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Sustainable Mobility at High Traffic Locations – The Case of the General Hospital Novo mesto: Final report from the SALOMON project

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Content

1. INTRODUCTION

There is an increasing need to promote sustainable[1] transport use in urban environments as frequent use of motor vehicles has several negative consequences, such as increases in air pollution, traffic congestion, traffic safety, and health risks. Since a big part of the adult population in European countries is working and work trips are predominantly made by private cars, it is especially important to start promoting sustainable transport in work settings (Guzman et al., 2020; Petrunoff et al., 2016). A shift from the use of private cars towards sustainable travel modes (cycling, walking, public transport) in workplace settings could lead to significant decreases in traffic congestion and improvements in individuals' health (Petrunoff et al., 2016).

In line with this notion, the SALOMON project[2] aims to develop a mobility plan that will help to increase the use of environmentally friendly transport options (e.g., cycling, walking, public transportation use) among employees, patients, and visitors of General hospital Novo mesto (GHNM), which is the fourth largest Currently, most of the hospital staff, patients, and visitors predominantly use private cars which leads to high pressure on the local urban infrastructure and generating societal costs, such as congestion, accidents, and environmental degradation. Hence, to reduce the carbon footprint and establish a sustainable, healthy, and accessible environment GHNM needs to change the mobility solutions. To do that, first, it is essential to identify the current travel patterns and examine the attitudes, perceptions, and underlying reasons related to the use and non-use of different travel modes among the target groups. Thus, to reach this goal a survey was conducted in the SALOMON project. In addition, focus group interviews were conducted with important stakeholders, such as representatives from the hospital management, municipality, and public transport providers, to understand their perspectives and approaches to current mobility challenges and possible solutions. The present report summarizes the findings both from the survey and focus-group interviews.

It should be noted that transport to and from a hospital has some special characteristics that are different from other transport contexts. First, passengers travel light and have little or no luggage or shopping bags, which means less need for a private car. Second, older visitors and patients with health problems create a high demand for uniform adaptation and special transport, such as taxi or patient transport. Third, the hospital staff makes up a large group of those travelling to and from GHNM, and they travel at fixed times and have critical functions which influence preferences for transport solutions. Finally, most of the hospital trips are made during times of the day which contributes to making congestion problems. These characteristics need to be considered when developing sustainable mobility solutions for the hospital.

1.1. Literature Review

Previous studies examining travel patterns among employees in different workplaces, including hospitals, indicate that there are both psychological factors (e.g., attitudes, perceived barriers and benefits, and social norms) and physical factors (e.g., built environment, cycling and walking infrastructure) that influence the choice and use frequency of different travel modes among people. This section summarizes the findings about different factors related to the use of sustainable travel modes that are focused within this project, which are public transport, active transport (cycling and walking), and carpooling.

[1] Sustainability is a concept comprising the environmental, social and economic aspects. In this report we refer to the environmental aspects when referring to sustainability uses it interchangeably with the term "environmental friendly".

[2] https://www.norwaygrants.si/en/projects/projects-of-the-programme-climate-change-mitigation-and-adaptation/salomon/

1.1.1. Factors related to public transportation use

Compared to private car use, public transportation use (e.g., bus, metro, tram) has significantly fewer environmental challenges and provide economic and health benefits to individuals (Kvan & Hashim, 2016; Patterson et al., 2019; Rojas-Rueda et al., 2012). Previous research examining the factors that are critical for the choice of public transportation indicates that having fast, frequent, and reliable public transport are the most important factors for attracting travelers to use public transportation more often (Aruwajoye, 2020; Beirao & Cabral, 2007; Chakrabarti, 2017; Guzman et al, 2020; Rye, 1999). Another important factor is the cost of the public transport tickets. One of the commonly used incentives for increasing public transportation use to/from workplaces is providing subsidies (e.g., reduced fees or free) to employees for public transportation use. Studies examining the effect of such subsidies show that overall, they have a positive effect on increasing public transportation use, especially among users with lower income levels (e.g., De Witte et al., 2006; Guzman & Hessel, 2022). However, there is also evidence that only providing subsidies to employees would not be alone enough to increase public transportation use, if service attributes of the public transportation are not good enough. For example, Guzman et al. (2020) have shown that in a specific mobility strategy, subsidizing the cost of a company bus fare appeared as less important than service attributes of the public transport, such as travel and waiting time, for the employees.

In addition to external factors, such as frequency of the services and cost, some psychological factors, such as attitudes towards public transportation and habits, are also critical for use of public transportation. While positive attitudes towards public transportation are shown to be positively related with the use (e.g., Bamberg et al., 2003; Beirao & Cabral, 2007), having a strong car use habit has been shown as a negative predictor of both intentions to use public transportation and reported use (e.g., Simsekoglu et al., 2015). Often, private car use is a habitual behavior that is carried out automatically without deliberate thinking and it is known that people who have a strong habit of using a particular travel mode (e.g., car) acquire less information and elaborate less about other available travel mode options (Verplanken et al., 1997). Therefore, interventions aiming to increase public transportation use to/from the workplaces need to challenge the employees to break their car use habits and search for alternative travel options.

1.1.2. Factors related to active transportation use

Walking and cycling are considered active travel modes, which have clear benefits for reducing environmental problems, and traffic congestion and improving individuals' health. Previous studies show that adverse weather, logistical constraints (e.g., transport of big items, activities before or after work), accident and safety risks, and lack of cycling facilities at the workplaces (e.g., secure bike shelter, showers) are among the common barriers against cycling to work (De Souza et al., 2014; Piatkowski et al., 2015; Rérat, 2019). In addition to improving cycling infrastructure and facilities, forming positive attitudes, building a positive culture for cycling, especially for employees who have negative attitudes toward cycling and never contemplated it, and examples of other colleagues who cycle to work were shown as psychological factors that can increase cycling to work (Gatersleben & Appleton, 2007; Heinen et al., 2013).

In terms of walking, problems with the connectivity of the streets, topography (e.g., steep uphill topography), sidewalk surface, and feeling unsafe and insecure while walking were reported as the most common barriers (e.g., Forsyth et al., 2008; Larranaga et al., 2019; Larranaga & Cybis, 2014; Sehatzadeh et al., 2011; Tian & Ewing, 2017). Therefore, it appears that to increase active transportation use in workplace settings it is especially important to improve the infrastructure and safety of the cycling/walking paths as well as improving the cycling facilities at the workplaces.

1.1.3. Factors related to carpooling

None-household carpools, meaning that two or more commuters from different households travel in the same private car, is another travel mode that can contribute to the reduction of environmental problems and traffic congestion (Abrahamse & Keall, 2012; Cairns et al., 2010; Neoh et al., 2017). Carpooling can be a good replacement for private car use; however, similar to the other travel modes there are both facilitators and barriers related to carpooling. A recent meta-analysis study (Neoh et al., 2017) has shown that being female, in full-time employment with a regular work schedule, owning a vehicle, and working in an organization with many employees are the factors that are most positively associated with carpooling in different countries. Also, workplace incentives for carpooling, such as providing reserved parking space for the carpools, organizing partner-matching programs, incentive payments, and exemption from parking charges, are shown to be effective for increasing carpooling among the employees in different workplaces (Cairns et al., 2010; Neoh et al., 2017). On the other hand, not being able to find suitable matches for carpooling and problems with getting in touch with the carpool matches appear as a common barrier against using carpooling (e.g., Neoh, 2017). Web-based interventions, which provide personalized information by making use of online ride-matching software to enable commuters to find carpool matches, lead to an increase in carpooling to/from workplaces (e.g., Abrahamse & Keall, 2012). To sum up, it is likely that the increasing use of digital tools/apps in transport, fewer people willing to take driving licenses, and the practical and economic benefits of car sharing will lead to increased attractiveness for carpooling in the future.

1.2. Theoretical framework of the study

The present study focuses on understanding the role of different factors for travel mode choice of the hospital staff and patients/visitors by using theoretical concepts both from the field of psychology and the field of transport economics.

1.2.1. Psychological perspective

Attitudes, intentions, social norms, and perceptions related to the use of different travel modes can be listed as important psychological variables influencing the travel mode choice of individuals. The Theory of Planned Behavior (TPB) (Ajzen, 1991) is one of the commonly used psychological models defining the role of attitudes, social norms, and intentions for actual behavior. According to the TPB (see Figure 1), our intentions (i.e., readiness to act in a certain way) are determined by attitudes (i.e., a person's overall evaluations of the consequences of a behavior), subjective norm (i.e., a person's beliefs about whether significant others think he/she should engage in that behavior), and perceived behavioral control (i.e., to what extent we have control over the behavior). Previous studies using the TPB to explain different travel behaviors show both direct and indirect significant effects of attitudes, subjective norm, and perceived behavioral control on travel mode choice (Bamberg et al., 2003; Donald et al., 2014; Lo et al., 2016). In addition to subjective norms, descriptive norms that are determined by how other people behave also have an influence on travel mode choice. Both positive descriptive norms (i.e., presence of others showing the same behavior) and subjective norm (i.e., approval and support from close others) lead to increases in the use of different travel modes, such as public transportation (e.g., Bamberg et al., 2003) and bike use (Heinen and Handy, 2012; Sherwin et al., 2014). In line with the previous studies, the TPB was used as the theoretical base when selecting the psychological variables that might influence travel mode choice among staff and patients/visitors of GHNM.

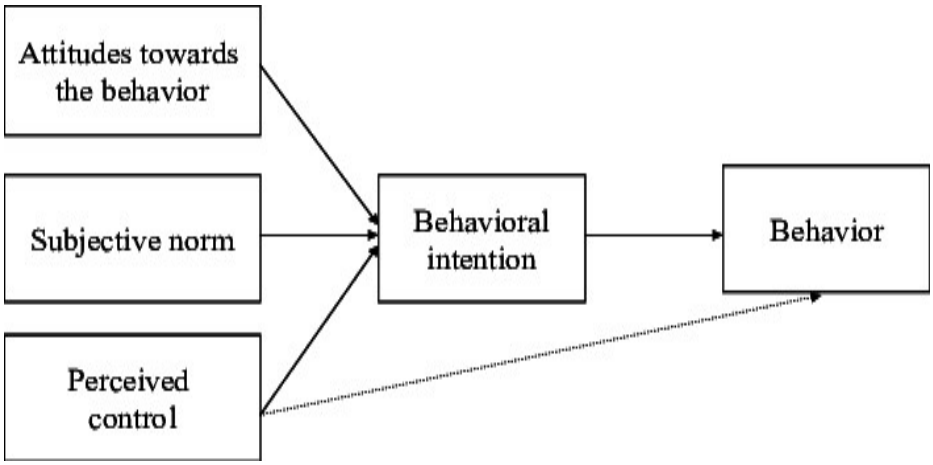

Figure 1. Theory of Planned Behavior (based on Ajzen, 1991)

1.2.2. Transport economy perspective

The demand for a good is explained by economic theory where lower price implies higher quantity (e.g., Pindyck and Rubinfelt, 2018). Transport is a service which mostly behaves like a normal good even though it has some special features. Probably the most prominent characteristic of transportation is that it is not demanded for its own sake (Button, 2022). The demand is, in other words, derived from the market actors' need to achieve other beneficial effects. The derived demand for transport is easily forgotten in the more overarching discussions on transport solutions. These indirect effects mean that well-functioning transport solutions are an important prerequisite for both increased welfare for individuals, the development of organizations, and even for economic growth for the country.

In passenger transport, which is the context of our study, people generally want to travel in a way that enables them to achieve their ultimate goal in the best possible way. The journey itself should be as short and comfortable as possible. In order to understand the demand side, several studies have been carried out to identify the importance of various factors. It is argued in the literature that one prominent difference from other goods is that factors other than price affect the demand for transport greatly. This refers back to insights from early economic works (e.g., Becker, 1965) that time use has a cost, and precisely the opportunity cost for time use is highlighted by Button (2022) as one of the most important factors that affects the demand for transport. The pecuniary value of travel time savings in transport was addressed by Bruzelius (1979) and a large literature demonstrates how it is possible to make estimations on the time value based on surveys using both stated and revealed preference approaches. The role of quality is principally accounted for by Spence (1975) and has recently been implemented in the regulation of transport markets by Clark, Jørgensen and Mathisen (2021). Empirical evidence also exists on this topic where one example is a comprehensive study by Balcombe et al. (2004) looking at demand effects for several transport modes by factors such as quality and time use in addition to price.

The insight that demand depends on a number of factors which can be related to a pecuniary value, leads to the concept of generalized costs which represent both strengths and weaknesses (see e.g., Wardman & Toner, 2020). In an operationalization of this concept, Hanssen et al. (2012) combine the sum of pecuniary costs (ticket price) and non-pecuniary costs (time use) in a general model. Additional elements have later been introduced such as the concept of risk and corresponding expected pecuniary effects of damage (e.g., Bardal and Mathisen, 2019) and more intangible elements of taste and preferences (Button, 2022). The latter element would consider the recent move towards the use of environmentally friendly alternatives even though they might be more expensive and imply higher time use or of lower quality. This generalized cost term, which is also referred to as total costs, is argued to be what is forming the basis of the demand functions in the economic models.

Generalized transport costs provide valuable insight for regulatory authorities wishing to manage the market so that external costs are also taken into consideration. Hanssen et al. (2012) argues that if one transport solution is to be preferred over another, then the generalized transport cost must be lower. Then customers in the market will find this solution most attractive, at least when the assumption of rational individuals is taken as a basis. To evaluate two transport solutions against each other, one will then look at differences in elements related to all factors and find conditions for what is needed for one alternative to be preferred over another. Hence, in order to make environmentally friendly alternatives preferred to the traditional fossil fuel private vehicles, they must provide higher utility for users in terms of time use, quality (comfort), price, service and security in addition to the pecuniary (cost) elements of ticket prices, toll fees or petrol consumption.

1.3. Aims

The SALOMON project aims to increase the percentage of employees, patients, and visitors that travel to/from the hospital in Novo mesto by environmentally friendly transportation alternatives. Additionally, the project aims to raise awareness among employees and patients on more environmentally friendly mobility alternatives (e.g., regular, and electric bikes, e-scooters, electric vehicles (EV), pedestrian routes, buses, trains, or car-sharing) that they can use while traveling to/from the hospital. To achieve the goals of the SALOMON project, a survey study and focus-group interviews were conducted.

The aims of the survey were 1) to find out the current travel patterns among GHNM staff and patients/visitors, 2) to examine attitudes, social norms, intentions, and perceived barriers related to sustainable transport mode use and 3) to explore the importance of different factors for public and active transport by using the Importance-Performance Analysis (IPA) framework.

The main aim of the interviews was to understand the perspectives and approaches of important stakeholders, such as municipality, hospital, and bus operators, towards barriers, measures, and limitations related to increasing use of sustainable transport modes in Novo mesto.

2. METHOD

A survey and focus-group interviews, which are described below, were used as research methods in the project. We first started with a survey to get information from a large group of respondents (patients, visitors, and hospital staff) and then conducted focus-group interviews with a small group of critical stakeholders to enrich our survey results. By combining a survey with focus-group interviews we aimed to use methodological triangulation to answer the research questions of the project in a more comprehensive way.

2.1. Survey

An online survey was used to collect data from hospital staff, and patients/visitors at General hospital Novo Mesto during February, March, and April 2023. Microsoft office tools were used to create the survey. A total of 1200 employees were reached by email and invited to participate in the survey. Only 146 employees responded to the survey with around a 12 % response rate. In addition, the link to the survey was shared on the websites of pharmacies, health centers, municipality, and administrative units to reach out to potential patients and visitors. To reach a higher number of respondents, a small group (15 people), especially older respondents, were approached at the hospital and invited to respond to the survey with the help of some research assistants. Participation in the survey was voluntary and all the respondents were assured of confidentiality and anonymity of their responses before starting the survey.

2.1.1. Sample characteristics

There were a total of 279 respondents including 146 hospital staff and 133 patients/visitors. Since patients and visitors visited the hospital only occasionally and were fewer in number, they were merged into the same group. Sample characteristics can be seen in Table 1 which demonstrates that the two groups are similar in most categories. Most of the respondents were female in both groups and patients and visitors had a slightly higher average age (48.4) than the hospital staff (44.1).

Table 1. Sample characteristics

	Hospital staff (n = 146)	**Patients & Visitors** (n = 133)
Gender (%)		
Male	18.5	25.6
Female	81.5	74.4
Age (Mean)	44.1	48.4
Education(%)		
Elementary school	0.7	1.5
High school	24.0	27.8
Higher vocational education	29.5	14.3
University and higher	45.9	56.4
Monthly income (%)		
Up to 1000 EUR	18.3	20.9
1000-1500 EUR	34.1	35.7
1500-2000 EUR	23.0	30.4
2000 EUR or more	24.6	13.0
Occupation (%)		
Employed	100	81.2
Unemployed	0.0	3.8
Student	0.0	0.0
Retired	0.0	15

In both groups, almost half of the respondents had a university or higher level of education, while the proportion of respondents having a higher vocational education was almost double among the hospital staff compared to the patients and visitors. Also, the proportion of respondents having a higher monthly net income (2000 euro or more) was much higher among the hospital staff than among the patients and visitors. Finally, the majority of the patients and visitors were employed, while 15% were retired and 3.8 % were unemployed.

2.1.2. Questionnaire

A questionnaire was developed to measure the respondents' current travel patterns and opinions about different aspects of sustainable travel modes, perceived barriers against using different travel modes, and finally factors that would encourage them using more sustainable travel modes. Most parts of the questionnaire were responded to by all the respondents; however, a small number of questions or items targeted only hospital staff or patients/visitors.

The first section included questions measuring the use frequency of different travel modes (e.g., petrol/diesel car, bus, train, walking) to identify the current travel patterns among the respondents. Also, there were some questions to gather some background information, such as distance to the hospital, parking location, and working schedule (for the staff). The second section included a scale measuring some psychological variables, which were attitudes, subjective norms, descriptive norm, intention, and habit related to use of sustainable travel modes. These variables were chosen based on the Theory of Planned Behavior framework. Respondents were asked to rate the items using a 5-points Likert type scale (1= completely disagree, 5=completely agree). The third section included three scales to measure perceived barriers against using public transportation (e.g., infrequent services), active travel modes (e.g., lack of safe walking and cycling routes), and carpooling (e.g., not knowing colleagues who are willing to carpool). For each scale, relevant factors were listed, and respondents were asked to indicate to what extent these factors hinder them from using the mentioned travel mode (1=not at all, 5=to a large extent). The next section included two questions. In the first question, respondents were given a list of factors that would encourage them to replace car use with more environmentally friendly transport modes (e.g., increasing the frequency of public transport services, improving cycling facilities at work) in the future and asked to choose among these factors. The second question asked the respondents which transport options they would use in the future to replace personal car use; they were again asked to choose from a list including different travel modes. Finally, there were some questions measuring demographic profile (e.g., age, gender, education) and vehicle and bike ownership of the respondents.

2.1.3. The Importance-Performance Analysis / Methodological Framework

To study the possibilities of transition towards more sustainable transport solutions at the GHNM we used the Importance-Performance Analysis (IPA) framework (Martilla and James, 1977), which is an approach originally developed to study the efficiency of marketing programs and later applied in other contexts such as evaluation of training programs (Siniscalchi et al., 2008), and sustainable transport alternatives (Hanssen and Hasan, 2023). The applicability and reliability of the IPA method have been tested in various contexts (see e.g., review by Magal et al., 2009).

In the IPA approach, first, the indicators to be measured are identified. Then, two questions or statements are given to each respondent for each indicator in the questionnaire. The first statement measures importance and the second measures performance. In the analysis, average ranking (scores) for the indicators concerning both importance and performance are compared. Traditionally the average scores are plotted in a two-by-two table (the IPA matrix) with degree of importance on the X-axis and degree of performance on the Y-axis. This gives a positioning of all indicators in four quadrants indicating which attributes

one should focus more on, and which are less important to develop further. An alternative IPA map is illustrated in Figure 2, where an Iso-rating line is introduced. The 45-degree upwards-sloping Iso-line represents a perfect balance between importance and performance and a zero-performance gap (e.g., Magal et al. 2009). The reasoning is that this line represents a situation where importance equals performance, and if there are any deviations from this situation it would indicate a need for change in strategy. In the following analyses we have applied the Iso-line approach since it is more robust in the conclusions compared to the traditional quadrant model where policy recommendations could change by only small changes in the importance and performance values.

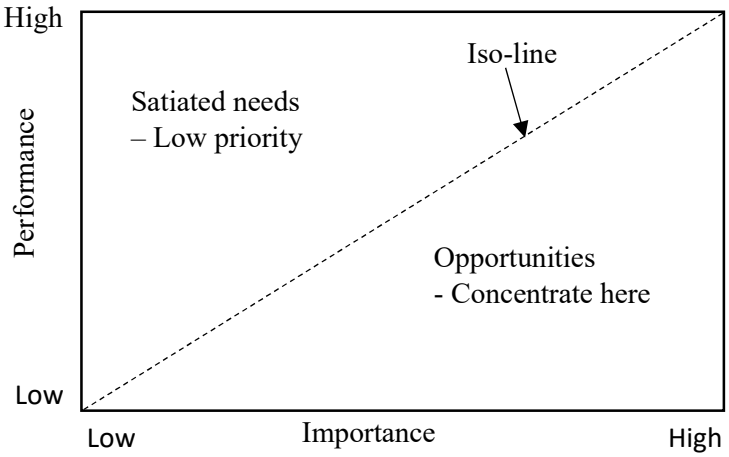

Figure 2. IPA map with Iso-line indicating balance between importance and performance (based on Hanssen and Mathisen, 2018).

2.2. Focus group interviews

2.2.1. Informants

There were five informants who represented five different organizations, which were Development centre Novo mesto, General Hospital Novo mesto, Bus Operator (Arriva), Novo mesto Municipality (Traffic Division), and the Association for Elderly People in Novo mesto. Organizations and informants were selected based on their relevance and importance for sustainable mobility plans in Novo mesto. They were invited to the interviews by email or phone.

2.2.2. Interview guide and data collection

A total of seven topics were asked to the informants. The questions covered several main topics which were: 1) challenges or issues associated with primary modes of transport used in the hospital area, 2) advantages and disadvantages of using different transport modes, 3) connectedness of the hospital area to surrounding settlements or regions, 4) key areas that need to be focused on to have a sustainable mobility plan for the hospital, 5) best strategies to develop a successful cooperation between different stakeholders to achieve a well-functioning sustainable mobility plan, 6) specific demographic groups or populations that face unique mobility challenges in the area and how can the mobility plan address their needs and ensure inclusivity, and 7) priorities, suggestions, and goals for improving sustainable mobility in the area. The focus-group interviews were conducted in a meeting room at Development Centre in Novo mesto, a moderator guided the group discussion based on a set of questions sent to the informants prior to the meeting.

3. RESULTS

3.1. Survey results

3.1.1. Vehicle ownership, distance to the hospital, and parking possibilities

As it can be seen in Table 2, both hospital staff and patients/visitors have a similar profile in terms of car and bike ownership. As expected, a majority of the respondents in both groups owned a car, which was a petrol/diesel car almost in all cases. Only a small percentage of the respondents in both groups (5%) reported having a battery electric car or a hybrid car. Similarly, most of the respondents reported having a bike, which was a regular bike in most of the cases followed by a small proportion of electric bikes. The percentage of respondents owning an electric bike was considerably higher (6.5%) among the patients and visitors than the hospital staff (3%).

Table 2. Vehicle ownership, distance to the hospital, and parking place

	Hospital staff (n = 146)	**Patients & Visitors** (n = 133)
Car ownership (%)		
Yes	83.6	86.5
No	16.4	13.5
Car type (%)		
Petrol/diesel car	93.4	95
Battery electric car	2.5	2.5
Plug-in hybrid	1.6	0.0
Hybrid	2.5	2.5
Bike ownership (%)		
Yes	67.8	69.9
No	32.2	30.1
Bike type (%)		
Regular bike	93	88.2
Electric bike	3	6.5
Both	4	5.3
Distance between home and hospital (%)		
0-2 km	15.1	15.0
2-7 km	21.2	27.8
7-15 km	18.5	17.3
15 and more	45.2	39.8
Parking place (%)		
Hospital parking lot for the staff	100	NA
Hospital parking lot for patients/visitors	NA	74
Public space	0.0	20.1
Private parking lots	0.0	5.9

In terms of distance between home and the hospital, the most frequent category of the respondents in both groups reported 15 km and more, while around 15% in both groups reported that distance between their home and hospital was only up to 2 km. Thus, this finding indicates that most of the respondents live in an area where using a motor vehicle (e.g., personal car, bus) is more likely to be essential to travel to the hospital. Finally, regarding the parking place the results show that all the staff traveling to the hospital by car park their cars at the parking lot reserved for the hospital staff. Similarly, most of the

patients/visitors (74%) park their car at the reserved parking lot for patients and visitors, while some (20.1%) park at the public spaces around the hospital, and a small group (5.9%) parks at private parking lots. It seems like the hospital provides enough parking possibilities for the hospital staff, while it is more limited for patients and visitors.

3.1.2. Frequency of different travel mode use

Figure 3 shows the number of hospital staff using different travel modes to travel to/from the hospital in a typical week. Most frequently used travel mode for the hospital staff was petrol/diesel car, followed by walking and carpooling. The majority of the staff (74%) reported using a petrol diesel car 5 days or more in a week, followed by 3.4% 2 days in a week, and 5.5.% 1 day in a week. Almost 20% reported walking to the hospital and 13.1% reported carpooling some days in a week. Thus, the frequencies of walking and carpooling were much less compared to the car use. On the other hand, only a few respondents reported using other travel modes, such as bus, train, and bike. In terms of bike use, no one reported using an electric bike and only one person reported using a shared bike, while around 5% reported using a regular bike to travel to the hospital. Also, almost no one combined different travel modes while traveling to/from the hospital.

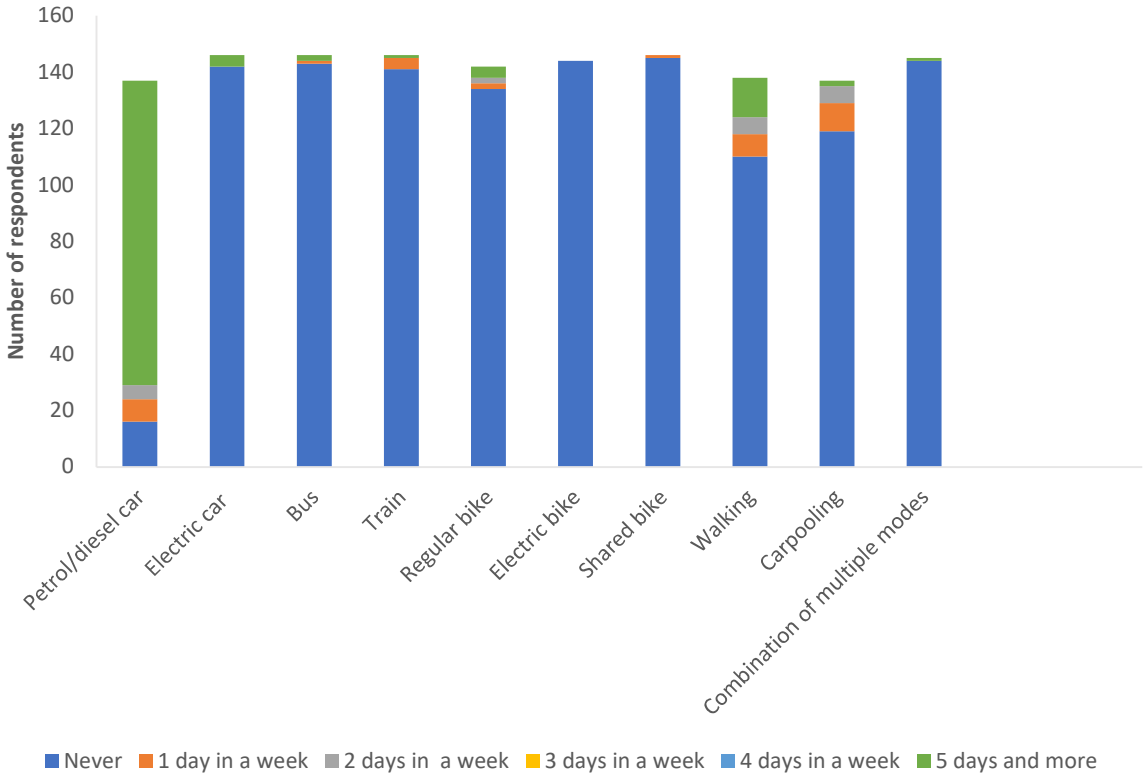

Figure 3. Travel mode use frequency for hospital staff

Figure 4 shows the number of patients/visitors using travel mode use to travel to/from the hospital. It should be noted that the frequency of travel mode used for the patients and visitors was not measured on a weekly basis as they do not come to the hospital as often as the staff. Like the hospital staff, the majority of the patients and visitors use a petrol/diesel car when they travel to the hospital. 65.4% reported using a petrol/diesel car always, while 20.3% reported often, 3% occasionally, and 7.5% rarely. Walking followed by patient transport (i.e., special cars for transporting patients) were the next most frequently used travel modes among the patients and visitors. Almost half of the patients and visitors reported walking to the hospital and almost 30% reported using patient transport at some frequency.

The least frequently used travel modes were shared bike followed by taxi and electric car. Although travel patterns for hospital staff and patients/visitors show big similarities, compared to the hospital staff proportion of patients and visitors using walking, bus, train, and combination of different travel modes are higher.

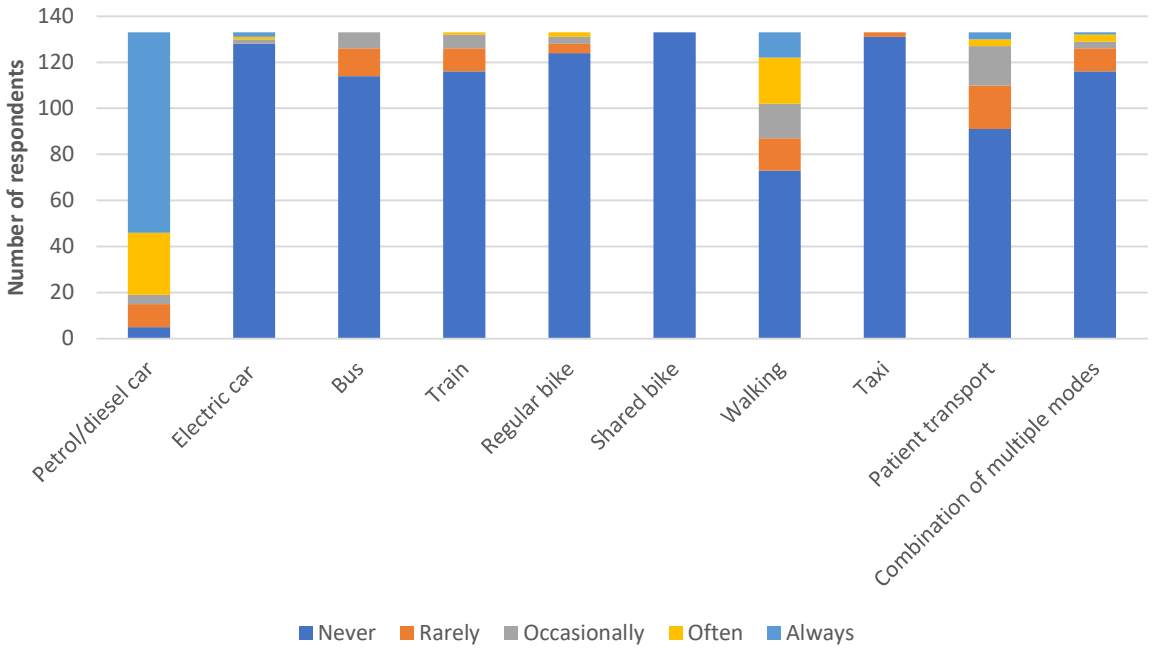

Figure 4. Travel mode use frequency for patients/visitors

3.1.3. Differences in the travel mode use frequency according to gender, age, and home-hospital distance

Cross-tabulation analyses were run to see whether travel mode use frequency of the participants differ according to these variables: age, gender and distance between home and hospital.

Both for the hospital staff, and patients/visitors there were no significant age differences, whereas there were some significant differences in terms of gender and home-work distance. Compared to female hospital staff (7.1 % report walking 5 days or more in a week) male staff walk more often (23.1% report walking 5 days or more in a week) when traveling to/from the hospital. Also, 4% of the male staff reported combining different vehicles in hospital trips whereas none of the female staff reported using multiple vehicles. Regarding the distance results show that as expected the distance between home and the hospital decreases hospital staff walk to the hospital more often and use their car less often. It seems that especially those who live within 2 kilometers' distance to the hospital use their car least and walk to the hospital most often.

Similar to the hospital staff, patient and visitors walk to the hospital more often and use their car less often as the distance between their home and the hospital decreases. In addition, patients and visitors living within 2-7 km followed by 7-15 km distances within the hospital use patient transport services significantly more often compared to those living in a distance less than 2 km or more than 15 km. The only significant gender difference was observed in car use; male patients and visitors use their personal car significantly less often (41.2 % reported using always) than female patients and visitors (73.7 % reported using always).

3.1.4. Attitudes, social norms, and intention related to the use of sustainable transport modes

Figure 5 shows the mean scores for the items measuring attitudes, social norms, and intentions related to the use of sustainable modes both for the hospital staff and patients/visitors. Items were measured using a 5-point scale (1=completely disagree, 5=completely disagree). Overall, the respondents in both groups gave similar ratings to the items.

In terms of attitudes towards different aspects of sustainable transport options, items that were most agreed by the respondents in both groups were the ones related to the health benefits of active travel modes, followed by items related to benefits of sustainable transport options for environment and reducing traffic congestion, and time-consuming aspect of public transportation. On the other hand, the least agreed items were related to the adequacy of public transport connections and the ease of cycling to the hospital. Thus, these findings indicate that although the respondents highly believe in the health and environmental benefits of using sustainable transport options, they find using them difficult due to some problems, such as infrequent and time-consuming public transport services. In addition, there were two items measuring only hospital staff's attitudes towards the hospital management's approach to sustainable mobility. The first item which was related to too few incentives used for sustainable mobility at the hospital was more agreed than the second one which was about the lack of priority of sustainable mobility for the hospital management. Mean scores for these items were relatively high indicating that hospital staff do not think that sustainable mobility is a prioritized topic at the hospital.

Regarding social norms, the subjective norm item ("My family and friends support me for using sustainable transport options") was rated more favourably than the item measuring descriptive norm ("Most of my colleagues at the hospital use sustainable transport options") for the hospital staff. This indicates that although the hospital staff receive support from their family and close friends for using sustainable transport options, they do not see enough examples of colleagues using sustainable transport options at the hospital. Variables related to subjective norm were rated more favorably among the patients/visitors than the hospital staff. Finally, the intention to use sustainable transport modes was measured with one item ("I plan to use sustainable transport options more often in the future") and it was rated at a medium level by both groups indicating neither a weak nor strong intention.

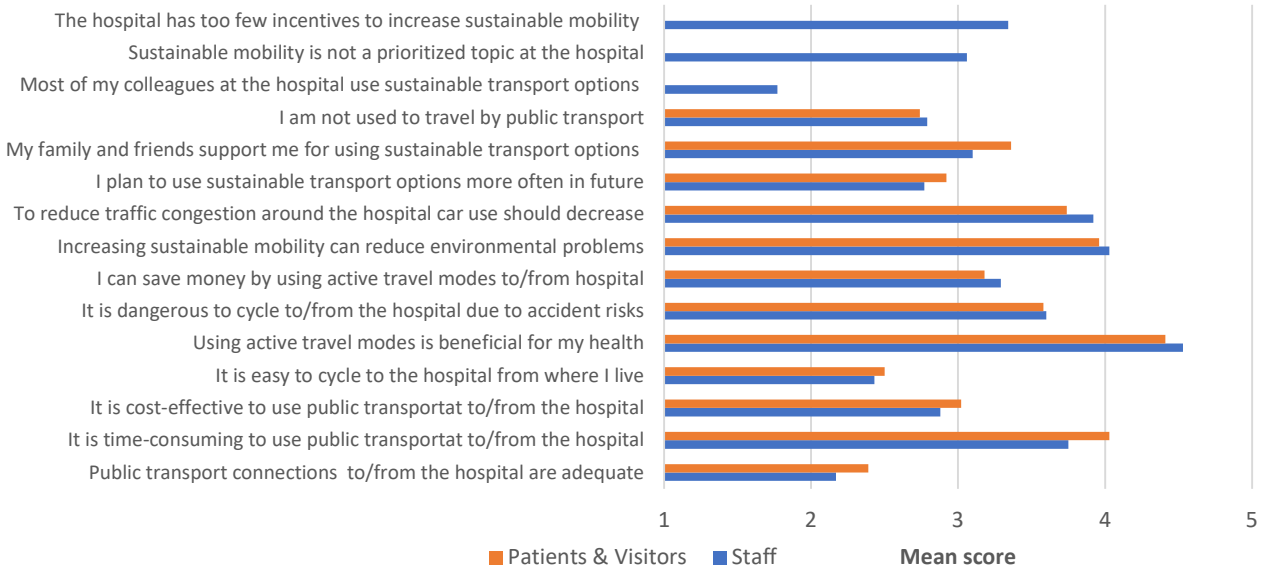

Figure 5. Mean scores for attitudes, subjective norms, and intention related to sustainable mobility

Examination of gender and age differences in opinions related to sustainable mobility shows that there are some items that have significantly different ratings according to gender and age. Hospital staff who are below 45 years old have overall more negative ratings of attitude, norms, and intention items than those who are above 45 years old. They especially report weaker descriptive norms (example of others using sustainable transport) and belief in the environmental benefits of sustainable transport. In terms of gender, women agree with the environmental benefits of sustainable transport more than men.

Among the patients and visitors, women find public transportation more time-consuming, and cycling to the hospital more difficult and they report weaker subjective norm (approval and support from close others) compared to men. No significant age difference was observed in the ratings of the items.

3.1.5. Perceived barriers against using sustainable travel modes

In this section respondents' ratings for barriers related to different travel modes (public transportation, active travel modes, carpooling) are reported. The respondents were asked to indicate to what extent they perceive these factors as barriers against using different travel modes using 5-points Likert type scale (1=not at all, 5=to a great extent). Barriers against carpooling were measured only for the hospital staff as it is more applicable option in a workplace setting.

Figure 6 shows the mean scores for the perceived barriers against public transport. Infrequent public transport services, followed by lack of flexibility with travel times and lack of possibility to combine with other activities, such as shopping and delivering children to school, appear as the highest barriers against public transport use in both groups. For the hospital staff, working the night shift was also reported as one of the highest barriers. On the other hand, traffic accident risks, followed by risk of harassment/unpleasant incidents and lack of comfort appear as the lowest barriers for both groups. Overall, both groups gave quite similar ratings for the items; however, it appears that compared to the patients/visitors, hospital staff reported delays with public transport, infrequent public transport services, long distances to the public transport points, and long travel time as bigger barriers. These findings can be explained by the fact that hospital staff need to travel to the hospital regularly and they have a strict time schedule that they should follow; therefore, how much time they need to use for transport is a more important criterion for them.

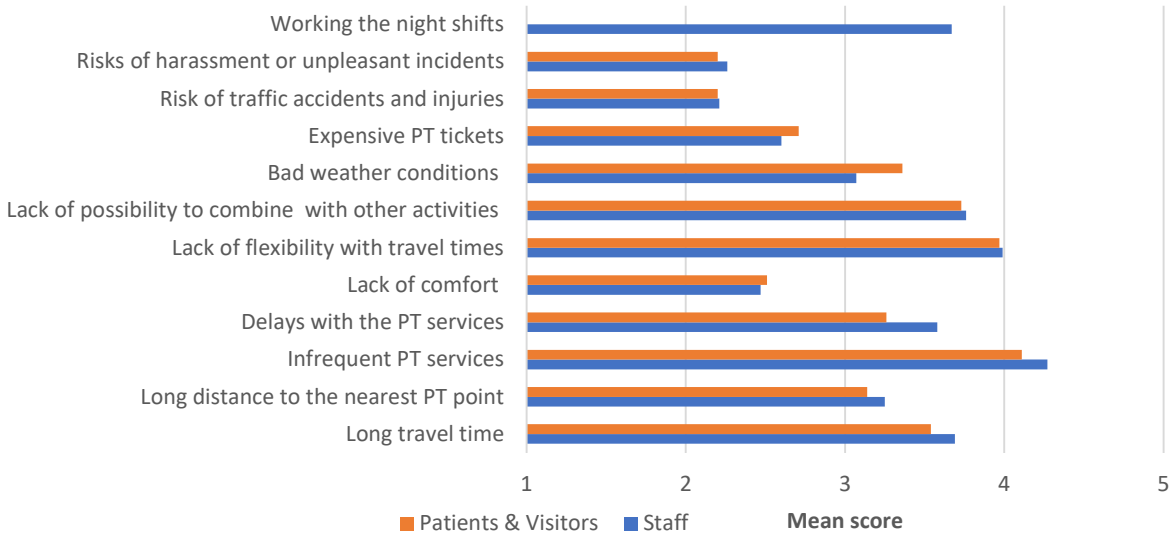

Figure 6. Mean scores for barriers against using public transport (PT)

Figure 7 shows the mean scores for the perceived barriers against active transport, which were cycling and walking. Bad weather conditions (e.g., rain, snow), followed by long travel time, lack of cycling and walking routes, and working night shifts (only for staff) were among the highest rated barriers, whereas risk of harassment/unpleasant incidents and lack of bike renting possibilities were among the lowest rated barriers for both groups. Not surprisingly, health problems and physical discomfort were reported as bigger barriers among the respondents including patients, who are more likely to have some physical limitations that make walking or cycling more difficult for them. Also, compared to patients/visitors, hospital staff rated the lack of safe walking and cycling routes and the lack of cycling facilities (e.g., secure bike shelters) as bigger barriers.

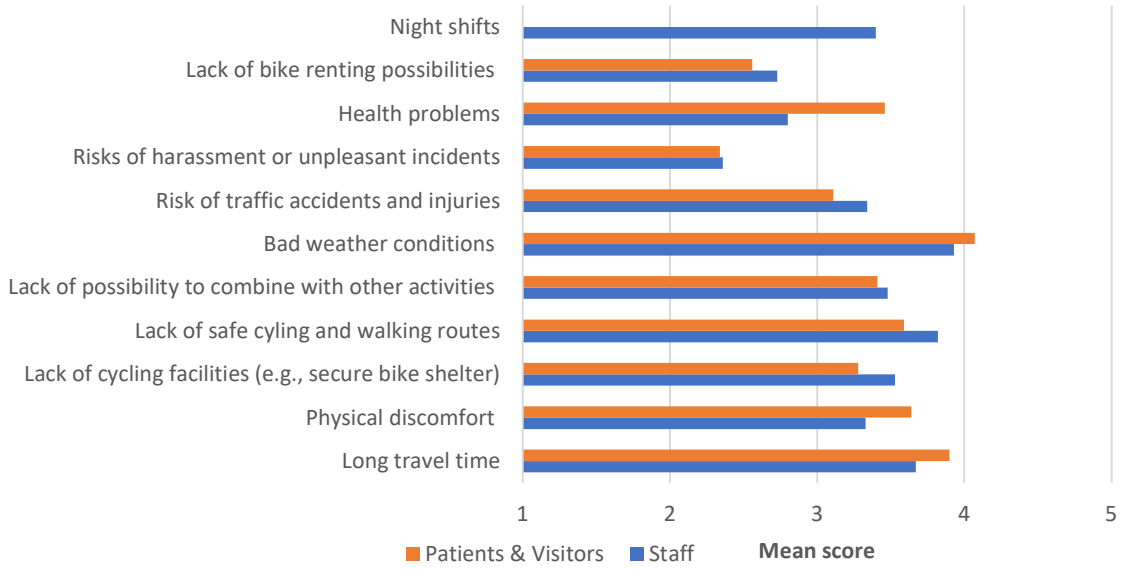

Figure 7. Mean scores for barriers against using active transport (AT)

Figure 8 shows the mean scores for the perceived barriers against carpooling among hospital staff. Not knowing colleagues who want to carpool, lack of flexibility with travel times and lack of incentives at the hospital, such as organizing partner-matching programs/apps, appear as the highest barriers. On the other hand, personal reasons, such as safety and hygiene, appear as the lowest rated barrier. These findings indicate that to increase carpooling the staff need support from the hospital management to get more familiar with carpooling and especially for matching with colleagues who are willing to carpool.

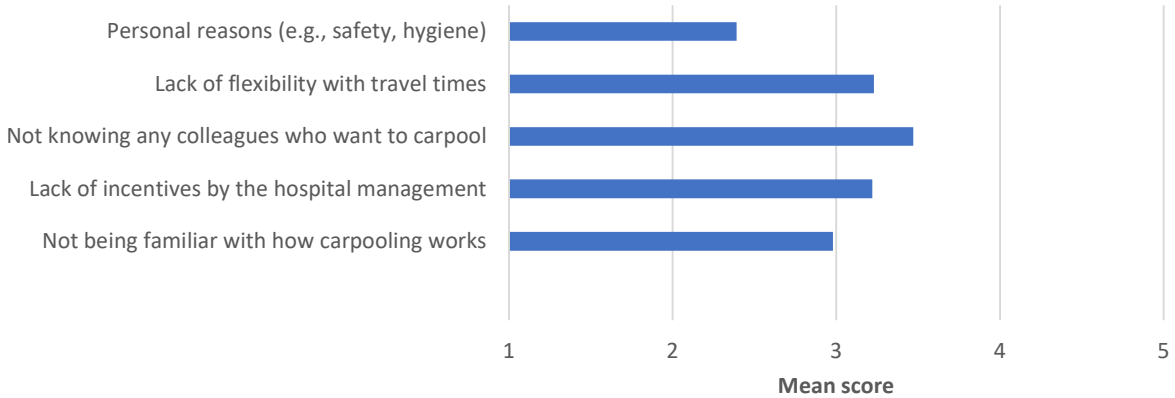

Figure 8. Mean scores for barriers against using carpooling

Among the hospital staff, compared to men women perceive barriers related to cycling, such as lack of safe routes and cycling facilities at work, stronger and they agree with the environmental benefits of sustainable transport more. In terms of age, hospital staff below 45 years old agree with the environmental benefits of sustainable transport less and they perceive time-related barriers of public transportation (e.g., travel time and delays) as stronger compared to those above 45 years old.

Among patients/visitors, overall compared to men women perceive barriers against public transportation and active transport as stronger, especially aspects related to time use and convenience. In terms of age, those above 45 years old perceive health problems and the possibility of being involved in traffic accidents as bigger barriers against bike use compared to those below 45 years old. Also, they perceive traffic accident risk as a significantly stronger barrier against using public transportation.

3.1.6. Factors that can increase sustainable transport use

The respondents were asked to choose factors that would encourage them to use more environmental-friendly travel modes, such as public transportation and cycling, instead of personal car. Figure 9 shows the number of respondents that chose each factor. It was possible to choose multiple factors.

More frequent public transport services were clearly the most frequently chosen factor that could increase sustainable travel modes for both groups, especially for the patients and visitors. For the hospital staff, improvements in cycling routes and cycling facilities at the hospital, followed by having more flexible working hours were among the most frequently chosen factors. For the patients and visitors, improvements in cycling and walking routes and better patient transport services were among the most frequently chosen factors. Overall, compared to patients and visitors, higher numbers of hospital staff chose improvements in cycling and walking routes and cycling facilities as factors that could increase the use of sustainable travel modes. Increased car parking fees were the least frequently chosen factor by both groups. The findings indicate that to increase sustainable mobility introducing pull factors, such as making improvements in the existing public transport services, is more essential than introducing push factors, such as increasing parking fees and reducing parking spaces.

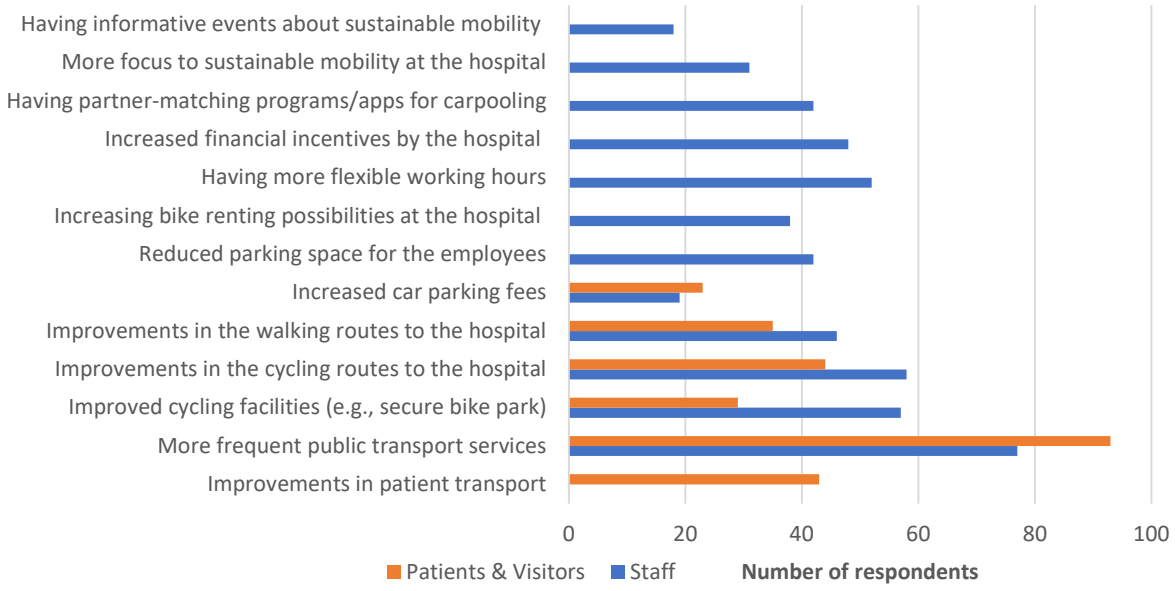

Figure 9. Factors that can increase sustainable transport

3.1.7. Future transport choice

Finally, the respondents were asked what transport option they would use instead of petrol/diesel car in the future. Figure 10 shows the number of respondents choosing different options. For the hospital staff, the most frequently chosen transport option was regular bike followed by bus, carpooling, walking, and electric bike. For the patients and visitors, the most frequently chosen transport option was the bus, followed by regular bike, carpooling, train, walking, and electric bike. Very few respondents chose electric cars in both groups. Overall, it appears that bus use and cycling have the biggest potential to replace personal car use in the future for both groups.

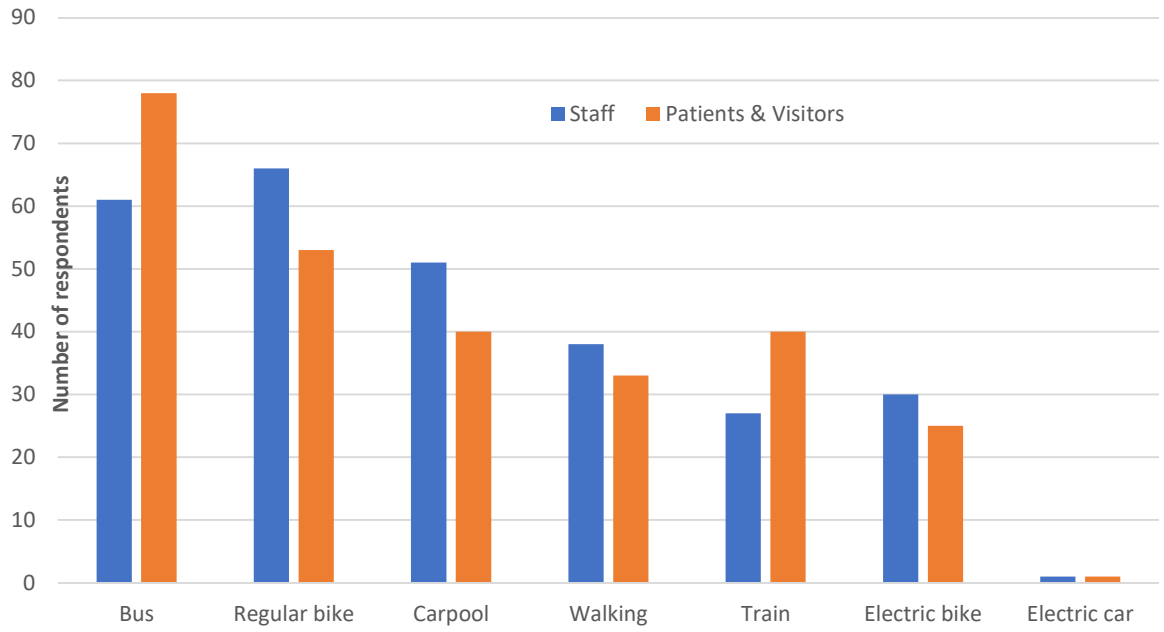

Figure 10. Replacement for petrol/diesel car

3.2. Important-Performance Analysis Results

Ideally, a survey would ask respondents to rate the importance (I) and performance (P) of each factor on a fine-graded scale. Due to strict limitations on the number of questions that could be given to the respondents, it was not possible to obtain such an approach in this survey. This was because of three reasons: 1. we addressed several types of alternative transport modes (required much time to have a full set of questions for each mode), 2. respondents completed the survey at the hospital (did not complete the survey at home with as much time as they wanted) and 3. data were collected to be used both for the IPA framework and theory of planned behaviour (which involve some common compromises to allow for use of the variables in both frameworks). Still, we believe that the results are sufficiently detailed to provide some insight.

Because of the limitations in the survey, we have measured importance (I) and performance (P) indirectly. As a proxy for importance, we have used respondents' attitudes towards different aspects of sustainable transport. This dimension relates to general expectations and was limited to aggregated categories. For performance, we used respondents' perceived barriers which fits well since it is a measure based on real experiences.

Results on the importance and performance for public transport are presented in Table 3 for the two groups "staff" and "visitors/patients". The factors are sorted according to the performance for the staff group. Moreover, a gap analysis derived by subtracting performance from importance is included in two columns to the right in Table 3. This means

that a negative value is perceived as a good thing since it represents a situation where performance is better than importance.

Table 3. Ranking of importance and performance for the use of public transport

	Importance (I)		Performance (P)		Gap (I-P)	
Factor	**Staff**	**Visitors/ Patients**	**Staff**	**Visitors/ Patients**	**Staff**	**Visitors/ Patients**
Accident	2,14	2,39	3,79	3,80	-1,65	-1,41
Harassment	2,14	2,39	3,74	3,80	-1,60	-1,41
Comfort	2,14	2,39	3,53	3,49	-1,39	-1,10
Cost	2,88	3,02	3,40	3,29	-0,52	-0,27
Weather	2,14	2,39	2,93	2,64	-0,79	-0,25
Distance	2,14	2,39	2,75	2,86	-0,61	-0,47
Delays	3,75	4,03	2,42	2,74	1,33	1,29
Time use	3,75	4,03	2,31	2,46	1,44	1,57
Combine	2,14	2,39	2,24	2,27	-0,10	0,12
Flexibility	3,75	4,03	2,01	2,03	1,74	2,00
Frequency	3,75	4,03	1,73	1,89	2,02	2,14
Total average	2,79	3,04	2,80	2,84		

It is evident from Table 3 that the two groups of passengers in general agree on both importance and performance of the different factors. The grand average importance for all factors is 2.8 for staff and 3.0 for visitors/patients, indicating that the last group is marginally more satisfied with the current services. The two groups have the same average value for performance, but there are differences for example by staff evaluating weather higher than the other group.

There are substantial differences when it comes to the gap between importance and performance. The main areas of improvements seem to be for the factors having the highest importance scores. Factors such as Delays, Time use, Flexibility and Frequency all score around 4 on importance while at the same time is assessed as having the worst performance with scores around 2.5 or lower. Hence, the gaps are very high for all these factors with Frequency at the top. Oppositely, factors with low importance such as Accidents, Harassment and Comfort which are less important have very high performance and the gap goes the other way around. The remaining factors have only minor differences between importance and performance and there are only negligible differences between the two respondent groups.

The importance and performance scores for active transport modes are presented in Table 4 (sorted according to performance for staff). Note that the results are not directly comparable with what we found for public transport in Table 4 since several factors are different.

Table 4. Ranking of importance and performance for the use of active transport modes

	Importance (I)		Performance (P)		Gap (I-P)	
Factor	**Staff**	**Visitors/ Patients**	**Staff**	**Visitors/ Patients**	**Staff**	**Visitors/ Patients**
Harassment	3,60	3,58	3,64	3,66	-0,04	-0,08
Bike rent	2,43	2,50	3,27	3,43	-0,84	-0,93
Health	4,53	4,41	3,20	2,54	1,33	1,87
Comfort	2,43	2,50	2,67	2,36	-0,24	0,14
Accident	3,60	3,58	2,66	2,89	0,94	0,69
Combine	2,43	2,50	2,52	2,59	-0,09	-0,09
Facilities	2,43	2,50	2,47	2,72	-0,04	-0,22
Time use	3,75	4,03	2,33	2,09	1,42	1,94
Safe routes	3,60	3,58	2,18	2,41	1,42	1,17
Weather	2,43	2,50	2,07	1,93	0,36	0,57
Total average	3,12	3,17	2,70	2,66		

For active transport modes, the average scores show very small differences between the two respondent groups. In general, the two groups agree on which factors are important and how they perform. The average performance is lower than the average importance, which indicates room for improvement. In the same way, as for public transport, the most interesting aspect is given by the gap analysis. For Accident, Time use, and Safe routes, being three of the most important factors, the performance is very low which creates a large gap. In contrast, Harassment which is also one of the most important factors is performing very well and has virtually no gap. On the other side of the scale, we find Bike rent which outperforms the importance with a high margin and indicates that little need for further development of renting options for bikes. The remaining factors have more or less a performance score in line with the importance.

It should be noted that carpooling was not included under IPA mainly because there were too few variables measuring carpooling and carpooling was relevant only for the hospital staff.

IPA Charts

The IPA chart for public transportation (Figure 11) shows that both groups agree mostly on both the Importance and Performance of the factors. The most important factors to improve performance are, increasing order, Frequency, Flexibility, Time use, and Delays. Interestingly, both groups agree on the ranking of the factors. However, staff are generally less satisfied than patients/visitors while at the same time rating them as lower importance.

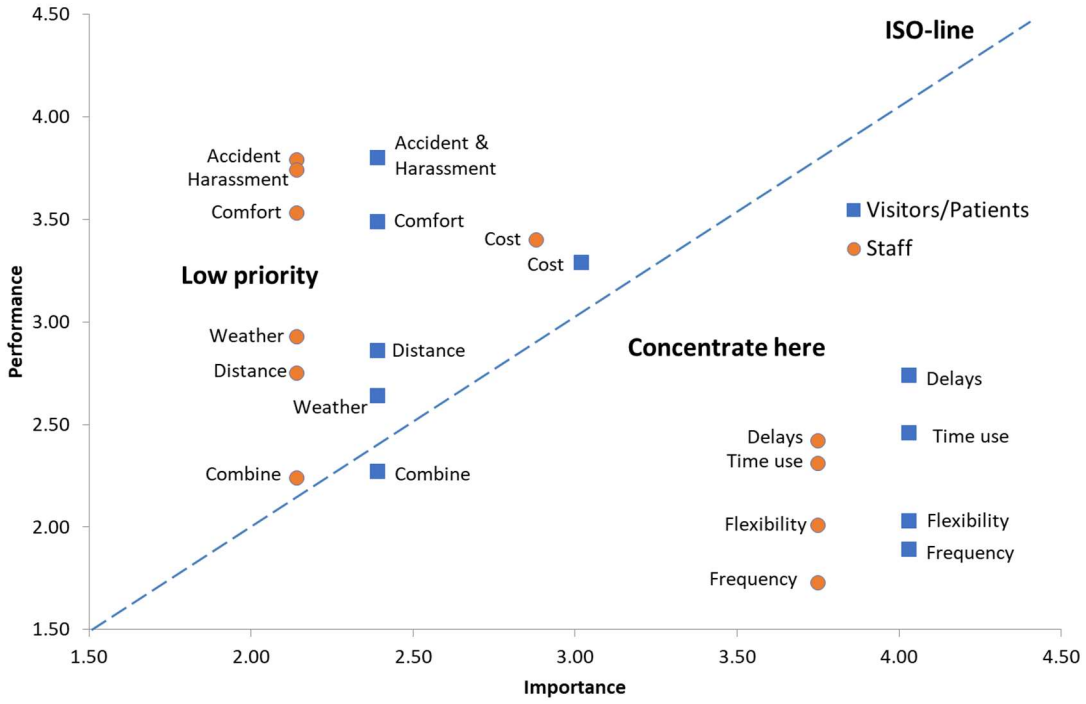

Figure 11. IPA chart with ISO-line for public transport (staff in boxes and visitors/patients in circles)

Figure 12 provides the IPA chart for active transport modes and for simplicity, the same legend is used in cases where the two groups have scores that are located close. Harassment is the only variable located in what would be classified as the upper left quadrant named “Keep up the good work”. Improvements should be concentrated on establishing safe routes for walking and cycling, reducing the probability of accidents and time use, and increasing focus on health benefits. Authorities are greatly represented as the main responsible for these factors. These elements are seemingly quite closely related where, for example, a measure of establishing dedicated lanes separated from road traffic would be safer, faster and encourage increased use which would have positive health effects. On the opposite side of the figure, we see that the availability of bicycles for rent is very high and further improvements do not seem to be necessary, at least not for transport to the hospital in case. There is not much to do with the weather, but any protective sheltering to improve conditions here is highly valued.

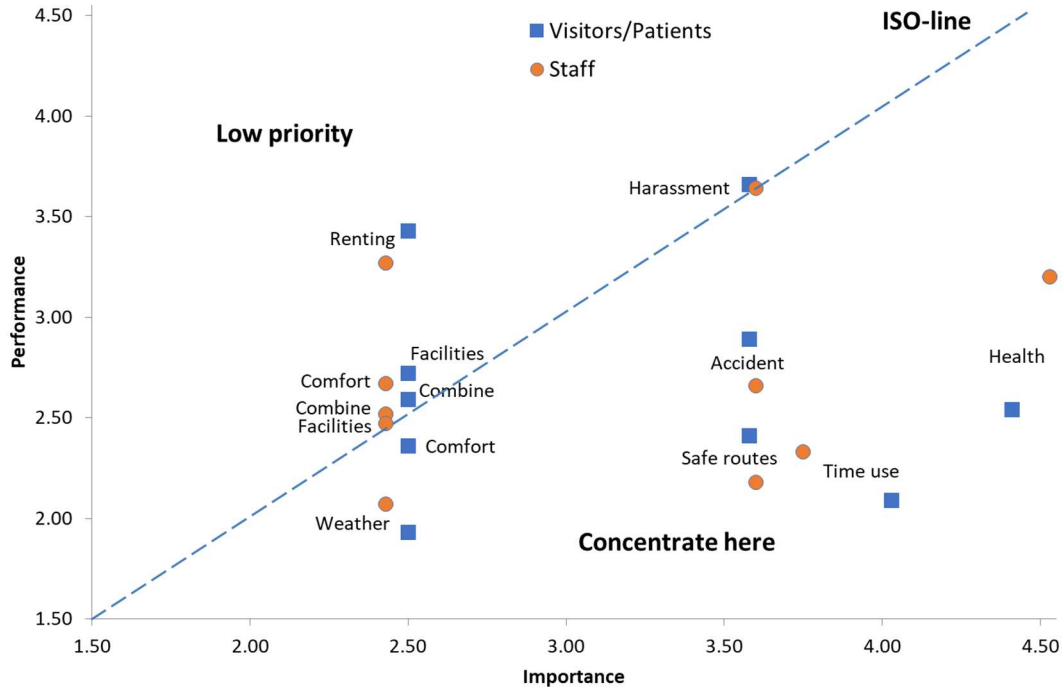

Figure 12. IPA chart with ISO-line for active transport (staff in boxes and visitors/patients in circles)

3.3. Focus group interview results

Based on the responses and common discussion of the informants four main themes appeared from the focus-group interviews. The first theme was about changing the traveler's mindset and habits. Informants agreed that some travelers do not want to use some sustainable modes of transport, such as cycling, because they perceive it less safe, and many prefer to use their private car due to comfort and time pressure. There is a need to change travelers' mindsets about sustainable transport use through promotional campaigns. The second theme was about the impact of the characteristics of the institution on the transport choice of travelers. Informants reported that since hospital trips are often urgent and critical people need as close and easy access as possible. Arriving at the hospital, especially from remote locations, is difficult but those coming from closer locations, especially younger, healthy, active travelers, should be the main target group for sustainable mobility. The third theme was about possible measures that can be used to increase sustainable mobility. Reducing car use by introducing some push measures (strict monitoring, expensive parking fees, fuel taxes, vehicle restrictions), increasing the frequency of inter-city public transport, charging parking fees according to the distance, creating passenger platforms for carpooling possibilities, and corporate reward programs for sustainable forms of mobility were among the common measures the informants mentioned. The final theme was about limitations in developing measures for sustainable transport. It was mentioned that public transport providers establish driving lines primarily according to the financial viability of such a measure (in any case they are subsidized by the state according to legislation). Also, sustainable transport options are less suitable for combining the purpose of travel (e.g., from home to kindergarten, school, then to work). Another limitation is related to the use of electric buses, they are rarely in use and not yet customized and convenient for carriers' standards. Finally, the fragmentation of information on available transport services by carriers as an obstacle was mentioned, and a common platform combining all information on available public transport seems necessary.

4. Discussion

This report summarizes findings from the survey study and focus-group interviews conducted within the SALOMON project. The results of the survey confirm that when traveling to the hospital traditional fossil-fueled cars are the most predominantly used transport mode by all the respondents, whereas sustainable transport options, such as public transport and bikes, are rarely or occasionally used. These findings clearly indicate the need to take some actions to reduce car use on hospital trips which can help to reduce traffic congestion, environmental problems, and traffic accidents around the hospital, which is currently a high-traffic location.

In terms of psychological variables related to travel mode choice, both the hospital staff and patients/visitors reported positive attitudes regarding the health and environmental benefits of using sustainable transport options. However, they report less favorable attitudes regarding, especially the time-related (e.g., frequency of public transport services, delays), and safety aspects (e.g., traffic accident risks) of sustainable transport options. Also, the intention to use sustainable transport options was relatively weak. Thus, findings indicate that although the respondents strongly believe in the environmental and health benefits of sustainable transport options, they find it difficult to use them due to some practical and safety reasons.

Importance-Performance Analysis allowed us to show which factors are most critical and which factors have less priority for increasing sustainable mobility among the respondents. Regarding public transport for both staff and patient/visitor groups, frequency of public transport services followed by flexibility, time use in travel, and delays were the most important factors to improve performance. These findings are in line with the previous studies indicating the importance of having fast, frequent, and reliable transport services for public transportation use (Aruwajoye, 2020; Beirao & Cabral, 2007; Chakrabarti, 2017; Guzman et al, 2020; Rye, 1999). Although both groups gave quite similar ratings for the barrier items, hospital staff perceive especially time-related barriers as stronger, which can be explained by their regular trips to the hospital and strict schedule at work. How much time is spent when traveling to the hospital appears to be a very important factor for both groups, especially for the hospital staff. When it comes to active transport use, safe routes for walking and cycling followed by reducing the probability of accidents and time use were found to be the most critical factors to improve for both groups, which supports the previous studies showing accident and safety risks as one of the most common barriers, especially for cycling (e.g., De Souza et al., 2014; Piatkowski et al., 2015; Rérat, 2019).

Based on the IPA results, it is possible to discuss measures that can be initiated to increase the use of public and active transport modes in hospital trips. Table 5 shows possible measures and responsible actors who might take a role in the development of these measures to increase sustainable mobility in hospital trips. It should be noted that even though the transport companies have freedom in how they behave in the market, the responsibility cannot be fully put on them since they are operating within the national and local public regulations for passenger transport. Consequently, they must meet requirements that are exogenous to them and fulfill the criteria of subsidy contracts to obtain funding. Hence, an improvement of these factors would need to be developed in cooperation between transport companies and the subsidizing body of the transport authorities. Also, although IPA charts enable us to visualize which factors should be given priority, they do not include considerations of costs. In most situations, there are budget restrictions for all actors involved in the transport market. Hence, in line with the reasoning of marginal thinking in economic theory, measures for improvements must be taken where they make the most contribution for each additional unit of invested resources. Thinking in this way opens up several possible situations. First, it could be that overall frequency cannot be increased, but total performance can be improved by having more departures when it affects most passengers. Then resources could be spent in a better way for the same factor. Second, it could be that two or

more factors are alternatives in demand. For example, if increases in the number of departures (improving Frequency) are extremely costly relative to changing the ticket rules (improving Combine and Flexibility), it might be better to use scarce resources to improve the latter aspect. Another example would be where changing the routes could increase travel time but at the same time improve frequency at some stops. Similar reasoning is valid for the active transport modes.

Table 5. Possible measures to increase sustainable mobility in hospital trips

Factor	Mode *	Main responsible	Possible measures
Accident	AT, PT	Authorities	Infrastructure improvements for the transport network (e.g., bus stops, signs, speed limits, winter maintenance)
Combining multiple modes	AT, PT	Transport company	Ticket regulations
Comfort	AT, PT	Transport company	Improving quality and standard of vehicles
Cost	PT	Authorities	Reducing ticket price, subsidies
Delays	PT	Transport company	Better route planning, dedicated bus lanes
Distance	PT	Transport company	Better route planning
Facilities	AT	Hospital	Installing safe bike parks, showers
Flexibility	PT	Transport company	Ticket regulations, increased cooperation with other transport modes
Frequency	PT	Transport company	Providing more frequent departures
Harassment	AT, PT	Authorities	Campaigns, law enforcement
Health	AT	Authorities	Campaigns, infrastructure
Renting	AT	Hospital	Bike stands
Safe routes	AT	Authorities	Investments in safe walking and cycling routes
Time use	AT, PT	Transport company	Better route planning, improving infrastructure

* AT represents Active Transport (walking and cycling) while PT represents Public Transport

Findings from the focus-group interviews support the survey findings. All the informants agreed that the use of personal cars for traveling to the hospital is very widespread and there is a clear need for promotion and awareness of different sustainable transport options. Breaking strong car use habits and changing the mindsets of travelers towards using more sustainable transport modes is mentioned as one of the biggest challenges. Since it is a long and complicated process the change in travel habits must be planned in the long term. A combination of some push (e.g., increasing parking fees, fuel taxes, vehicle restrictions) and pull measures (e.g., corporate reward programs for sustainable forms of mobility) were suggested by the key stakeholders to increase sustainable mobility around the hospital. Also, increasing the frequency of inter-city public transport and improving cooperation between organizations for the planning and management of travel habits and mobility were mentioned as important steps towards increasing sustainable mobility.

The present report provides some useful findings that will be applied when developing a sustainable mobility plan for GHNM. The hospital has a plan to develop the outdoor area which is a perfect opportunity to make it more attractive for all users of the transport infrastructure to make sustainable choices. Constructing drop zones for those travelling with shuttle services and making some priority areas for patient transport could be prioritized by the hospital. In addition, making safe and efficient walking connections to the nearby bus and train stations and creating safe and protected bicycle parking areas with charging possibilities for electric bikes are suggested for increasing active travel use around the hospital.

Although the SALOMON project focuses on a specific hospital case, the findings from the project can also be applied to other large workplace contexts where there is a need for reducing private car use and promoting sustainable transport mode use among employees. Despite providing some useful findings, the survey study had also some limitations, such as having a relatively low sample size. Due to the time limit of the project and the tight working schedule of the hospital staff, it was not possible to reach a larger number of respondents. Another limitation might be that survey findings were based on self-reports of the respondents and thus may not reflect their actual behavior in all cases. Combining the survey method with direct observations can be a way to overcome this limitation in future studies. Our survey has focused on observable variables such as traffic volume and time use, but other indicators to include in future studies could be for example air quality and another emission that can be measured by sensors at selected locations. It should also be noted that the focus of this report has been on how to promote environmentally friendly alternatives but not make car use less attractive. However, it is expected that making environmentally friendly transport options more attractive by improving the conditions will lead to decreases in private car use. Future studies could also focus on specific factors and strategies to decrease private car use when traveling to/from the hospital. Finally, conducting a follow-up study in the future to see if there will be changes in mobility patterns of the hospital staff, patients, and visitors after the introduction of a sustainable mobility plan could be useful for evaluating the effectiveness of the mobility plan.

5. Conclusions

Based on the findings from the survey study and focus-group interviews some conclusion points are listed below:

- The vast majority of the respondents, especially hospital staff, are using their personal car to/from the hospital. Use of environmentally friendly transport modes, such as train, bus, and bike use, is very low, especially among the hospital staff. Thus, there is a clear need to increase the use of sustainable transport modes, such as cycling and public transport use, among the hospital staff, patients, and visitors of GHNM.
- No significant age difference was observed in terms of using travel modes to hospital; however, there were some significant gender differences. Compared to female respondents, male respondents reported that they walk and combine different vehicles more often when traveling to/from the hospital
- Shorter distance to the hospital increased the likelihood of walking to the hospital among the respondents. Those who live within 2 kilometers distance of the hospital use their car least and walk to the hospital most often.
- Overall respondents strongly believe in the health and environmental benefits use of public and active transport modes; however, they prefer to use them infrequently mostly due to the lack of frequent services/facilities and safety concerns.
- The intention to use more environmentally friendly transport options in the future is relatively weak, especially for hospital staff.
- Infrequent public transport services followed by a lack of flexibility with travel times and combining with other activities (e.g., shopping, delivering children to school) appear as the strongest barriers to public transport use among the respondents.
- Bad weather conditions, followed by a lack of safe walking and cycling routes and long travel time appear as the strongest barriers to active transport mode use (cycling and walking) among the respondents.
- Not knowing colleagues who want to carpool, lack of flexibility with travel times, and lack of incentives at the hospital, such as organizing partner-matching programs/apps, appear as the strongest barriers to the use of carpooling among the hospital staff.
- In terms of gender differences in perceived barriers, compared to male staff women staff perceive barriers related to cycling, such as lack of safe routes and cycling facilities at work, as stronger and they agree with the environmental benefits of sustainable transport more.
- In terms of age differences in perceived barriers, patients/visitors above 45 years old perceive health problems and the possibility of being involved in traffic accidents as bigger barriers against bike use compared to those below 45 years old.
- Most of the respondents report that providing more frequent public transport services and improving cycling connections & facilities could increase their use of public and active transport considerably more in the future.
- According to IPA results, frequency of public transport services followed by flexibility, time use in travel, and delays are the most important factors that need to be improved for increasing public transport use. On the other hand, safe routes for walking and cycling followed by reducing the probability of accidents and time use appear as the most critical factors that need to be improved for increasing walking and cycling.
- Focus group interviews indicate that critical stakeholders (e.g., representatives from the municipality, bus operators, and development center) perceive challenging strong car use habits and changing the mindset of travelers towards using more sustainable transport modes as one of the first steps towards increasing sustainable mobility in the area.
- Increasing the frequency of inter-city public transport and improving cooperation between organizations for the planning and management of travel habits and mobility are among the measures suggested by the stakeholders.

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