town portrait - life in Dortmund - city portal dortmund.de. (n.d.). Retrieved August 23, 2015, from http://www.dortmund.de/de/leben_in_dortmund/stadtportraet/stadtgeschichte/links_stadtgeschichte/index.html

Lu, M. (1999). Determinants of Residential Satisfaction: ordered logit vs. Regression Models. *Growth and Change*, *30*, 264–287. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/0017-4815.00113/pdf

Maas, J., van Dillen, S. M. E., Verheij, R. A., & Groenewegen, P. P. (2009). Social contacts as a possible mechanism behind the relation between green space and health. *Health & Place*, *15*(2), 586–95. doi:10.1016/j.healthplace.2008.09.006

Macintyre, S., & Ellaway, A. (1998). Short reportSocial and local variations in the use of urban neighbourhoods: a case study in Glasgow. *Health & Place*, *4*(1), 91–94. doi:10.1016/S1353-8292(97)00030-0

Macintyre, S., Ellaway, A., & Cummins, S. (2002). Place effects on health: how can we conceptualise, operationalise and measure them? *Social Science & Medicine*, *55*(1), 125–139. doi:10.1016/S0277-9536(01)00214-3

Michalos, A. C. (Ed.). (2014). *Encyclopedia of Quality of Life and Well-Being Research*. Dordrecht: Springer Netherlands. doi:10.1007/978-94-007-0753-5

Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *Lancet*, *372*(9650), 1655–60. doi:10.1016/S0140-6736(08)61689-X

Molinari, C., Ahern, M., & Hendryx, M. (1998). The relationship of community quality to the health of women and men. *Social Science & Medicine*, *47*(8), 1113–1120. doi:10.1016/S0277-9536(98)00114-2

Morland, K., Wing, S., Diez Roux, A., & Poole, C. (2002). Neighborhood characteristics associated with the location of food stores and food service places. *American Journal of Preventive Medicine*, *22*(1), 23–29. doi:10.1016/S0749-3797(01)00403-2

Moser, C. A., & Stuart, A. (1953). An Experimental Study of Quota Sampling. *Journal of the Royal Statistical Society. Series A (General)*, *116*(4), 349. doi:10.2307/2343021

Muhajarine, N., Labonte, R., Williams, A., & Randall, J. (2007). Person, Perception, and Place: What Matters to Health and Quality of Life. *Social Indicators Research*, *85*(1), 53–80. doi:10.1007/s11205-007-9124-4

Oppenheim, A. N. (1992). *Questionnaire Design, Interviewing and Attitude Measurment*. Pinter Publishers Ltd.

Painter, K. (1996). The influence of street lighting improvements on crime, fear and pedestrian street use, after dark. *Landscape and Urban Planning*, *35*(2-3), 193–201. doi:10.1016/0169-2046(96)00311-8

Parkes, A., Kearns, A., & Atkinson, R. (2002). What Makes People Dissatisfied with their Neighbourhoods? *Urban Studies*, *39*(13), 2413–2438. doi:10.1080/0042098022000027031

Pearce, J., Day, P., & Witten, K. (2008). Neighbourhood Provision of Food and Alcohol Retailing and Social Deprivation in Urban New Zealand. *Urban Policy and Research*, *26*(2), 213–227. doi:10.1080/08111140701697610

Pearce, J., Witten, K., Hiscock, R., & Blakely, T. (2007). Are socially disadvantaged neighbourhoods deprived of health-related community resources? *International Journal of Epidemiology*, *36*(2), 348–55. doi:10.1093/ije/dyl267

Pepall, E., Earnest, J., & James, R. (2007). Understanding community perceptions of health and social needs in a rural Balinese village: Results of a rapid participatory appraisal. *Health Promotion International*, *22*(1), 44–52. doi:10.1093/heapro/dal042

Perlstadt, H. (2014). *Community Intervention*. (J. M. Fritz & J. Rhéaume, Eds.). New York, NY: Springer New York. doi:10.1007/978-1-4939-0998-8

Rambaldi, G., Kyem, P. A. K., McCall, M., & Weiner, D. (2006, June 5). Participatory Spatial Information Management and Communication in Developing Countries. *The Electronic Journal of Information Systems in Developing Countries*. Retrieved from http://ejisdc.org/Ojs2/index.php/ejisdc/article/view/237

Roosa, M. W., White, R. M. B., Zeiders, K. H., & Tein, J.-Y. (2009). An Examination of the Role of Perceptions in Neighborhood Research. *Journal of Community Psychology*, *37*(3), 327–341. doi:10.1002/jcop.20298

Santo, C. A., Ferguson, N., & Trippel, A. (2010). Engaging Urban Youth through Technology: The Youth Neighborhood Mapping Initiative. *Journal of Planning Education and Research*, *30*(1), 52–65. doi:10.1177/0739456X10366427

Sen, A. (2002, December). Why health equity? *Health Economics*, *11*(8), 659–666. doi:10.1002/hec.762

SimuPLAN. (2013). *Modellgestutzte Ermittlung der Immissionsbeitrage aller relevanten Quellgruppen fur das Stadtgebiet von Dortmund*.

Sooman, A., & Macintyre, S. (1995). Health and perceptions of the local environment in socially contrasting neighbourhoods in glasgow. *Health & Place*, *1*(1), 15–26. doi:10.1016/1353-8292(95)00003-5

Stafford, M., Cummins, S., Macintyre, S., Ellaway, A., & Marmot, M. (2005). Gender differences in the associations between health and neighbourhood environment. *Social Science & Medicine (1982)*, *60*(8), 1681–92. doi:10.1016/j.socscimed.2004.08.028

Stevenson, A., Pearce, J., Blakely, T., Ivory, V., & Witten, K. (2009). Neighbourhoods and health: A review of the New Zealand literature. *New Zealand Geographer*, *65*(3), 211–221. doi:10.1111/j.1745-7939.2009.01164.x

Tesfazghi, E. S., Martinez, J. A., & Verplanke, J. J. (2010). Variability of Quality of Life at Small Scales:

Addis Ababa, Kirkos Sub-City. *Social Indicators Research*, *98*(1), 73–88. doi:10.1007/s11205-009-9518-6
Timperio, A. (2004). Perceptions about the local neighborhood and walking and cycling among children. *Preventive Medicine*, *38*(1), 39–47. doi:10.1016/j.ypmed.2003.09.026
Vries, S. de, Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P. (2003). Natural environments -- healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environment and Planning A*, *35*(10), 1717–1731. doi:10.1068/a35111
Walker, R. B., & Hiller, J. E. (2007). Places and health: a qualitative study to explore how older women living alone perceive the social and physical dimensions of their neighbourhoods. *Social Science & Medicine (1982)*, *65*(6), 1154–65. doi:10.1016/j.socscimed.2007.04.031
Weber, D., & Anderson, D. (2010). Contact with Nature: Recreation experience preferences in Australian parks. *Annals of Leisure Research*, *13*(1-2), 46–69. doi:10.1080/11745398.2010.9686837
Wen, M., Hawkley, L. C., & Cacioppo, J. T. (2006). Objective and perceived neighborhood environment, individual SES and psychosocial factors, and self-rated health: an analysis of older adults in Cook County, Illinois. *Social Science & Medicine (1982)*, *63*(10), 2575–90. doi:10.1016/j.socscimed.2006.06.025
WHO. (2002). *Community participation in local health and sustainable development : approaches and techniques*. Copenhagen : WHO Regional Office for Europe. Retrieved from http://apps.who.int//iris/handle/10665/107341
WHO. (2011). *Burden of disease from environmental noise-Quantification of healthy life years lost in Europe*. Denmark. Retrieved from http://www.who.int/quantifying_ehimpacts/publications/e94888.pdf?ua=1
WHO | Ambient (outdoor) air quality and health. (n.d.). Retrieved January 18, 2016, from http://www.who.int/mediacentre/factsheets/fs313/en/
WHO, & UN Habitat. (2010). *Hidden cities: Unmasking and overcoming health inequities in urban settings*. Geneva: World Health Organization. Retrieved from http://www.who.int/kobe_centre/publications/hidden_cities2010/en/
Woodgate, R. L., & Skarlato, O. (2015). "It is about being outside": Canadian youth's perspectives of good health and the environment. *Health & Place*, *31*, 100–10. doi:10.1016/j.healthplace.2014.11.008

7. APPENDICES

APPENDIX A Questionnaire

Respondent No.:_____
Gender: _____

Sorry Madam/ Sir, I have something to ask you but you are free to accept or to refuse. We are currently conducting a survey for the University of Twente on the resources related to health. Would you accept to respond to this survey that will take you 15 minutes?
[If the person refuses, thank him/her. If he/she complies, the questionnaire is administered.]
Thanks for accepting. We would like to map health related facilities based on your own perception. For this reason, we would like to know which places you "go" and "avoid" in your neighbourhood and the reasons for that.
To begin further, we need to have general information first.
Do you live in this neighbourhood? *[If the person replies 'No'*, Well, our study is based on this neighbourhood. Anyway, thanks for your time and willingness to participate. *If the person replies 'Yes', proceed by asking next question below.]*
Since when are you living here? Please mention in years. _____
We request you to point on the map three places in your neighbourhood you like to go because they are good for your health and other three places you avoid because they are bad for your health.
We will start with places you like to go.

1. **Please point three places in your neighbourhood you like to go because they are good for your health.**
2. **Please mention what health related activities you can do in these places.** For example, the activities that are beneficial for your health.

Write down the activities next to each places (A, B, C) as mentioned by respondent in table1 below. Also tick mark (√) the type of activity for each places. For example, tick mark outdoor activity if cycling is mentioned.

places you go	**Health related activities you can do in the place (such as, jogging, cycling, social interactions, etc.)**	**Indoor Activity**	**Outdoor Activity**	**Both**
A				
B				
C				

Table1

3. *For the pointed places, please evaluate the reasons in Table2 below.*

Please indicate the respondent no. (1,2,3...). Ask all questions regarding reasons till evaluation for each reasons for first place then move on to the second and third.
We would like to know if 7 reasons that we have listed are applicable to the places you pointed as the 'place you go'.

Is 'distance to the place' applicable as a reason for going to place A? *If the reply is Yes, tick mark box in 'Yes' column for applicable place. If the reply is No, tick mark box in 'No' column and write down 'NA' in the box under place A.*

Ask the questions in the same way for all other listed reasons and follow the same process for first point.

If the place pointed is indoor facility (inside building), please ask the questions for reasons addressing the surrounding location of that indoor facility.

For example, Is 'safety in the surrounding location' of indoor facility (suppose A) applicable reason for going to A?

After asking for 7 listed reasons, ask if there are any additional reasons.

Are there any other reasons for going to this place (A in this case)?

If there are other reasons, please write one reason in one highlighted box in Table 3a-3b under question 4 below.

Now, ask respondent to evaluate the reasons that he/she has mentioned as applicable in scale of 1 to 6, 1 being very bad to 6 being very good. For example: suppose for place A.

How would you evaluate 'distance to the place' in the scale of 1 to 6, 1 being very far and 6 being very near?

Write down the evaluation scale number as mentioned by the respondent for 'distance to the place' in the box under the first pointed place (A) in table2.

After this evaluation for the first point, ask the questions for the second point then for third point.

Respondent no. **Table2**

Tick mark (√)box in 'Yes' column if reason is applicable for corresponding pointed place.

Tick mark (√)box in 'No' column if reason is not applicable for corresponding pointed place. Write down 'NA' in the box under pointed places (A,B,C) if reasons are not applicable to pointed place.

Write down appropriate evaluation scale number in the box under pointed places (A,B,C) if the reasons are applicable. Write down 'NA' if reasons are not applicable to pointed place.

Reasons	Is the reason applicable?						Evaluation Scale						Not Applicable	Places you go		
	A		B		C											
	Yes	No	Yes	No	Yes	No	1	2	3	4	5	6		A	B	C
Distance to the place							very far	far	slightly far	slightly near	near	very near	NA			
Cost of the resource							very unaffordable	unaffordable	slightly unaffordable	slightly affordable	affordable	very affordable	NA			
Availability of services as required							very unavailable	unavailable	slightly unavailable	slightly available	available	very available	NA			
Cleanliness in place or surrounding							very unclean	unclean	slightly unclean	slightly clean	clean	very clean	NA			
Safety in place or Surrounding							very unsafe	unsafe	slightly unsafe	slightly safe	safe	very safe	NA			
Air quality in place or Surrounding							very bad	bad	slightly bad	slightly good	good	very good	NA			
Noise in place or Surrounding							very dissatisfying	dissatisfying	slightly dissatisfying	slightly satisfying	satisfying	very satisfying	NA			

4. *If there are other reasons, please write one reason in one highlighted box in Table 3a-3b below.*

Write down the additional reasons mentioned by respondent for any of the pointed places in the highlighted boxes below.
If reason is applicable to the place, tick mark (√) appropriate evaluation scale number from 1 to 6 (1= very bad to 6= very good)
If reason is not applicable to the place, tick mark (√) 'NA'.

	Additional Reason 1	Additional Reason 2	Additional Reason 3
Places you go			

A	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
B	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
C	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA

Table3a

Write down the additional reasons mentioned by respondent for any of the pointed places in the highlighted boxes below.
If reason is applicable to the place, tick mark (√) appropriate evaluation scale number from 1 to 6 (1= very bad to 6= very good)
If reason is not applicable to the place, tick mark (√) 'NA'.

Places you go	Additional Reason 4							Additional Reason 5							Additional Reason 6						
A	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
B	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
C	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA

Table3b

Go to question 5 for places avoided for good health.

5. **Now we request you to point on the map three places in your neighbourhood you avoid because they are bad for your health.**
6. **Please mention what health related activities you can do in these places.** For example, the activities that are beneficial for your health.

Write down the activities next to each places (D,E,F) as mentioned by respondent in table4 below. Also tick mark (√) the type of activity for each places. For example, tick mark outdoor activity if cycling is mentioned.

places you avoid	**Health related activities you can do in the place (such as, jogging, cycling, social interactions, etc.)**	**Indoor Activity**	**Outdoor Activity**	**Both**
D				
E				
F				

Table4

7. *For the pointed places, please evaluate the reasons in Table5 below.*

Please indicate the respondent no. (1,2,3...). Ask all questions regarding reasons till evaluation for each reasons for first place then move on to the second and third.

We would like to know if 7 reasons that we have listed are applicable to the places you pointed as the 'place you avoid'.

Is 'distance to the place' applicable as a reason for avoiding place D? *If the reply is Yes, tick mark box in 'Yes' column for applicable place. If the reply is No, tick mark box in 'No' column and write down 'NA' in the box under place A.*

Ask the questions in the same way for all other listed reasons and follow the same process for first point.

If the place pointed is indoor facility (inside building), please ask the questions for reasons addressing the surrounding location of that indoor facility.

For example, Is 'safety in the surrounding location' of indoor facility (suppose D) applicable reason for avoiding D?

After asking for 7 listed reasons, ask if there are any additional reasons.

Are there any other reasons for avoiding this place (D in this case)?

If there are other reasons, please write one reason in one highlighted box in Table 6a-6b under question 8 below.

Now, ask respondent to evaluate the reasons that he/she has mentioned as applicable in scale of 1 to 6, 1 being very bad to 6 being very good. For example: suppose for place D.

How would you evaluat e 'distance to the place' in the scale of 1 to 6, 1 being very far and 6 being very near?

Write down the evaluation scale number as mentioned by the respondent for 'distance to the place' in the box under the first pointed place (D)in table5.

After this evaluation for the first point, ask the questions for the second point then for third point.

Respondent no. **Table5**

Tick mark (√)box in 'Yes' column if reason is applicable for corresponding pointed place.

Tick mark (√)box in 'No' column if reason is not applicable for corresponding pointed place. Write down 'NA' in the box under pointed places (A,B,C) if reasons are not applicable to pointed place.

Write down appropriate evaluation scale number in the box under pointed places (A,B,C) if the reasons are applicable. Write down 'NA' if reasons are not applicable to pointed place.

Reasons	Is the reason applicable?						Evaluation Scale						Not Applicable	Places you avoid		
	A		B		C											
	Yes	No	Yes	No	Yes	No	1	2	3	4	5	6		D	E	F
Distance to the place							very far	far	slightly far	slightly near	near	very near	NA			
Cost of the resource							very unaffordable	unaffordable	slightly unaffordable	slightly affordable	affordable	very affordable	NA			
Availability of services as required							very unavailable	unavailable	slightly unavailable	slightly available	available	very available	NA			
Cleanliness in place or surrounding							very unclean	unclean	slightly unclean	slightly clean	clean	very clean	NA			
Safety in place or Surrounding							very unsafe	unsafe	slightly unsafe	slightly safe	safe	very safe	NA			
Air quality in place or Surrounding							very bad	bad	slightly bad	slightly good	good	very good	NA			
Noise in place or Surrounding							very dissatisfying	dissatisfying	slightly dissatisfying	slightly satisfying	satisfying	very satisfying	NA			

8. *If there are other reasons, please write one reason in one highlighted box in Table 3a-3b below.*

Write down the additional reasons mentioned by respondent for any of the pointed places in the highlighted boxes below.
If reason is applicable to the place, tick mark (√) appropriate evaluation scale number from 1 to 6 (1= very bad to 6= very good)
If reason is not applicable to the place, tick mark (√) 'NA'.

Places you avoid	Additional Reason 1							Additional Reason 2							Additional Reason 3						
D	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
E	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
F	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA

Table6a

Write down the additional reasons mentioned by respondent for any of the pointed places in the highlighted boxes below.
If reason is applicable to the place, tick mark (√) appropriate evaluation scale number from 1 to 6 (1= very bad to 6= very good)
If reason is not applicable to the place, tick mark (√) 'NA'.

Places you avoid	Additional Reason 4							Additional Reason 5							Additional Reason 6						
D	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
E	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA
F	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA	1	2	3	4	5	6	NA

Table6b

After completion of collecting information about pointed places, go to question 9.

1. **We will need some personal information about you which will be used only for the research and will be confidential.**

How old are you? (Tick the appropriate one)	20-30	☐	31-40	☐	41-50	☐	51-60	☐ 61 and above ☐
Do you have migration background? (Tick the appropriate one)	Yes	☐	No	☐				
What is the highest education level you have attained?	_____							
What is your occupation?	_____							

Thank you for participating in this research.

APPENDIX B Spatial distribution of used and avoided health opportunities in Nordstadt

The numbers in the maps represent the ranking of identified locations based on the number of respondents for particular reason. The maps with '(used)' in legend title represent locations identified as used health opportunities and the maps with '(avoided) in legend title represent locations identified as avoided health opportunities.

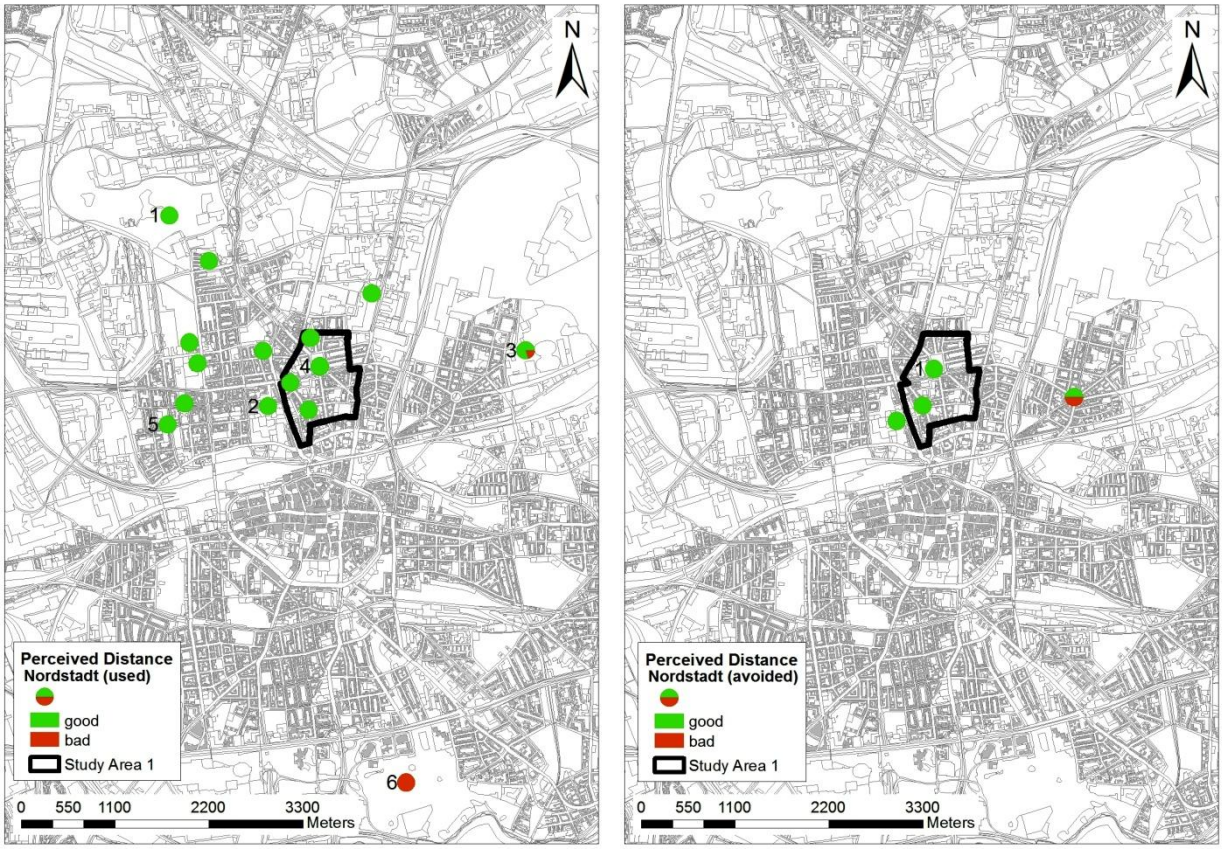


Figure 7-1Perception of distance in identified health opportunities in Nordstadt

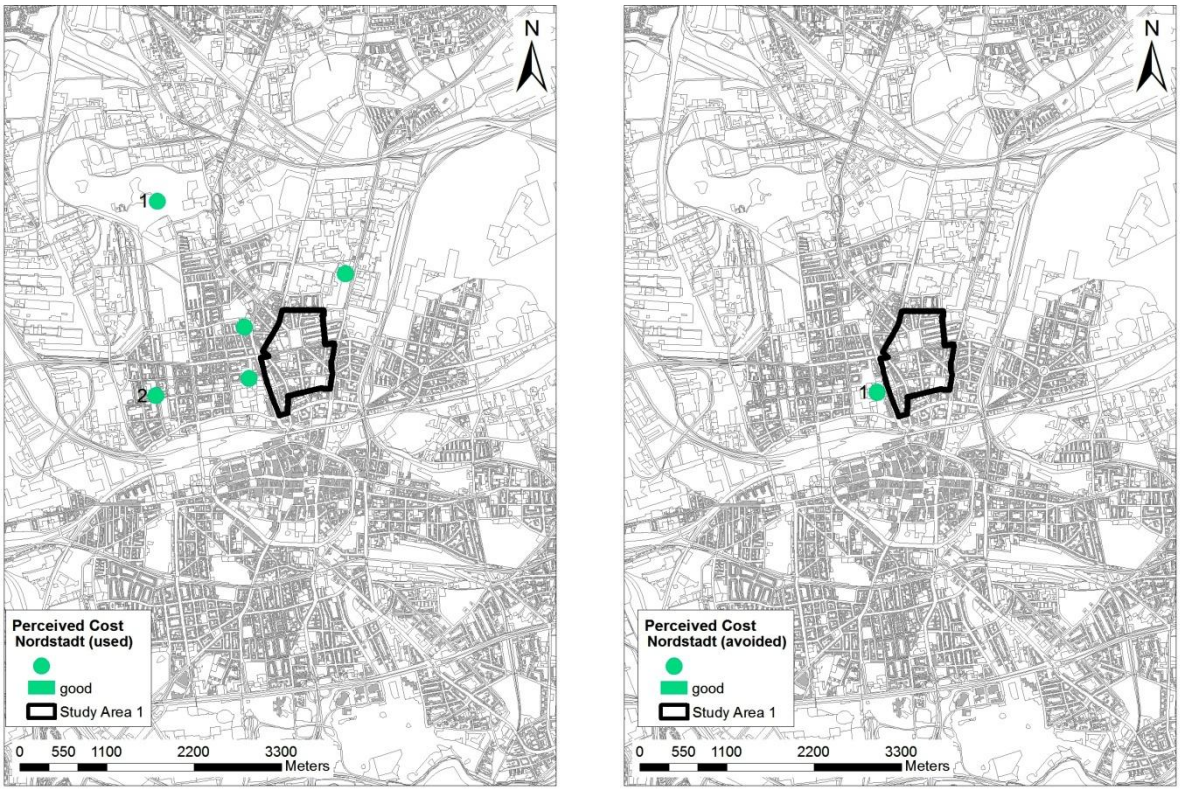


Figure 7-2 Perception of cost of resources in identified health opportunities in Nordstadt

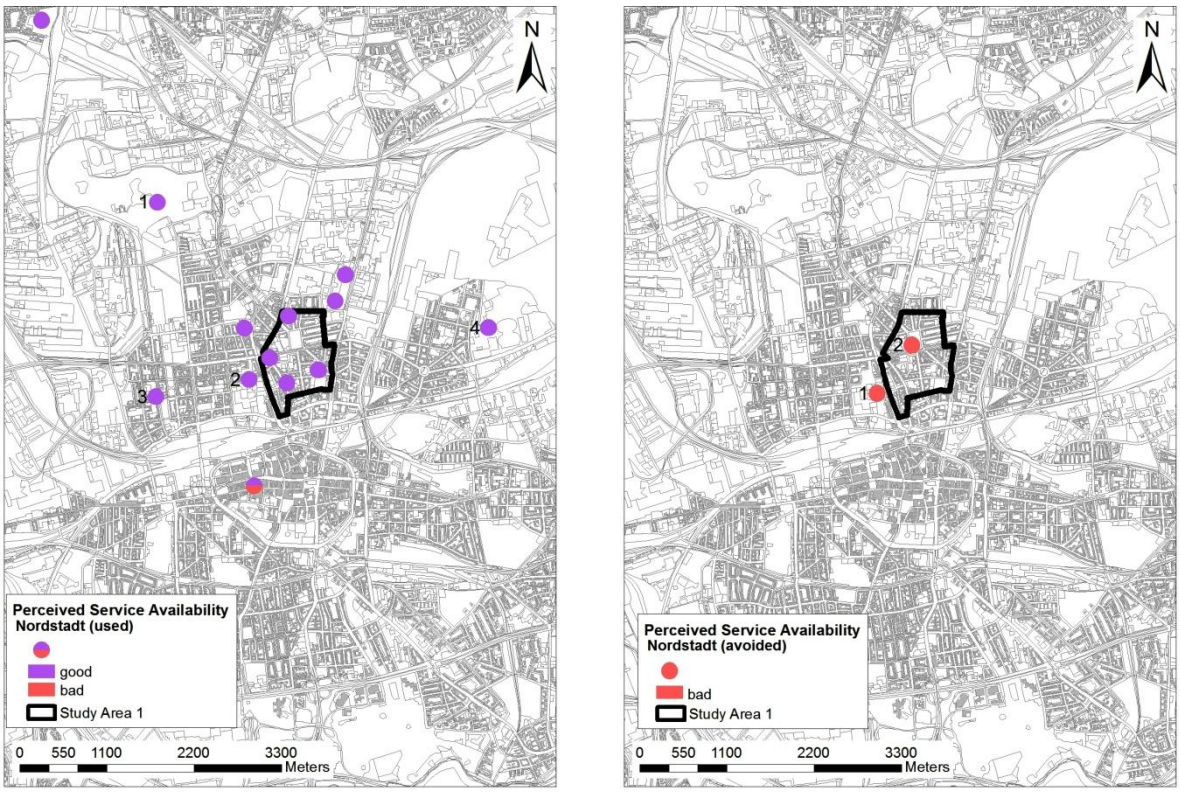


Figure 7-3 Perception of availability of services in identified health opportunities in Nordstadt

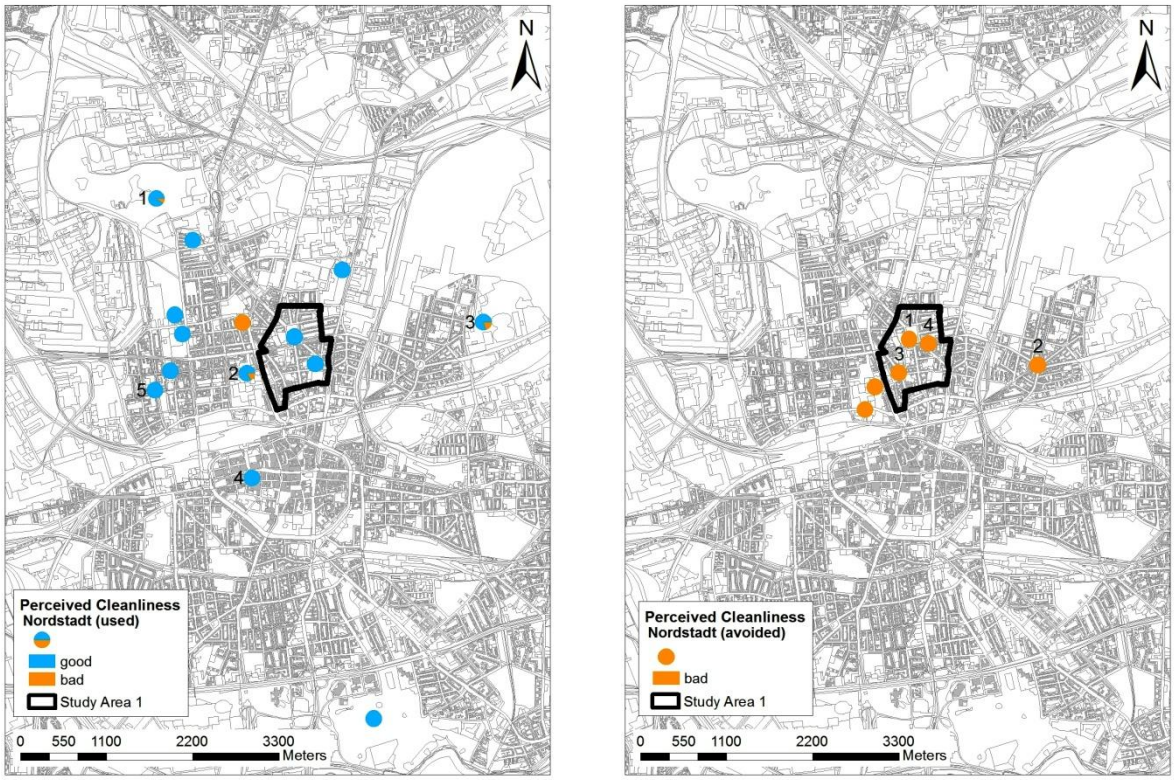


Figure 7-4 Perception of cleanliness in identified health opportunities in Nordstadt

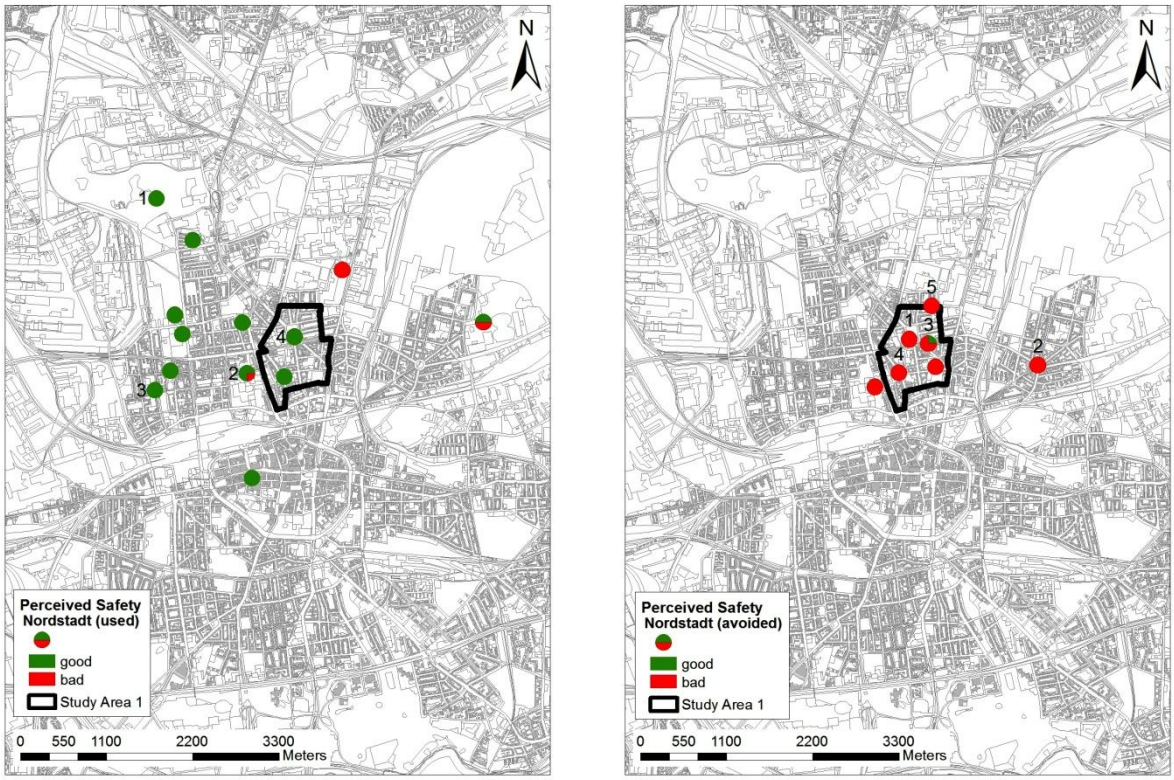


Figure 7-5 Perception of safety in identified health opportunities in Nordstadt

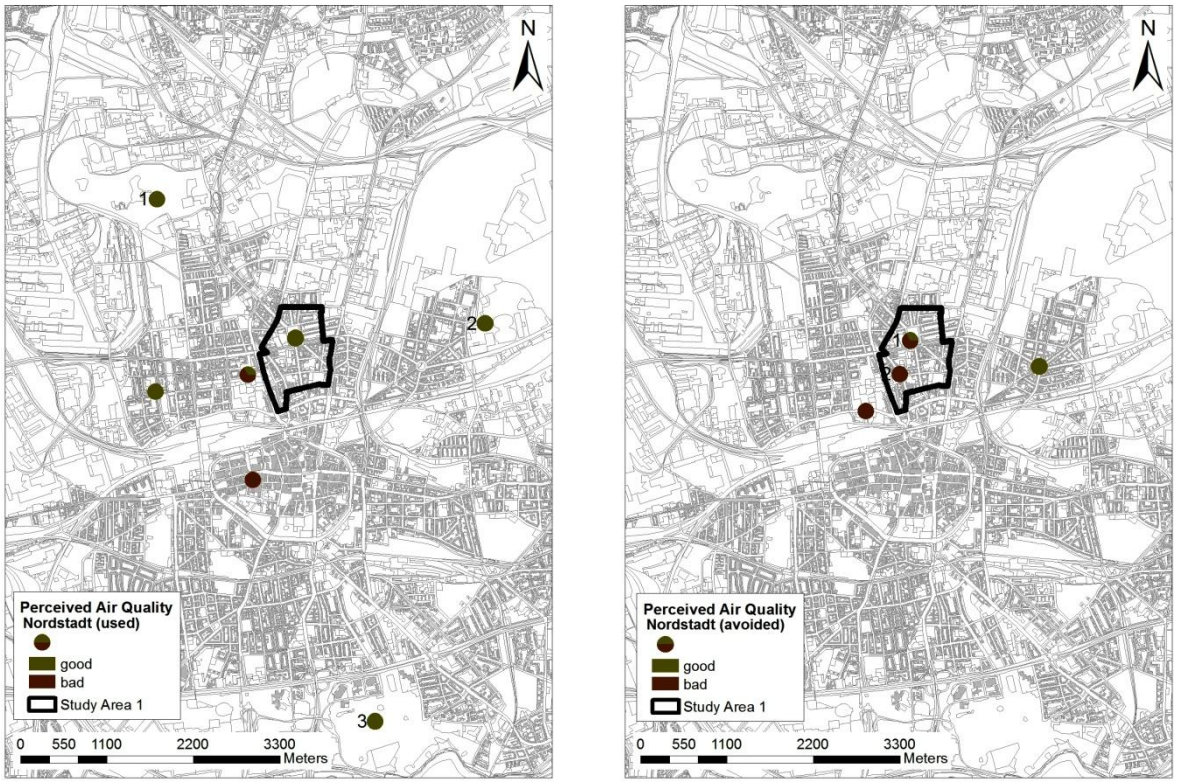


Figure 7-6 Perception of air quality in identified health opportunities in Nordstadt

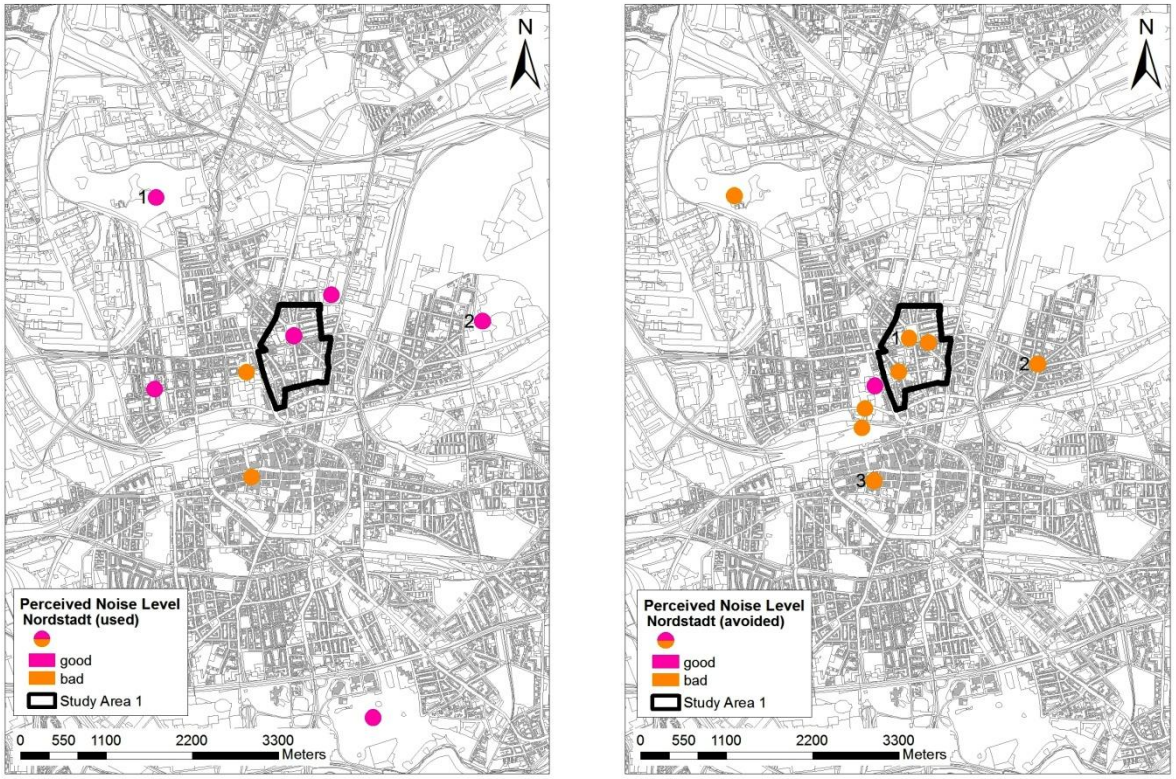


Figure 7-7 Perception of noise level in identified health opportunities in Nordstadt

APPENDIX C Spatial distribution of used and avoided health opportunities in Kreuzviertel

The numbers in the maps represent the ranking of identified locations based on the number of respondents for particular reason. The maps with '(used)' in legend title represent locations identified as used health opportunities and the maps with '(avoided) in legend title represent locations identified as avoided health opportunities.

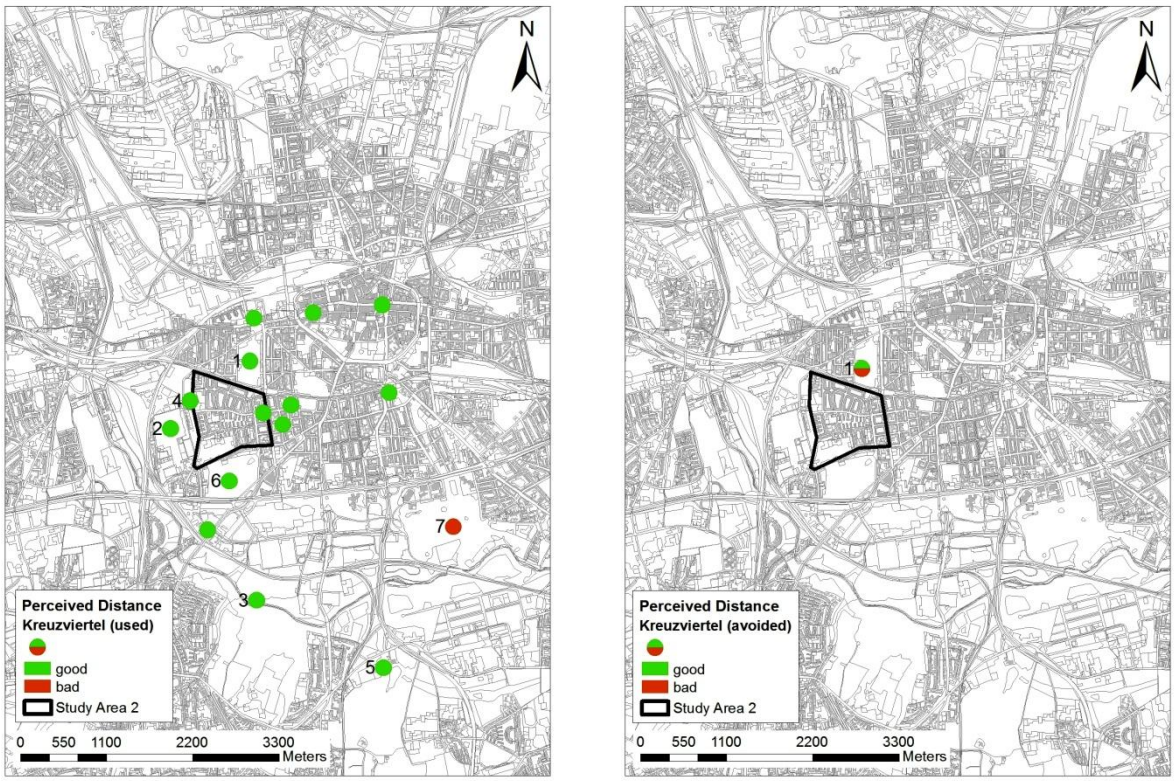


Figure 7-8 Perception of distance for identified health opportunities in Kreuzviertel

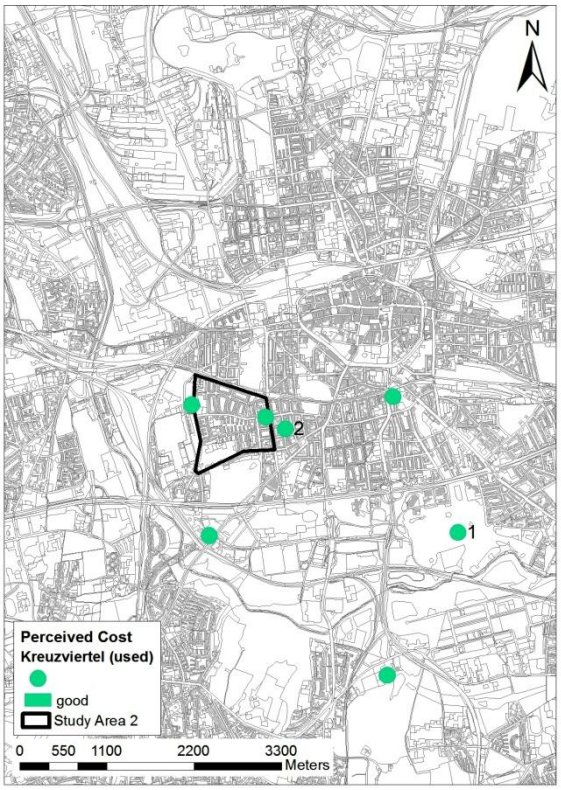


Figure 7-9 Perception of cost of resources in identified health opportunities in Kreuzviertel

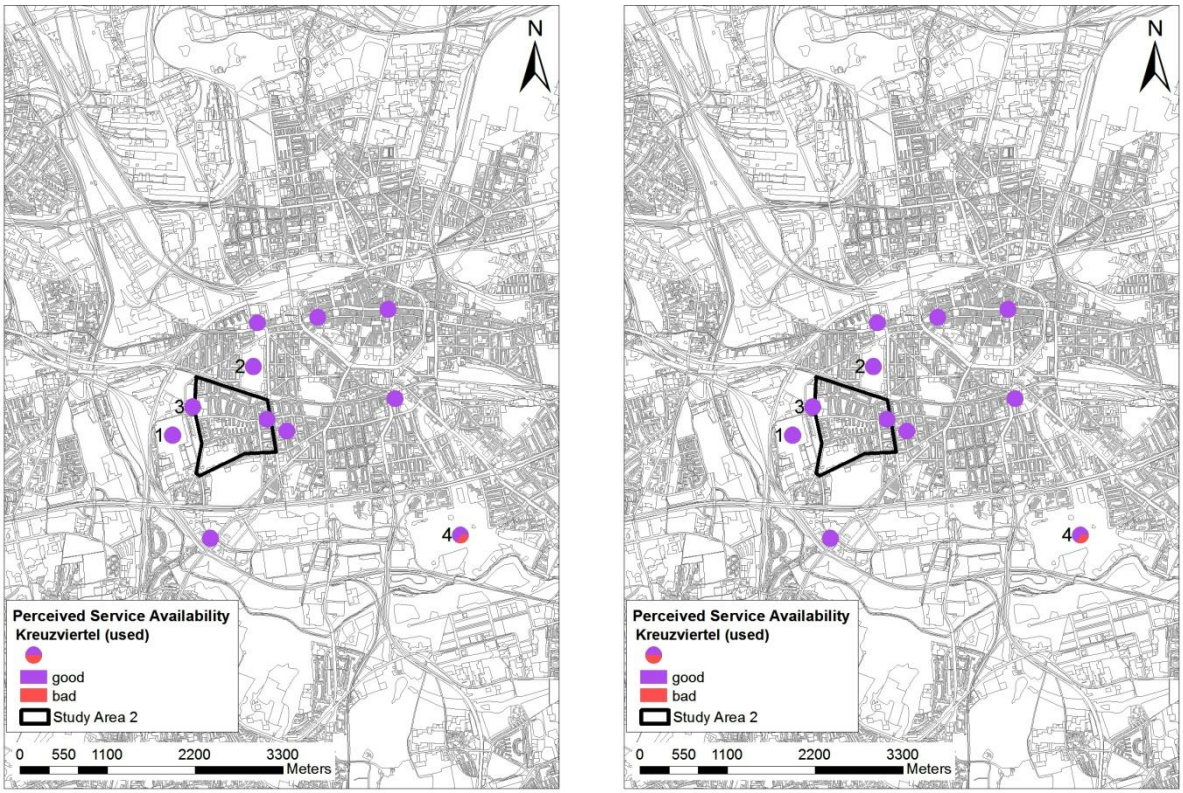


Figure 7-10 Perception of service availability in identified health opportunities in Kreuzviertel

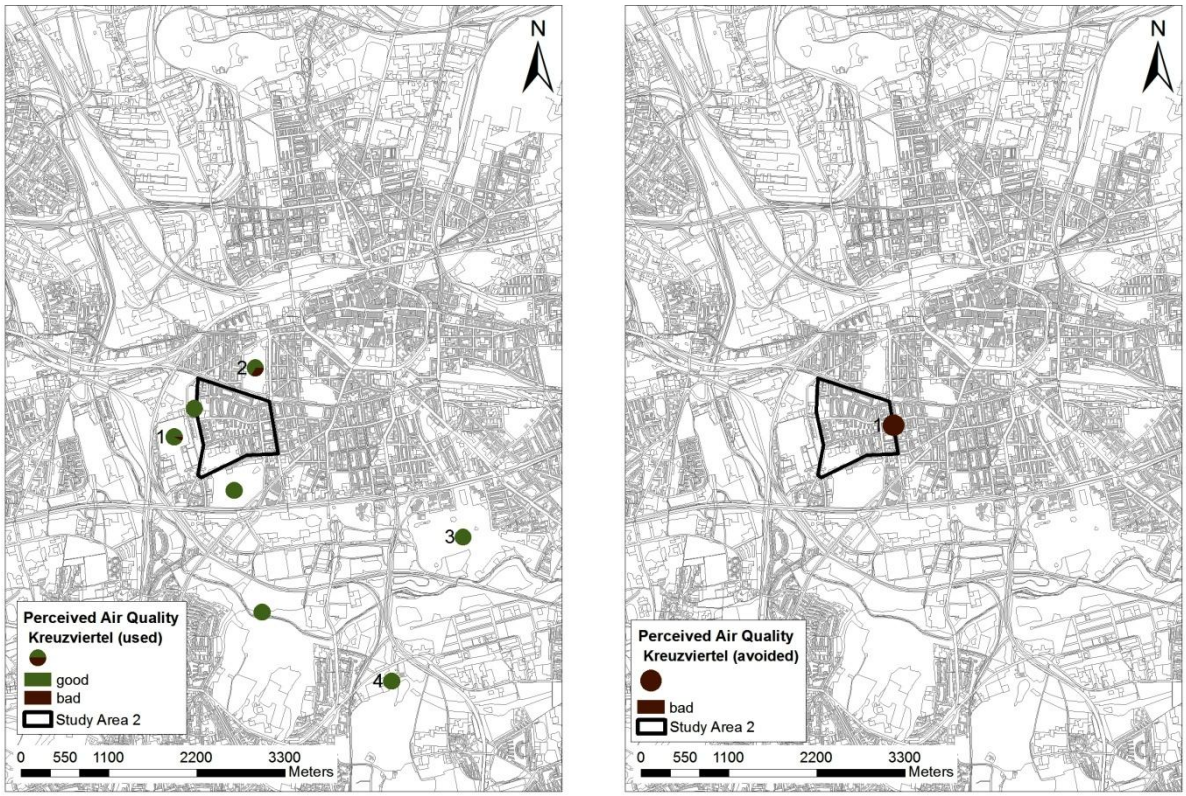


Figure 7-11 Perception of air quality in identified health opportunities in Kreuzviertel

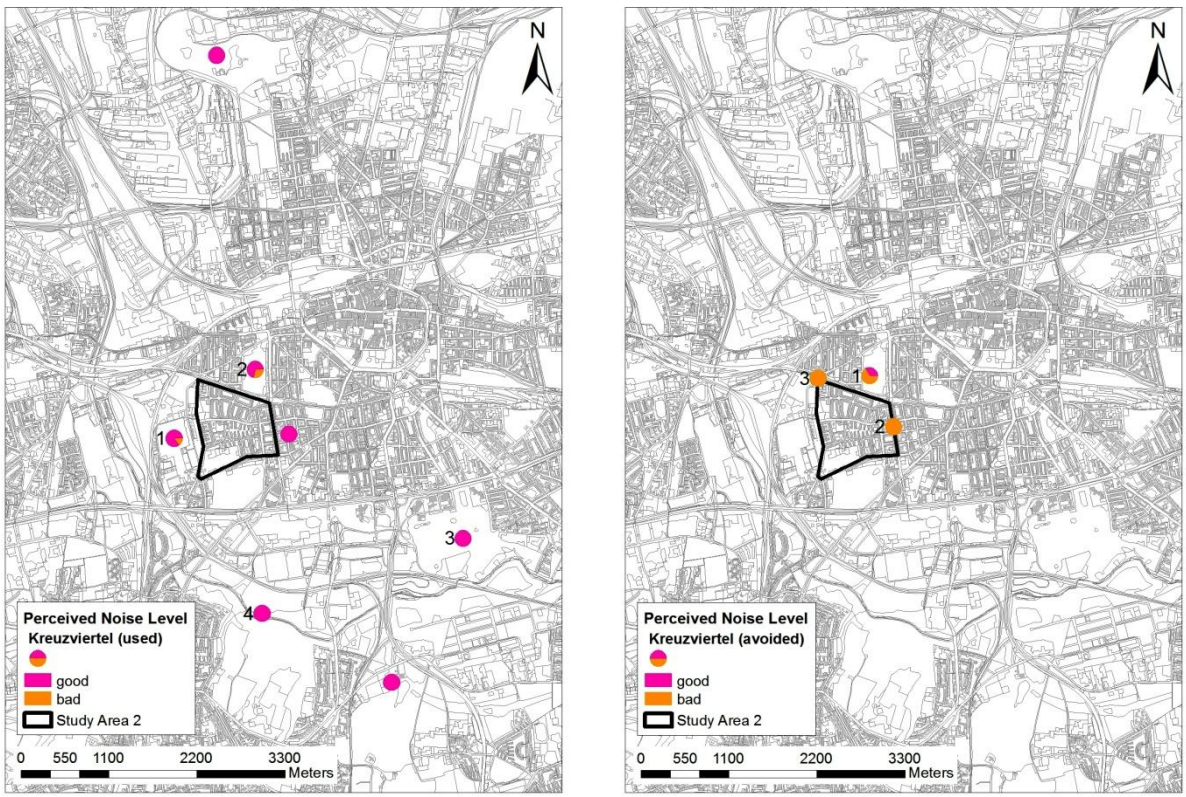


Figure 7-12 Perception of noise level in identified health opportunities in Kreuzviertel

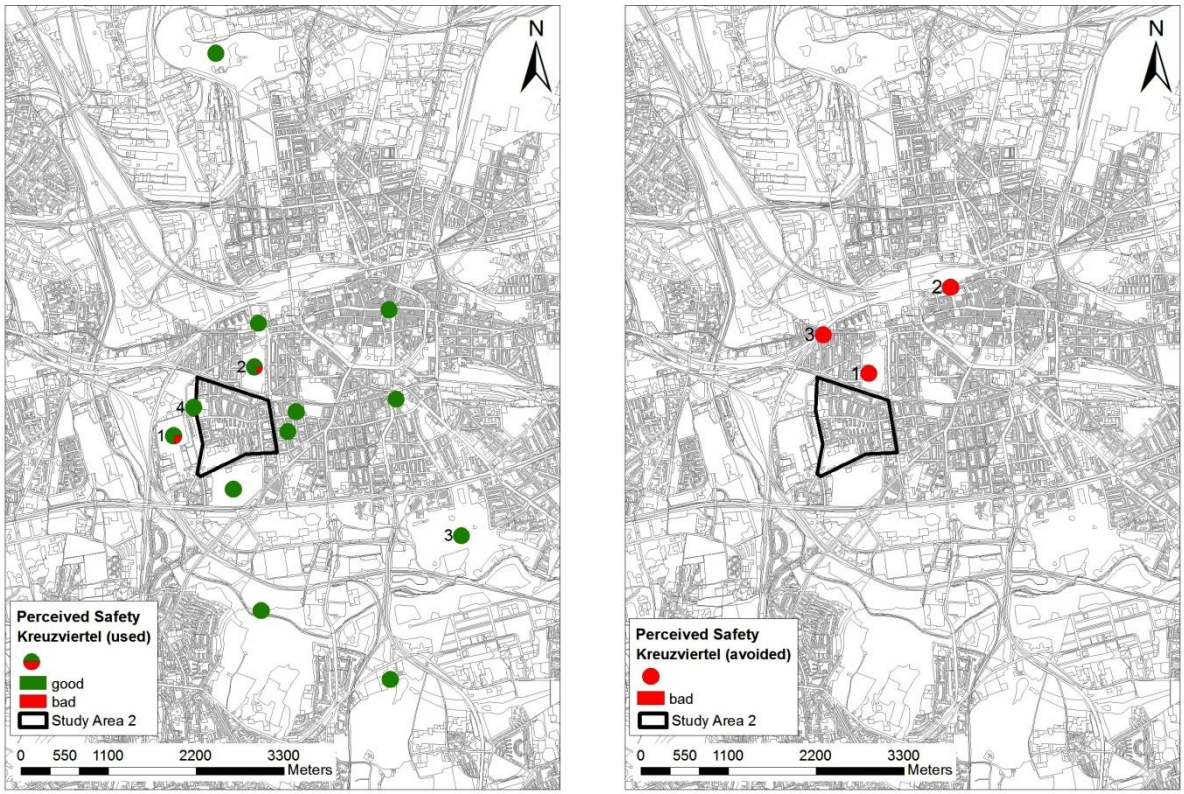


Figure 7-13Perception of safety in identified health opportunities in Kreuzviertel

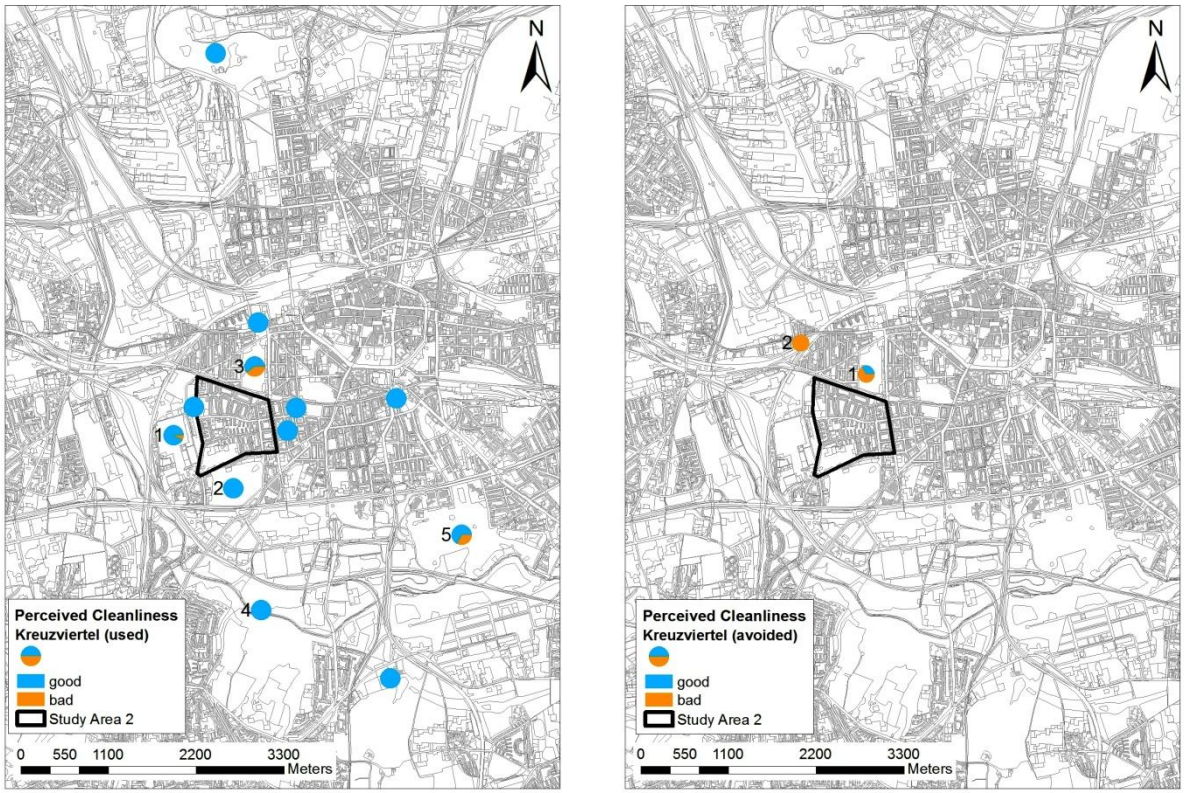


Figure 7-14 Perception of cleanliness in identified health opportunities in Kreuzviertel

APPENDIX D Personal characteristics based perception of neighbourhood characteristics for health opportunities in Nordstadt

The variation in responses between different gender is explored further and illustrated in Figure7-15 and Figure7-16 below.

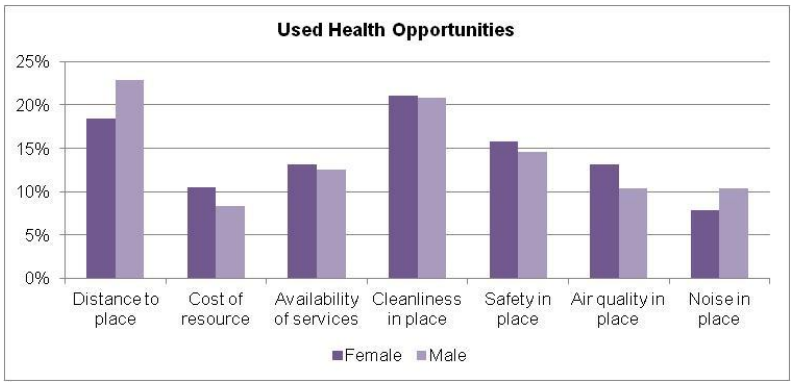


Figure 7-15 Gender-based perception of neighbourhood characteristics for used health opportunities in Nordstadt

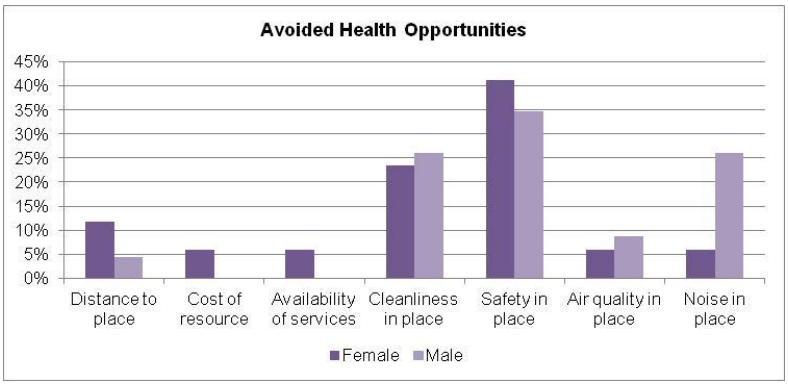


Figure 7-16 Gender-based perception of neighbourhood characteristics for avoided health opportunities in Nordstadt

Regarding used health opportunities (Figure7-15), for females, cleanliness (21%) came out to be the most important characteristics followed by distance to place(18%). Safety was perceived by 16% female respondents whereas air quality and service availability (both 13%) were slightly less perceived than safety. Cost of resource was considered by 11% of females whereas noise (8%) was least perceived. For male respondents, distance (23%) seems to be the most important characteristics followed by cleanliness (21%) and safety (15%). Availability of services (13%) was slightly more perceived than air quality and noise (both 10%). Cost of resource (8%) was least important for males.

Regarding avoided health opportunities (Figure7-16), for both genders, safety (41% female, 35% male) seems to be the main issue. Cleanliness was the issue after safety (24% female, 26% male). For female respondents, distance was also considerable factor and cost, availability of services, air quality and noise all were least perceived (all 6%). For male participants, cleanliness and noise was important (both 26%) than air quality (9%). Distance was least perceived by males (4%) and they didn't mention cost and availability of service.

Comparatively, for used health opportunities, males perceived distance, and noise more than females and females perceived safety, air quality and cost of resource more than males. Safety was perceived most important characteristics by females whereas it was distance for male respondents. For avoided health opportunities, safety was perceived the most by both genders. Males perceived air quality and noise more than female and females perceived safety and distance more than males.

The variation in responses between different **age** groups is discussed below (Figure7-17 and Figure7-18). Regarding used health opportunities, young respondents perceived distance (21%) slightly more than cleanliness (20%). Safety and availability of services (both 14%) were equally perceived. Noise and cost (both 9%) were least perceived than air quality (12%). Old age group's perception scored highest in

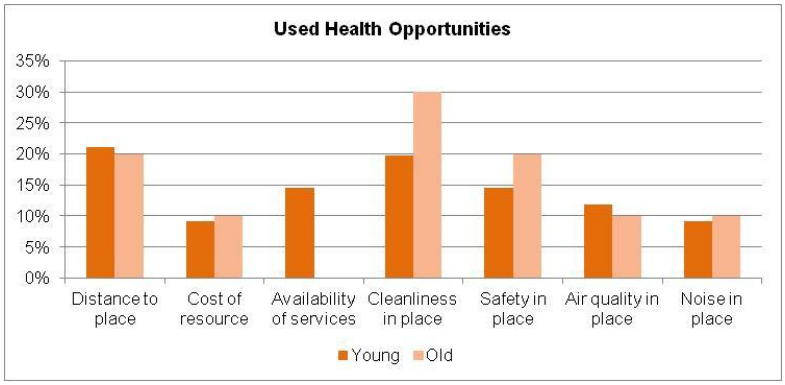


Figure 7-17 Age-based perception of neighbourhood characteristics for used health opportunities in Nordstadt

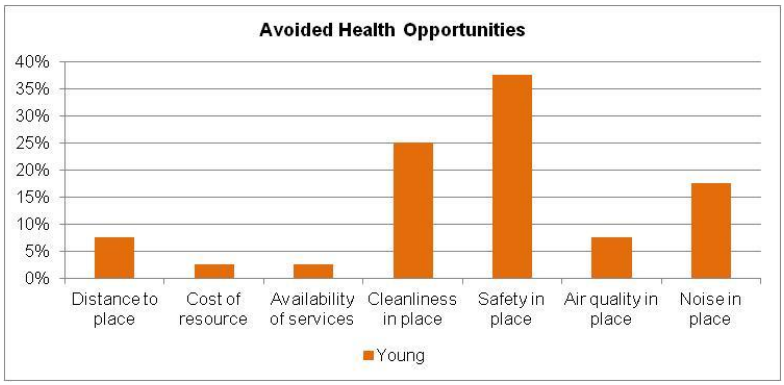


Figure 7-18 Age-based perception of neighbourhood characteristics for avoided health opportunities in Nordstadt

cleanliness followed by distance and safety (both 20%). Equal scores were given for cost, air quality and noise whereas availability of services was not mentioned. The older respondents didn't response regarding avoided health opportunities. The young age respondents scored highest in safety followed by cleanliness and noise. For air quality and distance response scores were equal (8%). Also, cost and availability of services were least scored.

It can be concluded that old age group respondents from Nordstadt perceived cleanliness, safety, noise and cost more than young age groups whereas, young age groups perceived distance and air quality more than old age groups. For young age groups, safety was the main issue for avoiding places.

The variation in perception between groups with and without **migration background** is discussed below.

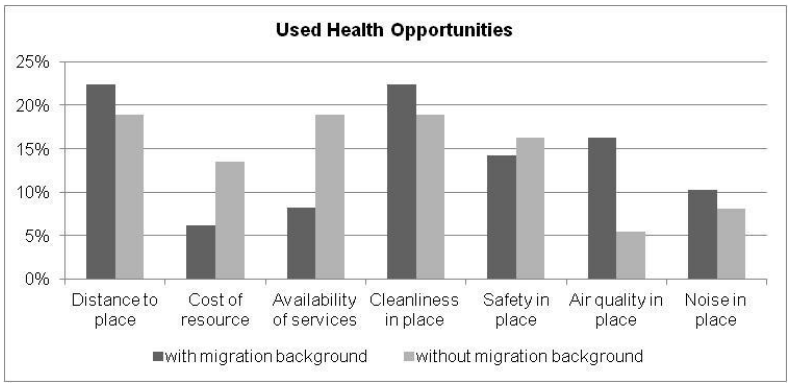


Figure 7-19 Perception of neighbourhood characteristics for used health opportunities based on migration background in Nordstadt

Regarding used health opportunities (Figure 7-19), for the participants with migration background, distance and cleanliness (both 22%) came out to be important characteristics followed by air quality (16%). Safety (14%) was perceived slightly less than air quality. For participants without migration background, distance, cleanliness and safety (all 19%) seem to be equally important. Safety (16%) was also important factor for them. Air quality (5%) and noise (8%) was least perceived.

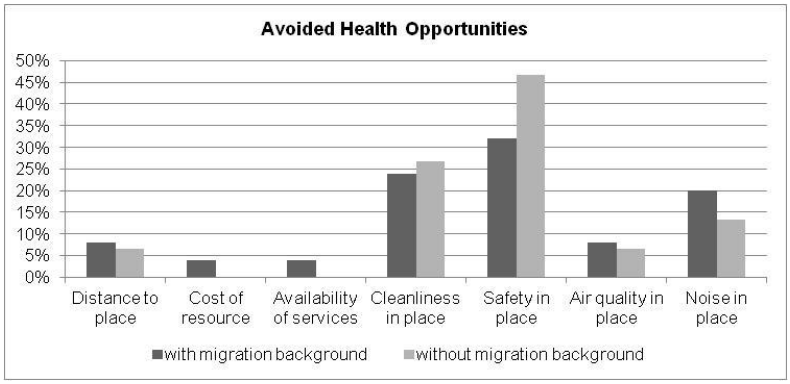


Figure 7-20 Perception of neighbourhood characteristics for avoided health opportunities based on migration background in Nordstadt

Regarding avoided health opportunities (Figure7-20), for both groups of participants (with or without migration background), safety was main issue followed by cleanliness and noise. Cost and availability of services were not mentioned by non migrant groups whereas these were least perceived. by migrant groups. Safety and cleanliness was perceived more by participants without migration background and noise was perceived more by participants with migration background.

The variation in perception between groups with different **education level** is discussed below (Figure7-21 and Figure7-22).

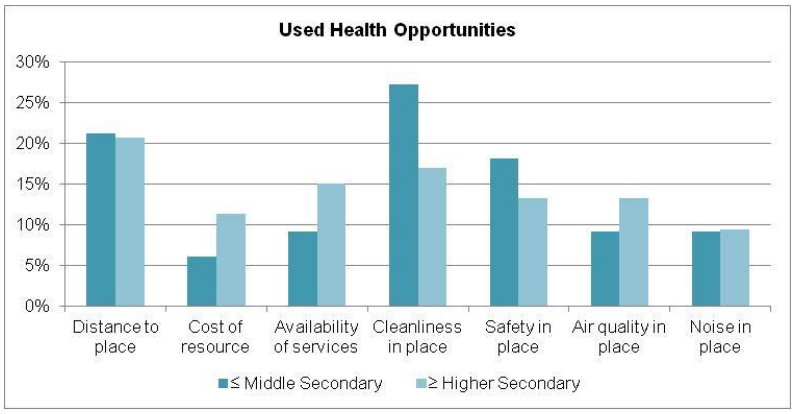


Figure 7-21 Perception of neighbourhood characteristics for used health opportunities based on education level in Nordstadt

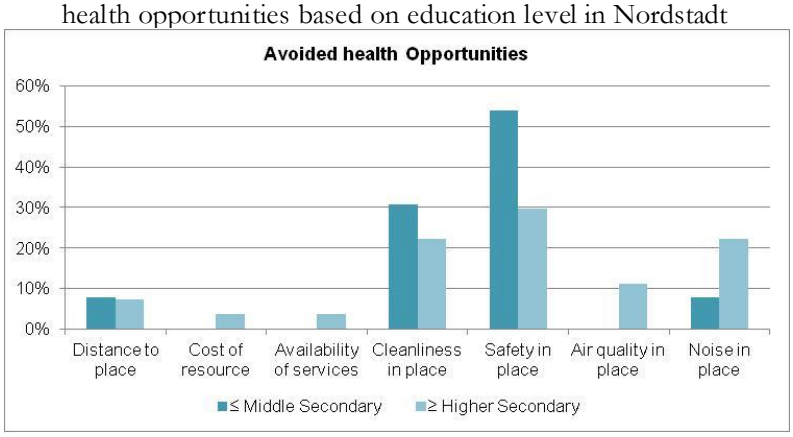


Figure 7-22 Perception of neighbourhood characteristics for avoided health opportunities based on education level in Nordstadt

Regarding used health opportunities, Figure7-21 shows that people with less education level perceived cleanliness (27%), distance (21%) followed by safety (18%). Environmental characteristics (air quality and noise) and availability of services were equally perceived (all 9%). More educated groups perceived distance (21%), cleanliness (17%) followed by availability of services (15%). Safety and air quality were equally perceived (both 13%) whereas noise was least perceived (9%).

In case of avoided health opportunities (Figure7-22), less educated and more educated groups perceived safety more followed by cleanliness. More educated (22%) perceived noise more than less educated (8%). Less educated perceived safety

(54%) more than more educated respondents (30%).

The variation in perception based on employment status which is discussed below (Figure7-23 and 7-24).

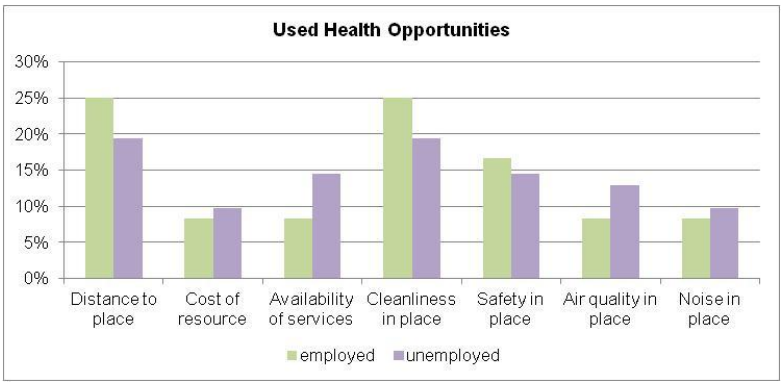


Figure 7-23 Perception of neighbourhood characteristics for used health opportunities based on employment status in Nordstadt

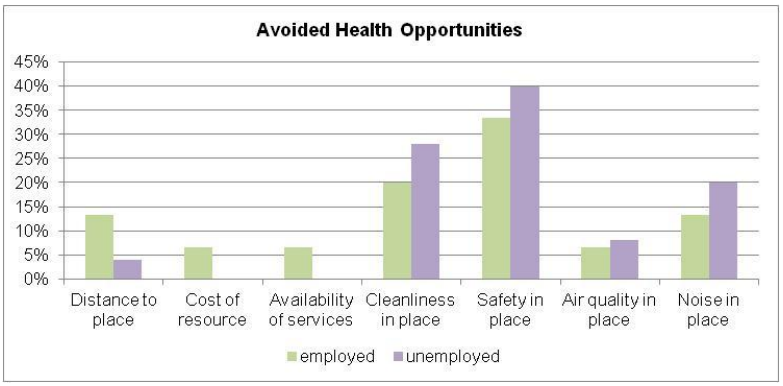


Figure 7-24 Perception of neighbourhood characteristics for avoided health opportunities based on employment status in Nordstadt

Figure7-23 shows that both employed and unemployed respondents perceived cleanliness, distance to place followed by safety regarding used health opportunities. Unemployed group perceived cost, availability of services, air quality and noise more than employed group. Figure7-24 shows that for both employed and unemployed groups, safety is important issue regarding avoided health opportunities followed by cleanliness. Both employed and unemployed respondents perceived noise more than air quality. Comparatively, regarding avoided health opportunities, unemployed respondentes are more concerned with safety, cleanliness, noise and air quality than employed ones.

APPENDIX E Personal characteristics based perception of neighbourhood characteristics for health opportunities in Kreuzviertel

The variation in responses between different **gender** is explained below (Figure7-25 and Figure7-26).

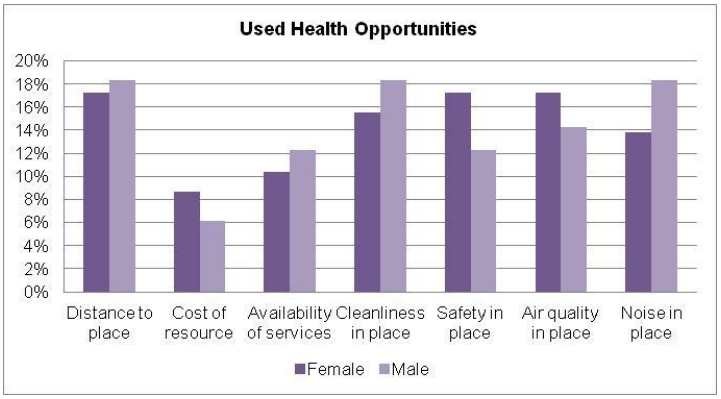


Figure 7-25 Gender-based perception of neighbourhood characteristics for used health opportunities in Kreuzviertel

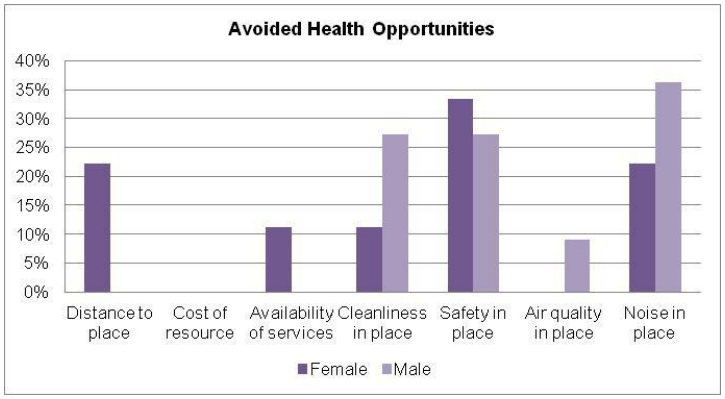


Figure 7-26 Gender-based perception of neighbourhood characteristics for avoided health opportunities in Kreuzviertel

When looking at differences in perception between genders, for used health opportunities (Figure7-25), safety was perceived by 17% of female respondents whereas only 12% of male perceived it. Air quality was perceived by 17% of female respondents and only 14% male perceived it. But, in case of noise, slightly more male respondents (18%) perceived it than female respondents (14%). Regarding avoided health opportunities (Figure7-26), 36% of male respondents perceived noise which was only 22% in case of female. Female respondents(33%) seem to perceive safety more than male respondents (27%) for avoiding locations as health opportunities.

Male respondents perceived noise more than safety and air quality for both used and avoided health opportunities while female respondents perceived safety more than noise. Female respondents mentioned parks as place for meeting friends apart from physical activity such as walking and jogging.

The variation in responses between different **age** group is discussed below (Figure7-27 and Figure7-28).

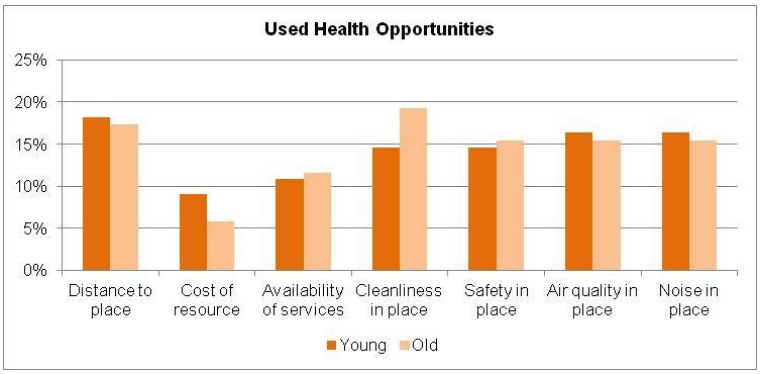


Figure 7-27 Age-based perception of neighbourhood characteristics for used health opportunities in Kreuzviertel

Regarding used health opportunities (Figure7-27), young respondents perceived distance (18%) more than air quality and noise (both 16%). Safety and cleanliness (both 15%) were equally perceived. Availability of services (9%) was perceived more than cost (9%) which was least perceived. Old age group's perception scored highest in cleanliness followed by distance. Equal scores (15%) were given

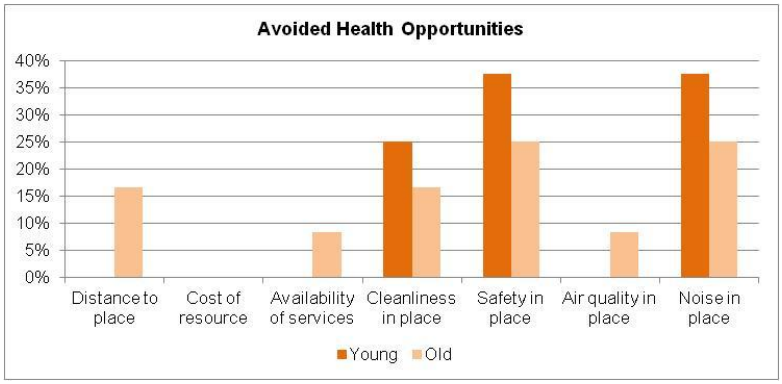


Figure 7-28 Age-based perception of neighbourhood characteristics for avoided health opportunities in Kreuzviertel

for safety, air quality and noise whereas cost was least perceived (6%). Regarding avoided health opportunities (Figure7-28), younger respondents didn't mention about distance, cost, service availability and air quality. They perceived safety and noise equally (38%) which was slightly more than cleanliness (35%). The older participants scored equally in safety and noise (25%) followed by distance and cleanliness (both 17%). For air quality and availability of services, response scores were equal (8%). Also, cost and availability of services were least scored.

It can be concluded that old age group respondents from Nordstadt Kreuzviertel perceived cleanliness more than young age group whereas, young age group perceived distance more than old age group for using locations. For young and old participants, safety and noise were the main issue for avoiding places.

The variation in perception between groups with and without **migration background** is discussed below (Figure7-29 and Figure7-30).

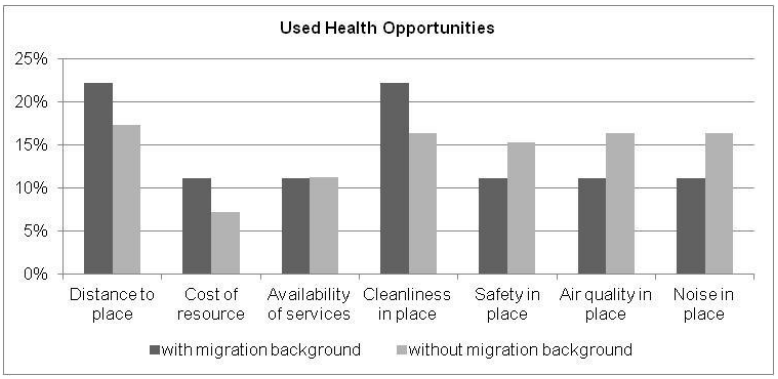


Figure 7-29 Perception of neighbourhood characteristics for used health opportunities based on migration background in Kreuzviertel

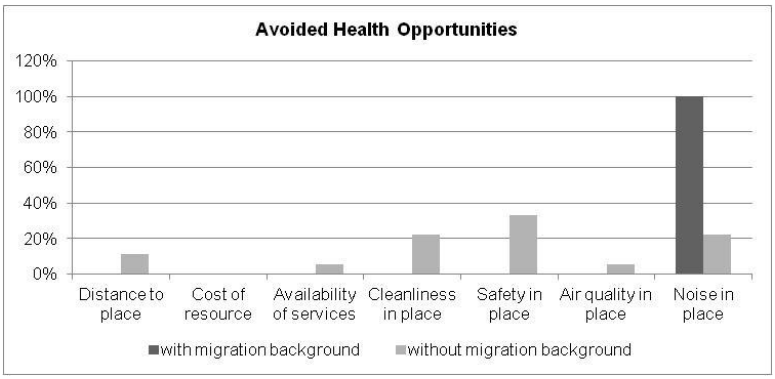


Figure 7-30 Perception of neighbourhood characteristics for avoided health opportunities based on migration background in Kreuzviertel

Regarding used health opportunities (Figure 7-29), for the participants with migration background, distance and cleanliness came out to be important characteristics (both 22%). Distance, cost, availability of services, air quality and noise were equally perceived (all 11%). For participants without migration background, distance was most important (17%) Cleanliness, air quality and noise were equally perceived (16%) and safety was slightly less perceived (15%). Cost was least perceived. Regarding avoided health opportunities (Figure7-30), participants with migration background didn't mention any of such locations. For participants without migration background, safety (33%) was main issue. Cleanliness and noise were equally perceived (both22%). Cost was not

mentioned by non migrant group.

The variation in perception between groups with different **education level** is discussed below (Figure7-31 and Figure7-32).

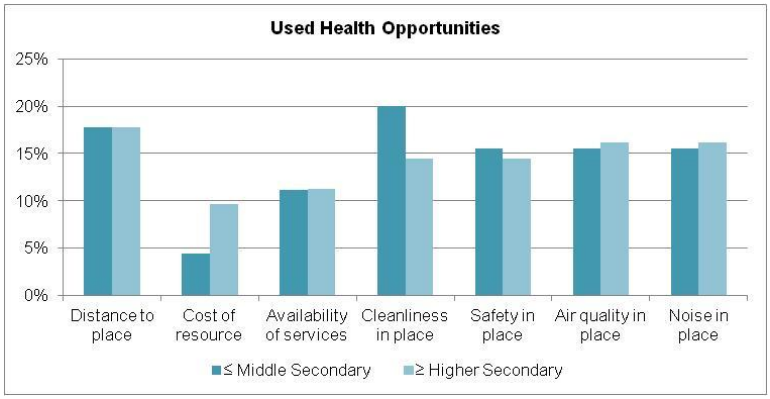


Figure 7-31 Perception of neighbourhood characteristics for used health opportunities based on education level in Kreuzviertel

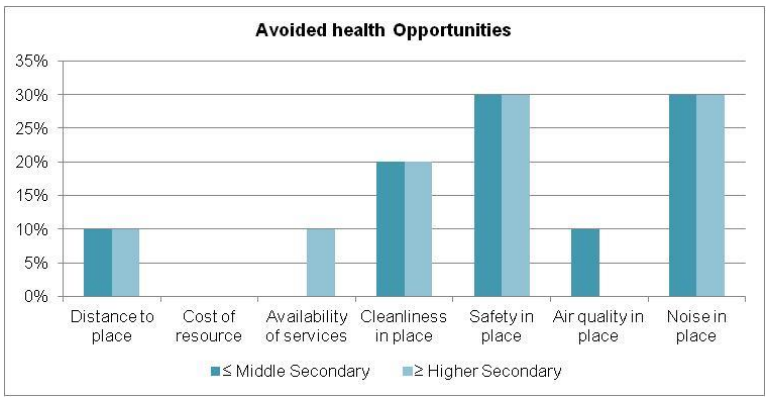


Figure 7-32 Perception of neighbourhood characteristics for avoided health opportunities based on education level in Kreuzviertel

Regarding used health opportunities, Figure7-31 shows that people with less education level perceived cleanliness (20%), followed by distance (18%). Safety, air quality and noise were equally perceived (all 16%). Cost was least perceived (4%) after availability of services (11%). More educated groups perceived distance (18%) more than environmental characteristics (air quality and noise). Cleanliness and safety were equally perceived (both 15%). Regarding avoided health opportunities (Figure7-32), both low and more educated respondents perceived safety and noise (both 30%) more than cleanliness (20%).

The variation in perception based on **employment status** is discussed below (Figure7-33 and Figure7-34).

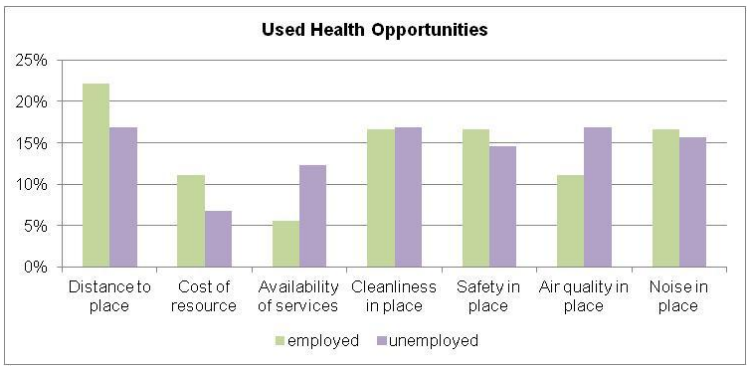


Figure 7-33 Perception of neighbourhood characteristics for used health opportunities based on employment status in Kreuzviertel

Regarding used health opportunities, Figure7-33 shows that employed respondents perceived distance to place (22%). Safety, cleanliness and noise were equally perceived (all 17%). Unemployed respondents perceived distance, cleanliness and air quality equally (all 17%). Safety (15%) was perceived slightly less than noise (16%). Employed respondents perceived distance more than unemployed.

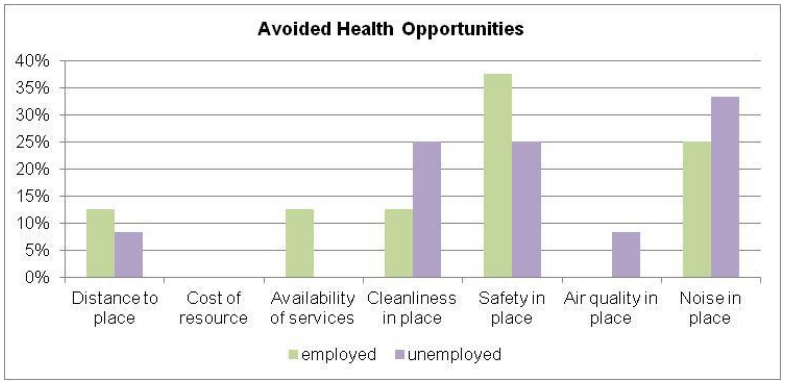


Figure 7-34 Perception of neighbourhood characteristics for avoided health opportunities based on employment status in Kreuzviertel

Regarding avoided health opportunities (Figure7-34), employed respondents perceived safety (38%) more followed by noise (25%).Perception of distance, availability of services and cleanliness scored equally (13%). Unemployed participants gave highest score to noise (33%) followed by cleanliness and safety (both 25%).

Comparatively, employed respondents perceived safety and distance more and unemployed perceived noise and cleanliness more than employed respondents.