Time, Money, and Trips You Didn't Make:

Transport Problems from a Wider Angle

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Time, Money, and Trips You Didn't Make:

Transport Problems from a Wider Angle

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Abstract

Transport planning in its current format focuses primarily on solving congestion, assuming that congestion is a sign of a poorly functioning network and that a poorly functioning network, in turn, can be equated with transport problems. Since transport planning is focused on the prevention of system failures, it risks disregarding serious transport problems that cannot be captured by analyzing the state of the transport system.

In this thesis I aim to develop and validate a tool that will help to identify and evaluate the scale, depth, and scope of transport problems as they are experienced by various population groups. The proposed tool is a survey designed to identify transport problems from the users' perspective, specifying the issues that affect actual and desired travel and compromise people's ability to travel and reach desired destinations.

The research consisted of a survey conducted among 2010 respondents in four areas in the Tel Aviv metropolitan area. The developed survey consisted of three sets of questions related to: (1) difficulty in trip-making; (2) dependency on others for trip-making; and (3) trips forgone, i.e. trips that were not made due to transport-related problems. The respondents were asked to report on whether the trip difficulties and trips forgone were related to issues of time, physical difficulty, cost, or discomfort.

After receiving the results, reliability and validity of the survey were tested using Cronbach's Alpha, Principal Components Analysis, T-tests, ANOVA, and regression models. The validity tests showed that income, car ownership, disability, and young age (18–24) were significantly related to transport problems, while gender and geographical location were only partially linked to the reporting of transport problems. In contrast, parents and older respondents (65+) reported having less transport problems compared to non-parents and people of younger ages. These findings suggest that a substantial part of the questionnaire is suitable for the systematical identification of transport problems and difficulties across the population.

1. Introduction and Research Objective

1.1. Introduction

Much of policymaking is founded on the identification of problems. The prevalent approach to transportation planning defines transport problems as an overload on the transport network which occurs when the system is used by more people than it can comfortably accommodate. This overload appears as traffic congestion – the very issue with which transport planning is concerned or used to be concerned. The modern definition of transport planning is broader and attempts "to ensure the effective and efficient movement of people and goods" (Cervero et al., 2001; Shiftan, Button, & Nijkamp, 2007). This modern approach, however, does not directly assess whether the transport system serves the entire population effectively and efficiently; instead, it assumes that a failure, namely, a poor functioning of the network, can be equated with transport problems. Indeed, transport planning focuses on the operation of the network but does not explicitly analyze whether the said transport network adequately serves citizens from all walks of life.

Likewise, the term "system problem" is used to refer to a central problem that is evident throughout the system but does not specify which users are affected by the poor functioning of the system or to what extent the different users (men, women, young people, older people, etc.) may be affected. This problem is caused by the way transport systems are planned according to the premise that there should be no congestion and that a free-flowing system is the best service that can be provided. Underlying questions about the purpose of a transport system are typically never asked: what are people's needs, who benefits from the systems built today, who struggles to reach their destinations, and who should be served by improvements in the system? Since these questions are hardly ever asked, transport planning risks ignoring a range of transport problems experienced by different people.

1.2. Research Objective

The goal of this research is to develop and validate a survey tool that will directly identify transport problems from a user perspective. While today's transport surveys are designed to register travel behavior and are, indirectly, suited to identify congestion-related problems, they do not recognize other user-related issues. Transport planning in its current form pays little attention to the user and, ultimately, risks solving "minor" issues while neglecting much more serious ones. I argue that the employment of a more specific and user-oriented approach to analyzing transport

problems can dramatically improve the understanding of the range of problems, caused, in part, by the existing car-centric planning methods. Clearer insights into these problems will ultimately produce better, more inclusive, solutions for transport planning. The information collected in this study can greatly benefit transport planners and policymakers by, for example, starting to plan according to the existing problems rather than primarily focusing on car congestion and vehicular traffic movement.

1.3. Contribution to Research and Practice

This thesis looks to broaden the current definition of transport problems, allowing transport research to establish a basic raison d'être, namely, gaining a better understanding of the problems as the basis for transport policy and planning. I will seek to show, for example, that certain population groups are experiencing more difficulties financing their travels or are suffering physical difficulties to access to use the transport system. Greater efforts at fixing user-reported problems could help planners and policymakers identify a broad range of transport problems, which in turn will help them to guide investments in the transport system to address these problems.

This thesis continues the work of transport researchers focusing on the transport problems of various populations, especially the work of Karel Martens (2006, 2015, 2017a,) who has written about a much needed shift from the usual measurement of level of service to a direct measurement of transport problems, and also relates to Martens' recent work with Karen Lucas (2012) on the way in which transport equity should be measured and evaluated (Lucas & Martens 2019). I have also drawn inspiration from Alexa Delbosc's research, both on her own and with Graham Currie and with Dianne Vella-Brodrick (2011, 2012, 2015) on the measurement of transport problems and social links to disadvantaged populations and the important connection between transport and well-being.

1.4. Thesis Structure

This study aims to develop and validate a tool for identifying transport problems from a user perspective, in other words, the issues that affect or compromise individuals' actual and desired travel. These issues will be analyzed according to the various populations by factors such as residential location, car ownership, income level, gender, and others.

Chapter 2 provides a review of the traditional approach to transport planning and its relationship to current transport problems. It then elaborates on the issue of social exclusion and other transport-related issues and analyzes issues from a (potential) user perspective rather than the performance of the system itself. Chapter 3 introduces the proposed tool, a survey, for identifying transport problems as experienced by end users, and Chapter 4 presents the results of using this tool while using different validation methods. Finally, Chapter 5 presents the conclusions and a discussion of the various options for further elaboration of this research.

2. Literature Review

The following literature review provides a theoretical and empirical basis for analyzing people's transport problems while comparing existing approaches to transport planning and how they relate to these problems. I then examine the literature on transport problems according to demographic attributes such as gender, age, income, etc. This overview of the various problems and the different population groups establishes the basis for developing the questionnaire and analyzing its results.

2.1. Transport Problem Versus Desired Situation

In an attempt to find how transport problems have been considered and defined in various transport planning approaches, it became clear that these approaches have not always explicitly identified a particular problem; some clues can, however, be identified. While the notion of congestion is at the heart of the classic and most common transport approach (Martens, 2015), this approach does not capture the range and depth of transport problems experienced by users and overlooks more severe issues in favor of a focus on travel time losses.

It is first important to demonstrate what a transport problem actually is. According to the Free Dictionary (2018), a problem is "an unsatisfactory situation that needs to be dealt with." Dissatisfaction can be measured objectively, like the need for clean air that follows a certain public standard, or subjectively, by registering people's expression of their dissatisfaction. But when does a problem move from the subjective and personal to the larger scope of being noticed and "dealt with"? While it seems reasonable that more significant problems with higher effect should be dealt with first, some difficulties go unnoticed and receive less attention than others, causing large groups and different communities to experience trouble in vain.

Having addressed the meaning of the word problem, we should now try to understand what defines a "transport problem." Unfortunately, the transport planning literature suffers from a scarcity of studies that provide an explicit definition. It can be assumed that a transport problem should be seen as any deviation from the desired transport situation, and indicators pointing at the traditionally preferred condition can be found in many documents, mostly examining the transport system in combination with the use of the standard of free-flowing traffic. Only a few studies have sought to directly identify transport problems and transport needs of transport users (Delbosc, 2012; Millonig & Fröhlich, 2018; Van Egmond, Nijkamp, & Vindigni, 2003).

2.2. Different Approaches to Transport Planning

2.2.1. Transport problems: Traditional approach

Major infrastructure planning and development has existed since at least the nineteenth century, and transport planning as a distinct practice can be traced back to studies in Boston and other US cities in the 1920s (Lay, 2005). The traditional approach to transport planning emerged from later American transport studies that developed in the 1950s and is considered the first comprehensive methodology for planning future transport systems. It is a most central and powerful institution whose impact is still felt today with a one-size-fits-all format of transport planning which aims at solving the problem of congestion (Lay, 2005; Martens, 2015). This classical approach looks to ensure the effective and efficient movement of people and goods by predicting future travel demands and the future performance of the existing system, focusing almost entirely on identifying different solutions for congestion as the main difficulty facing users (Martens, 2015).

Traditional transport planning begins by observing travel behavior, applying transport models, and thereby identifying future transport demands. Modeling transport demand in most industrialized countries is conducted via several variations of the four-step model (Martens, 2017a, 2017b). This model uses land use and socioeconomic data to determine trip generation (i.e., the number of trips people make on an average day), distribute the trips (i.e., the spatial distribution of trips over a geographical area etc.), split the trips over available modes of transportation (typically limited to car and public transport), and finally assign the trips to specific transport routes (i.e., assignment of trips to road links or public transport connections). This procedure results in a predicted number of trips on each transport link, information which allows transport planners to determine the match between transport supply (the capacity of each transport link) and the expected travel demand (the number of trips on each link). While this procedure is relevant for both road and public transport links, the focus has been on the level of service (LOS) provided by the former. A road link's LOS is determined by the smoothness of its traffic flow, with LOS A representing free-flowing traffic and LOS F complete standstill (Martens, 2006, 2017a). Initially, any deviation from LOS was perceived as a "transport problem," but in light of the difficulty to provide LOS A across a network, a transport problem is currently deemed to exist if the LOS drops below B or even C. The next step in this classical model is the identification and assessment of possible alternative investments to address the lack of capacity. In the ideal model, these

alternatives are subjected to an evaluation based on cost–benefit analysis and environmental impact.

Nowhere in this process are the end-users asked to report on the transport problems that directly affect them. Traditional transport planning focuses on the functioning of the transport network and sees preventing network congestion and travel time loss as the main needed outcomes. Indeed, as mentioned earlier, congestion is considered the most dominant problem of the field (Martens, 2017a).

2.2.2. Transport problems: Sustainability approach and accessibility approach

From the 1970s, there have been demands to move away from the traditional approach for transport planning, namely, to discard vehicular mobility in favor of personal mobility and to move away from traffic congestion to accessibility provision (Morris, Dumble, & Wigan, 1979). Other approaches have evolved, most prominently transport planning for sustainability and for accessibility (Martens, 2015). The goal of the former is to plan transport while aspiring to protect the environment and to promote healthier travel habits, thus making the reduction of car-based travel its primary goal. The latter, on the other hand, looks to solve the lack of accessible destinations by changing land use policy and offering transport systems with better service and availability, thus asking whether a person can access the places necessary to fulfill their basic needs. The implicit problem that arises is the inability to access enough basic destinations, whether because it is a rural area with few accessible destinations and high car dependency or because it is a dense area with enough destinations but other barriers preventing easy travel such as physical of financial difficulties (Martens, 2015, 2017a; Owens, 1995). Both the sustainability and the accessibility approaches have significantly different perspectives from the traditional approach, but neither has become as dominant.

2.2.3. Transport problems: People-centered transport planning

People-centered transport planning is another relatively new approach that focuses on accessibility and establishes a new analytical framework (Martens, 2017a, 2017,b). The approach quantifies and assesses transport system services in terms of the levels of accessibility experienced by people with varying circumstances (different income levels, gender, age, physical ability, ethnic background, etc.). After determining accessibility levels, the people-centered approach sets a

threshold for accessibility. It is the first approach to establish the concepts of justice and fairness at its core, thus setting a new standard for other approaches. An examination of justice in transport systems quickly leads to the identification of different groups that suffer from or enjoy the system at different levels. This approach thus distinguishes between different population groups and analyzes the accessibility level of each (Martens, 2017a).

2.3. Transport Problems by Personal Attributes

2.3.1. Gender

Women have different travel habits and tendencies compared to men. Their differences are originated in their different income, travel patterns and behaviors resulting from their household and caregiving responsibilities. Traveling in commute-focused transport systems, make women more likely to suffer from transport disadvantage (Perez, 2019). Safety is also an important gender-related transport issue, but due to lack of scope, it will not be studied here.

When asked about their travel preferences, women were found to prefer using public transport as it frees them from driving and allows for a pleasant journey (Beirão & Cabral, 2007). Since most transit users are women, they are greater affected by poor transit systems (Haustein, 2012; Perez, 2019). Improved public transit helps women more than men since their daily travel patterns are more diverse (Morris et al., 1979). As men tend to have two trips per day – commute to and from work – women run errands and have multiple-purpose trips, which is harder to make using public transport due to its low frequency outside of peak-hours or when transit doesn't reach all destinations (Matthies & al., 2002, Perez, 2019)

As already mentioned, women tend to be the main caregiver of children and older people. This affects women's activities and trip lengths, since they need, for example, to take their charges from place to place, whether by stroller, bike, public transport, or car (Casas, Horner, & Weber, 2009; Fan, 2017). McDonald (2005) showed that women make 77% more trips with children than their husbands and that mothers in dense areas have the same maternal burden as those in more rural places, since children might not have decent public transport and are thus dependent on their parents for rides to school and other activities.

Due to preference or social constraints, women are less likely to hold a driver's license than men (Lucas, 2012). In Israel, for example, 86% of Jewish men have a driver's license in contrast to only 69% of Jewish women (Central Bureau of Statistics, 2017). Women, therefore,

might not always have a choice regarding their use of public transport. A 2005 survey conducted in England showed that access to a car is a crucial factor in women's ability to access jobs. It also suggested that women are not first in line when it comes to using the family car, although they tend to be running errands and chauffeuring their children (Fan, 2015; Litman, 2002). Supporting this finding that women tend to be the main caregivers of children while men tend to be the main income holder is the fact that men spend more time and distance on their daily commute compared to women (Fan, 2015; Rutherford and Wekerle, 1988; Siren & Haustein, 2013). This is also affected by residential living environments, in which it is hard to walk or cycle to children's education institutes and commercial areas (Perez, 2019).

Another aspect to be considered is how gender affects transport disadvantage in old age. Transport difficulties of older people will be discussed further in the literature review, but it is important to remember that women's part of the population is bigger as the population grows older (Perez, 2019; Siren, 2007). It has been proven than that women might be more dependent on others and on public transport for their daily trips and that current service levels don't always apply to their needs (McDonald, 2005).

2.3.2. Income and car ownership

Transport and income are very much related, and various studies have shown that people with lower income tend to travel less (Bocarejo & Oviedo, 2012; Litman, 2007; Mollenkopf, Marcellini, & Ruoppila., 2005) and have fewer weekly (Lucas, 2012) and long-distance trips and that travel takes up a higher share of their income (Banister, 1994; Litman, 2007). They can thus be described as suffering from transport disadvantage (Delbosc & Currie, 2011; Mallet, 2001).

The link between car ownership and income is proven yet complex. There is no doubt that those with a lower income are less likely to own a car due to its high cost (de Dios Ortuzar & Willumsen, 1994; Lucas, 2012; Martens, 2006; Stokes & Lucas, 2011); however, in many rural and suburban places, people with lower income have a car despite having a low income, since there is simply no way of getting around and participating in society without a car (Lucas, 2012). Just as low income has been found to correlate with low car ownership and poor public transport availability, there is also evidence that transport disadvantage can cause poverty by denying people access to jobs, grocery stores and education (Banister, 1981; Lucas, 2012).

While it is easy to understand how having a lower income decreases the chance of being a car owner, in recent years the rate of car ownership has grown, mostly within middle-level incomes

but also within lower-level incomes (Dargay, Gately, & Sommer, 2007; Lescaroux, 2010). In Israel, there has been a significant increase in car ownership rates. The Central Bureau of Statistics publication reported that in 1998 only 14.4% of the lower-income decile had at least one car, but in 2017 that number nearly tripled with 41.1% of the lower-income decile owning at least one car. When examining the same data for the 5th income decile, figures jumped significantly from 47.4% to 74.2%, (Central Bureau of Statistics, 1998, 2017). This can be explained by the increase of income levels in Israel but also reflects the stagnation in those years in the development of efficient public transport. For example, in 2013, Israel invested 86% less money in public transportation per capita than the global average (Knesset Research and Information Center, 2013).

Moreover, some people are forced car owners due to either living in a rural environment (Banister, 2014) or lacking public transport infrastructure (Currie & Delbosc, 2013; Jones, 1987). An increase in the building of rural and suburban homes condemned the residents to relying mostly on private cars. In addition to forced car ownership, it is important to remember that car availability is not synonymous with car ownership; in some cases, individuals cannot use their own car due to various physical, emotional, financial, or other reasons (Wachs & Kumagi, 1973).

It is essential to understand how transport availability is inherently linked to a person's income, and this, in turn, affect job opportunities and other factors. Ultimately, it creates a vicious cycle of increasing car dependency among people with lower-income levels.

2.3.3. Land use, travel, and travel difficulties

It is well known that transport and land use are linked and have a simultaneous effect on travel (Holz-Rau & Scheiner, 2019; Litman & Steele, 2012). Living in a dense environment with mixed land use can have a significant benefit in terms of saving travel time (Cervero & Duncan, 2006; Ewing & Cervero, 2001; Frank & al., 2007; Moriarty, 2016). People may be able to live close to their work and not have to depend on others or on a car to sustain basic needs such as going to the supermarket, getting medical care, or having access to proper education (Frank et al., 2007; Van Acker & Witlox, 2010; Zhang, 2006). In such dense areas, public transport can be way more efficient than in rural or suburban places (Holz-Rau & Scheiner, 2019; Scott & Horner, 2008). The urban grid can in many ways determine whether people can move around quickly using public transport, on bicycles, or on foot (Fielbaum, Jara-Diaz, & Gschwender, 2016; Hong, Shen, & Zhang, 2013; Moudon et al., 2005; Van Acker, Mokhtarian, & Witlox, 2014). Not so people living in suburbs, small towns, or rural villages, most of whom rely on cars since the built environment

provides very few services and opportunities (Berger, 2015; Mattioli, 2014; Pucher & Renne, 2005).

2.3.4. Parenthood

There are many life stages during which one can become a caregiver, such as becoming a parent or having an elderly parent or sick relative. The focus here in on parenthood rather than any other kind of caregiving; future research, however, should certainly include questions on different kinds of caregivers.

On becoming a parent, one automatically becomes responsible for another person for the next few decades. One's daily activities change drastically both inside and outside the family home. Taking a child to kindergarten, preschool, playdates, doctor's appointments, or even to the park needs pre-planning and suitable transportation (Umberson, Pudrovska, & Reczek, 2010). Parents who are fortunate enough, spend little time getting around as they are either driving or live in walking or cycling distance from their destinations. Others, who don't live in very dense and accessible environment, testify to spending a far greater amount of time getting around with kids than without (Fan, 2015). The reason parents sometimes prefer private cars is, often, because children need to be taken from place to place, and urban streets and buses don't always fit strollers, and even when they do, the ride can be uncomfortable for parents or their children. The situation is even harder for single parents, who don't have a partner to lean on when it comes to transport or any other need. Single parents are, accordingly, likely to spend more time driving or accompanying their children in their daily journeys compared to non-single parents (Umberson et al., 2010).

The aspect of gender and its effect on travel patterns was discussed above but is relevant here too, as mothers have different travel patterns from fathers, as mentioned previously (Umberson et al., 2010).

2.3.5. Age

Age is an essential factor when examining transport problems (Paez & al., 2007; Nordbakke & Schwanen, 2014; Social Exclusion Unit, 2003). These days in the western world, when a person retires, they are very likely to live for a few more decades. In this period, their daily activities change drastically and their transport needs change accordingly. Shifting from a nine-to-five work routine, retired people become more focused on meeting friends, walking in the park, and visiting

their family, mostly during daytime hours and outside peak hours (Arentze & al, 2008; Hjorthol, Levin, & Siren, 2010; Rosenbloom, 2011; Siren & Hakamies-Blomqvist, 2004; Wachs & Kumagi, 1973). This is, of course, the situation for those individuals who can afford to retire; others need to work even after retirement age.

As a person ages, they are likely to have more physical problems, which may affect travel. Such physical disabilities and difficulties could be the reason why some older people prefer to keep driving and remain independent and not to rely on walking or cycling (Arentze et al., 2008; Marottoli et al., 2000; Newbold, Scott, Spinney, Kanaroglou, & Paez, 2005; OECD, 2001; Paez et al., 2007; Rosenbloom, 2001; Schwanen, Dijst, & Dieleman, 2001; Siren & Hakamies-Blomqvist, 2004). Public transport is not perfectly accommodated to older people, and sometimes walking and link distances might be too difficult or even dangerous (OECD, 2001); saving travel time might not be as crucial as it used to be, but providing easy access might be more critical and sensitive than before (Kim, 2011; Loader & Stanley, 2009; Paez, Ruben, & Faber 2009; Scheiner, 2006; Siren & Hakamies-Blomqvist, 2004). Older people may, in addition, become entirely dependent on others for their daily travel and other transport needs. Some depend entirely on a personal assistant, but others rely on being driven by people in their social networks, using public transport, or catching taxis (Haustein, 2011; Smith and Sylvestre, 2001).

Some older people might have had the chance to accumulate some wealth during their working life, but this is also dependent on their pension payments or whether they have a pension or are still working. These factors differ between countries and social classes and make it difficult to predict the financial aspect of their transport needs.

Young adults are also likely to experience transport difficulties but of a different nature and for other reasons (Delbosc & Currie, 2011; Paez et al., 2009). For example. in Israel, most 18-year-olds are enrolled in two to three years of military or national service and do not earn a decent basic wage until they finish. For several years thereafter, they are usually enrolled in higher education and thus have student jobs or junior positions and don't earn enough money to buy and run their own cars. Low income can be seen to impact their travel options by limiting them to more affordable means such as public transport, bicycles or e-bikes (Litman, 2017). When living in non-urban or non-dense areas, it can be difficult for these young people to rely on public transport and travel can thus be inconvenient or time-consuming. Those who continue to live in their parents' homes rely on being driven or on borrowing the family car if they have a license,

thus limiting their independence. Increasing car costs and reduced overall rates of people getting a driver's license might be the cause for a weaker sense of autonomy among young adults (Delbosc & Vella-Brodrick, 2015).

2.3.6. Disabilities

Disabilities are very closely linked to transport difficulties, since people in wheelchairs or using guide dogs often need help arriving at their destinations. The different modes of transportation (walking, bikes, public transport, cars, or motorcycles) are not all equally accessible to people with disabilities, and some have to rely on others, either occasionally or systematically, to move them around. For people with disabilities trips might take longer, but there is no sufficient research focusing on time-related transport problems among this population group, as most research on disability and transport focuses on physical improvements of facilities (Wilson, 2003). Travel costs for people with disabilities are not so evident, and there are mixed results in the literature regarding their spending on transport (Oxley & Richards, 1995) due also to this population's lower income levels, the lack of appropriate transport solutions, and the, perhaps consequent, reduced ambition of people with disabilities to travel.

People with disabilities are more likely to suffer from social exclusion, since their access to education and jobs is reduced (Wilson, 2003). While this can be seen as due, in part, to lower health rates, it is also due to the lack of easy and convenient ways of travelling to higher education institutes and work places. There is a need for physical adjustments, ramps, and a sensitive environment, but most of all, people with disabilities need a frequent and reliable transport system, which gives them the freedom to participate in society in the most basic way (Wilson, 2003).

This thesis addresses disability just like all other personal factors, but it should be noted that the integration of people with disabilities in society demands an in-depth analysis of the various types of disabilities, which is beyond the scope of this research.

2.4. Social Exclusion

The ability of people to move around is shaped by the various modes of transportation available and their quality (Buehler & Pucher, 2009; Walker, 2012). Even a seemingly well-functioning transport system may conceal various issues such as inconvenience or unaffordability. Social exclusion refers to extreme transport problems that affect especially lower income groups and minorities. It is important to diffrenciate social exclusion from lower scale transport problems, and note that transport problems that do not result in social exclusion per se but to a loss of time on a

daily basis and experiences of physical difficulty while traveling, eventually result in fewer trips and thus potential social exclusion (Shay & Khattak, 2012).

The planning of paths, roads, and public transport are key to enabling people to participate in activities out of home. According to the people-centered transport approach, transport and land-use planning should jointly guarantee that (virtually) all people enjoy a sufficient level of accessibility to the activities considered "normal" for participation in society. Social exclusion is the denial of resources and the lack of ability to participate in such activities. It has a huge effect on quality of life and future opportunities (Levitas et al., 2007), and transportation planning must therefore take this issue into consideration. Outcomes of social exclusion can range from various daily inconveniences, such as the difficulty of shopping for food when you don't own a car, to more long-term problems, such as finding or holding a job. Lucas (2012) has shown that low income correlates with reduced access to means of transport and fewer trips. The financial inability to own a car, for example, can be a cause of social exclusion, primarily in suburban areas or areas with limited public transportation services. A person's physical condition may also impede access to social activities, leading to reliance on others or on the available public transport system (Lucas, 2012). It is important to understand a person's degree of mobility and accessibility or lack thereof in order to assess the extent of exclusion and formulate appropriate solutions (Martens, 2017).

A transport system must respond to the needs of all (or most) users, from all sectors of the population, thereby offering a variety of opportunities for social inclusion. Transportation was found to be a key factor in encouraging the activity and social participation of older people, particularly when in close proximity to their residence (Nordbakke & Schwanen, 2014).

2.5. Transport Problems by Categories

The main interest of this thesis is in the daily problems that people experience while traveling and the way those problems disturb their everyday lives. From the previous section's review of transport problems, three main types of transport-related problems stand out: time, physical ability, and cost. These problems were reviewed previously by population groups, but for methodological consistency, will be introduced again briefly in a different way.

2.5.1. Time

The time factor determines whether one is able to reach all of one's daily destinations. Although distance is crucial for assessing how long it will take to get from one place to another, we tend to mostly consider the time it will take us to arrive. For example, people care more about the time it will take them to get to work and less about the number of kilometers involved. In the survey developed throughout this thesis, I examine the relationship between time-related transport problems and the demographic variables mentioned above (car ownership, income, place of residence, etc.)(Fan, 2015; Martens, 2015, 2017b).

2.5.2. Physical difficulty

Whether people experience physical difficulty while traveling is determined by a combination of their own physical ability and the environment. For people who have difficulty walking, the 400 meters deemed an acceptable distance from a home to a bus stop may be a substantial effort (Wilson, 2003). Younger or more physically able people may rarely suffer physical difficulty in an urban environment with transport services always close by but are more likely to experience it in a rural environment where the bus stop may be far away, certainly under hostile weather or difficult topographical conditions (Delbosc & Vella-Brodrick, 2015). Such geographical issues should also be considered alongside individual physical ability when discussing the physical difficulty of make trips.

2.5.3. Costs

Money can be a substantial barrier, discouraging people from making important trips (Delbosc & Currie, 2011; Litman, 2017). Low income can thus be seen as a main cause for preventing trips, but sometimes other personal attributes, such as gender or age, can be considered very closely linked to available income and are therefore good predictors of finance-related trips difficulties (Delbosc & Vella-Brodrick, 2015; Perez, 2019).

2.6. Current Methods for Collecting Travel-Related Data

Travel-related data today focus on travel behavior, travel patterns, or travel preferences but rarely inquire into people's actual transport problems. Data on travel behavior and preferences are collected through several means: household travel surveys, big data sources, and stated preference

surveys. An examination of each method and its advantages and disadvantages when addressing transport problems helps to justify the chosen method of research.

Household travel surveys are the primary means for collecting information on travel habits and provide vital input for current transport planning practices. They consist of user travel diaries which are filled in over one or a number of days by a representative sample of the population and reveal travel patterns that can be projected onto the total population of a specific area (Clarke, Dix & Jones, 1981). Although household travel surveys gather much data about trip-making, they only collect information about travel that actually took place and about travel-related choices and not about foregoing travel, problems experienced during travel, opinions about alternatives, or satisfaction from the journey.

A second method that makes use of modern technology aligns with Stopher and Greaves' (2006) suggestion to abandon old approaches and move forward toward big data. Transport-related big data would include the aggregation of the travel habits of many residents via automatic data collection from cell phone GPS systems. Such a mass of information would allow planners access to information concerning large percentages of users and more specific details about the time, routes, and destinations of their journeys (Stopher & Greaves, 2006). Big data could be highly beneficial for planners, allowing them to bypass the human biases inherent in diary registration, but it also has its drawbacks. In order to understand whether users experience transport problems, it is insufficient to register their actual trips through big data. Big data is still relatively new, and it remains an open question whether it can be used to identify transport problems.

The third method utilizes the direct approach of stated preference surveys. These are used to identify specific preferences through choice experiments. In stated preference surveys, the respondents are asked to state what would be their expected behavior in hypothetical future trips (Loomis, 2014; Richardson, Ampt, & Meyburg, 1995). The emphasis in these surveys is on choice and the motives or cases in which users change their choices. To the best of my knowledge, such surveys have not yet been employed with the purpose of gaining insight into individual user difficulties encountered during regular transportation use.

The above methods have some definite disadvantages. Many household travel surveys repeat variations of the same questions: for example, where people go and what modes of transport they use. Stated preference surveys allow respondents to choose between travel options but, in doing so, they do not provide any insight into the types of transport problems that users might

have. In addition to these methods, experts are currently discussing the future of travel surveys via GPS and other automated systems of information gathering; however, these too leave a knowledge gap regarding many of the possible problems encountered. The automated devices allow a researcher or a policymaker to see and collect information about habits but not to directly identify what people are *not* doing nor the reasons for their problems and unmade trips – the very questions that are significant for planners attempting to improve transport services. Current transport surveys and data collection methods do not reflect the problems that affect the socially excluded or anyone suffering from an inefficient or poorly functioning transport system.

2.7. Conclusion of Literature Review

The literature review has provided a rich understanding of the various transport issues faced by different population groups, issues that can and should arise when attempting to identify transport problems. |As the different bodies of research show, many different population groups face the challenge of traveling in a comfortable way: women and young people tend to use public transit more often than men and older people; lack of car ownership and low income are closely linked to transport disadvantage; and living in remote, non-compact areas make it difficult to access daily needs independently. Unfortunately, as discussed above, the household travel surveys typically conducted as a basis for transport planning rarely ask specific questions regarding individual transport problems; rather, they merely ask respondents to report on their actual trip-making without collecting information on possible problems that they may have encountered when making these trips. Apart from household travel surveys, very few reliable tools are available for explicitly identifying transport problems from an end-user perspective. The introduction of transport problem measurement tools into transport planning could enable the identification of a broader set of transport problems than just travel time losses, which is currently seen as the key transport problem. Transport problems measurement tools should allow for better identification of problems that cannot be derived from merely observing user behavior and provide planners with the necessary information basis for dedicating closer attention to the unseen issues.

In the following chapters a research strategy will be presented based on the main three types of transport problems identified from the literature review: (1) difficulties related to actual trips, (2) dependence on others, and (3) trips forgone. Those problems will be analyzed according to personal attributes (income, age, etc.) or issues characterizing the problem (difficulties relating to time, cost, etc.). These three types of problems allow for the organization of previously researched

themes in transport difficulty in a way that grasps and measures individual real-life travel experiences. For example, if an older woman has financial problems that prevent her from traveling to her desired destinations, she should be able to express her experience, which should then be measured systematically using the proposed transport problem measurement tool.

3. Research Strategy

3.1. Introduction of Selected Methodology

This research aims to develop a survey tool that can identify transport problems among the general population while understanding how personal attributes may contribute to the difficulties they experience.

Transport planning is based on collecting data on current travel behavior, extrapolating future behavior from this data, putting the expected journey on the current transport network, and then determining whether existing capacity is sufficient. Where it is not, a "transport problem" exists. This research proposes a direct approach of asking people about their transport-related problems: what hinders them in their travel, what makes them forgo a trip, and how free are they to travel independently?

3.2. Survey Development Process

The development and validation of the survey tool was achieved in a three-step process, which represents the methodology of this research: 1) developing an initial questionnaire to identify transport problems among the general population; 2) conducting three pilot surveys using the initial questionnaire and improving it in an iterative process; and 3) conducting a survey of 2000 respondents using the final version of the questionnaire. The final questionnaire was validated through the statistical analyses of the survey results in combination with additional data.

3.2.1. Creating the questionnaire

The first step of the research consisted of developing the questionnaire through an iterative process (see below). In order to develop a research tool that can be used in practice and can generate input for transport planning processes, the questionnaire must be relatively inexpensive to carry out among a large sample of the population. This is one of the key reasons for choosing a quantitative rather than a qualitative survey. This also has implications for the number and type of questions that can be included in the questionnaire.

Based on the literature review, the problems were divided into three groups:

(1) Difficulties related to trip-making (time, physical difficulty, financial difficulty, and inconvenience);

(2) Dependence on others for trip-making;

(3) Giving up on trips due to poor transport options (either occasionally or systematically).

The questionnaire draws on experiences in a range of fields including health (Johnson, 2014), psychology (Worthington & Bodie, 2017), and management (Stopher & Greaves, 2006;). In each of those fields there is wide experience with various arrays of questions that relate to a person's perceived situation, feeling, or capabilities and are asked as important issues in and of themselves or as an introduction to further exploration. When it comes to health, for example, many questionnaires first ask how the respondent would describe their general health ("excellent, very good, good, fair, or poor") and then ask follow-up questions about specific conditions. The different types of surveys in health studies and in other fields have been verified and validated using various measures for more than 70 years. The surveys are validated using physical tests (looking to prove a person's health is as good as they think it is) and other components such as projected future mortality rates (the earliest surveys were validated by testing the first respondents' real mortality dates) or future health (more flexible measurements that involve returning to a patient and reassessing their later health and its correlation to their first answers to the survey).

By employing the method of a self-rated questionnaire in the field of transport, this survey will allow for the assessment of the different aspects of transport problems in relation to an individual's demographics, income, neighborhood, and other seemingly influential personal attributes.

3.2.2. Pilot survey

The questionnaire was tested using an iterative process whereby respondents were asked to fill it in via a door-to-door approach and to then answer a series of open-ended questions in a cognitive interview. Several points were taken into consideration in the pilot surveys: ease of handling the questionnaire, suitableness of the layout, clarity of the definitions, and relevance and adequacy of the questions (Moser & Kalton, 1971, p. 49). Once the initial version of the questionnaire was prepared, we asked 35 respondents in two different neighborhoods to fill it in and immediately

followed it up with a short interview comprising questions such as: “Did you understand the question and its possible answers?,” “Why did you answer the way you did?,” “What experience are you describing as you answer this question?,” etc. The purpose of these cognitive interviews was to assess whether the questions in the draft questionnaire successfully captured what was intended.

As a result of this process, two important changes were introduced. First, I improved the formulation of questions. for example, in the part dealing with dependency on others, respondents answered as if they could not have made this trip in any other way, while in fact they merely decided to travel together to their destination. The new formulation ensured that the question stressed trips where no other suitable travel option was available other than the respondent relying on someone else. Second, I clarified that the availability of a mode of transport does not necessarily mean one is able to use it. For example, from the in-depth interview it became clear that there were people with cars who cannot use them or others who live in areas with an excellent cycling infrastructure but who have physical or emotional problems that prevent them from using their own bicycle. A question was formulated to ask about such specific problems.

Based on the interview results, the questionnaire was improved and administered once again among respondents in other neighborhoods. This step was repeated three times until a satisfactory version of the survey was achieved. Each round helped to affirm the adequacy of the questionnaire, which is “probably the most valuable function of the pilot survey” (Moser & Kalton, 1971, p.48). An adequate questionnaire is one in which the respondents understand all the questions which are clear and unambiguous and do not lead toward a single answer or drown in technical terms: “Almost the most useful evidence of all on the adequacy of a questionnaire is the individual fieldworker’s report on how the interviews went, what difficulties were encountered, what alternations should be made and so forth” (Moser & Kalton, 1971, p.49).

3.2.3. Final survey

The second step of the research consisted of surveying four selected areas in the Tel Aviv metropolitan area: two in the central city of Tel Aviv and two in the suburban ring (one in the city center of Kfar Saba and one in a set of small rural and suburban villages north of Kfar Saba). The aim of this was to generate data that would enable the validation of the questionnaire in the third step of the research. Given the instrumental nature of this step of the study and the need to collect

a large number of responses, implementation was outsourced to a survey company (GeoCartographia).

The chosen neighborhoods were Ramat HaChayal and Kikar HaMedina in Tel Aviv and the city center of Kfar Saba and small suburbs and villages nearby. These locations were chosen due to their relatively close distance to eachother. Two walkable neighborhoods from each city (Kfar Saba city center and Kikar HaMedina), one less walkable (Ramat HaChayal) and one more remote (small suburbs and villages). The choice of locations can help understand if any differences are derived from their location or specific characteristics.

The questionnaire consists of one general question and three main sets of questions:

1. General question. This introduces the topic and is used as one of the ways of validating the survey.

   Q1.1 How convenient is it for you to reach all the places you wish to reach?

2. Questions about transport difficulties. These questions ask whether respondents have experienced specific difficulties in their trips over the last three days. The difficulties described in this segment include time (takes too long to get from place to place), money, physical difficulty, and inconvenience. Inconvenience can include any sort of feeling that cannot be specified in the previous difficulties such as trouble changing buses, stress of driving, not finding a seat on public transport, etc.

   *Q2.1. Over the last three days (including Saturdays and holidays), how often have you experienced spending an excessive amount of **time** reaching your destination?*

   *Q2.2. Over the last three days (including Saturdays and holidays), how often have you experienced exerting an excessive amount of **physical effort** reaching your destination?*

   *Q2.3. Over the last three days (including Saturdays and holidays), how often have you experienced spending an excessive amount of **money** reaching your destination?*

   *Q2.4. Over the last three days(including Saturdays and holidays), how often have you experienced an excessive amount of **discomfort** reaching your destination?*

3. Questions about dependency. These questions start from depending on household members and move to depending on others family members who might not be so close and even depending on people who live in another city.

   *Q3.1. Over the last three days, how often have you had to rely on **direct household members** for your trips, since there was no other suitable solution for your arrival or return?*

*Q3.2. Over the last three days, how often have you had to rely on **neighbors, friends, or (extended) family living in close proximity** for your trips, since there was no other suitable solution for your arrival or return?*

*Q3.3. Over the last three days, how often have you had to rely on **other people (friends or family living outside your own town or city, colleagues)** for your trips, since there was no other suitable solution for your arrival or return?*

4. Questions about forgone trips. These questions return to the difficulties mentioned in the first segment of questions. Here, however, another possible reason for forgoing trips is added, namely, the lack of means to return home.

*Q4.1. Over the last three days, how often did you want to make a trip but decided not to do so because it would take an excessive amount of **time** to reach the destination?*

*Q4.2. Over the last three days, how often did you want to make a trip but decided not to do so because it would demand an excessive amount of **physical effort** to reach the destination?*

*Q4.3. Over the last three days, how often did you want to make a trip but decided not to do so because it would cost an excessive amount of **money** to reach the destination?*

*Q4.4. Over the last three days, how often did you want to make a trip but decided not to do so because it would involve an excessive amount of **discomfort** to reach the destination?*

*Q4.5. Over the last three days, how often did you want to make a trip but decided not to do so because you would not have been able to **return home on the same day**?*

The survey used a Likert-type scale for its questions (Moser & Kalton, 1971, p.362). Possible answers vary from "none of my trips," meaning the respondent does not suffer from the problem described in the question, to "in nearly all of my trips," meaning the respondent suffers from the problem systematically.

3.2.4. Validation of the survey

The third step comprises the validation of the questionnaire. This step was required in order to assess whether the questionnaire is indeed measuring what it set out to measure: the existence of transport problems among the population surveyed. This was done through two distinct approaches: internal validity and external validity.

Internal validity makes it possible to assess whether a survey has internal reasoning and consistency. Its scale was measured with standard statistical methods, such as Cronbach's alpha reliability coefficient for Likert-type scales (Gliem & Gliem, 2003). Cronbach's alpha allows for the assessment of whether several sets of questions can be put together to measure a single phenomenon. As the main question or subject here is self-rated transport problems, I used

Cronbach's alpha to prove a relationship between the three sets of questions. Another technique used here was principal component analysis (PCA), which converts several variables into a single variable, thus allowing for a multivariate analysis. Such analysis isn't new to the field of transport problem measurement and has been conducted recently by other transport researchers (Delbosc & Currie, 2011; Delbosc & Velle-Brodrick, 2015), and it allowed for the identification of statistically significant groups of problems in surveys such as this. After creating these variable, I conducted a multivariate analysis in order to compare the different effects of each variable on transport problems. My expectations from the survey were that personal attributes such as income, age, or car ownership, would affect the severity of transport problems. A regression analysis included controlling the effect of personal attributes and therefore provided a measurement of the extent to which a person's personal attributes affect their transport problems.

The second approach, external validity, consists of a series of tests based on the obtained survey results. These tests aim to determine whether the received results are in line with expectations. In this research, for example, does the survey identify transport problems where they might be expected? While there may be many reasons for results that deviate from expectations in the case of a self-rated survey, systematic deviations from expectations raise major concerns about the validity of the designed survey instrument. In this research, for example, people with access to a car might be expected to experience less transportation-related problems than those without access to a car, and the results are therefore expected to show more severe transport problems among people who don't own a car. The external validity test aims to analyze survey results systematically to see whether they do indeed confirm theoretical expectations.

4. Survey Results

4.1. Introduction

The first step in the research consisted of the construction of a first draft of the survey. This survey was based on the results of the literature review and formulated in an attempt to keep it as short as possible. A satisfactory version of the survey was established using the conclusions and adaptations from the pilot surveys. In the winter of 2017–2018, GeoCartografia, a professional survey company, was hired to conduct the survey over local landline phones in the chosen areas.

4.2. Data Processing

4.2.1. Changes from the original version of the survey

Three changes were made by the survey company during the process of asking respondents, which unfortunately resulted in the loss of some of the information. The first concerned gender. The option to answer "else" and not just male or female when asked about gender was not presented (despite being stated on the original questionnaire), because of the gendered nature of the Hebrew language. The second involved age. There are no respondents under the age of 18, for legal reasons, and no subdivision for the age groups above 65 (although the original questionnaire differentiated accordingly: 12–17, 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, 85+). Third, regarding education, only four categories were presented to the respondents: high school or less; more than high school but not academic; academic; refuse to answer. This eliminated some of the original categories and narrowed down the ability to understand the differences usually asked in Israel about education levels. The original options included: no formal education; elementary school; high school/high-school yeshiva/high-school ulpana; professional/technical studies; Bachelor's degree; yeshiva/seminary; Master's degree or higher.

4.2.2. Data editing and correcting

The collected data was first processed and edited to ensure that all values taken into consideration were complete, accurate, and uniform (Moser & Kalton, 1971, p. 411–413). Recoding the answers concluded in rescaling some of them from 1–5 to 0–4 for the sake of convenience, using the number 0 to refer to no reply, and using numbers 1-4 to refer to various levels of problems. This allowed nullifying answers such as "no reply" when calculating correlations and other statistical tests. The only major difference of the survey from the pilot stages appeared in the question about

modes of transport, which can be easily read and understood when reading a table but does not suit to answering over the phone. The survey company therefore asked respondents to answer in a different way, allowing us to understand their situation in the best way possible given the change in phrasing. Answers to this question demonstrated problems of irrelevance: for example, some of the respondents answered that they owned a train or an unmotorized scooter, which were not options in our initial questionnaire and are not major, reliable, or regular modes of transport. These types of answers, as they are irrelevant for the survey, repeated 101 times and were excluded from the analysis.

4.2.3. Scaling the questions

The survey generated a score for each answer of each respondent of each respondent. In order to obtain this score, the answers have been translated into a numerical value (see Table 4.2.3.1).

Table 4.2.3.1. Scaling the Answers to Questions Q1.1 to Q.4.5

Points for each answer to questions Q2.1–Q2.4 (trip difficulty) and questions Q3.1–Q3.3 (trip dependency)	
Answer	Points
No reply	0
For none of my trips	1
For some of my trips	2
For more than half of my trips	3
For nearly all my trips	4

Points for each answer to questions Q4.1–Q4.5 (trips forgone)	
Answer	Points
No reply	0
Never	1
Only once	2
A few times	3
Repeatedly	4

4.2.4. New variables

Nine new variables were created based on the original database in order to enable a number of bivariate and multivariate analyses.

1. Car in household – joining respondents to cars in their household regardless of whether the car is for their sole use or shared. This variable helped to show the impact of car availability at a very high probability.

2. Car possibility – using the number 1 when there is a car in their household and nothing preventing its use (combination of the variable “car in household” with the variable

"problem using car") and the number 2 when there is a car that can't be used or there is no car in their household. This variable allowed for the fact that not all people with cars in their households can use it due to physical or emotional problems.

3. Tel Aviv – joining the two examined neighborhoods from each area (the two neighborhoods of Tel Aviv and the two areas in and around Kfar Saba). This allowed for a comparison between residents from the core of the metropolitan and those living outside the core.

4. City center – joining Kikar HaMedina in Tel Aviv and Kfar Saba city center and comparing it to Ramat HaChayal joined with north Kfar Saba. This allowed for a comparison between residents from relatively walkable and urban areas and those from less walkable, more suburban, and less dense areas.

5. Parenthood – using the number 1 to refer to adults who have children in their household and the number 2 to refer to people who don't have children in their household. This variable derived from the components of family as answered by each respondent and helped to examine the assumption that parents might report more transport problems.

6. Young adults – using the number 2 to refer to people aged 18–24 and the number 1 to refer to people aged 25–64 (i.e., excluding older people). This allowed for the examination of a population with possible transport problems and its comparison with a population not expected to have major transport problems.

7. Older people – using the number 2 to refer to people aged 65+ and the number 1 to refer to people aged 25–64 (i.e., excluding young adults). Like the previous young adults variable, this allowed for the examination of a population with possible transport problems and its comparison with a population not expected to have major transport problems.

8. Problem using car – using the number 0 when there is no problem using a car and the number 1 when there is a physical, medical, or emotional problem that prevents use of a car.

9. (Dis)ability – noting all respondents who either have a recognized disability which requires them to use a mobility aid (e.g., a white cane, a wheelchair, a guide dog, a walker, or a walking stick) or do not use a physical aid but state that they should be using one.

4.3. Data Description

The survey had 2010 respondents who were evenly distributed over the four different neighborhoods: the Kikar HaMedina and Ramat HaChayal neighborhoods in Tel Aviv, Kfar Saba city center, and north Kfar Saba.

4.3.1. Chosen neighborhoods

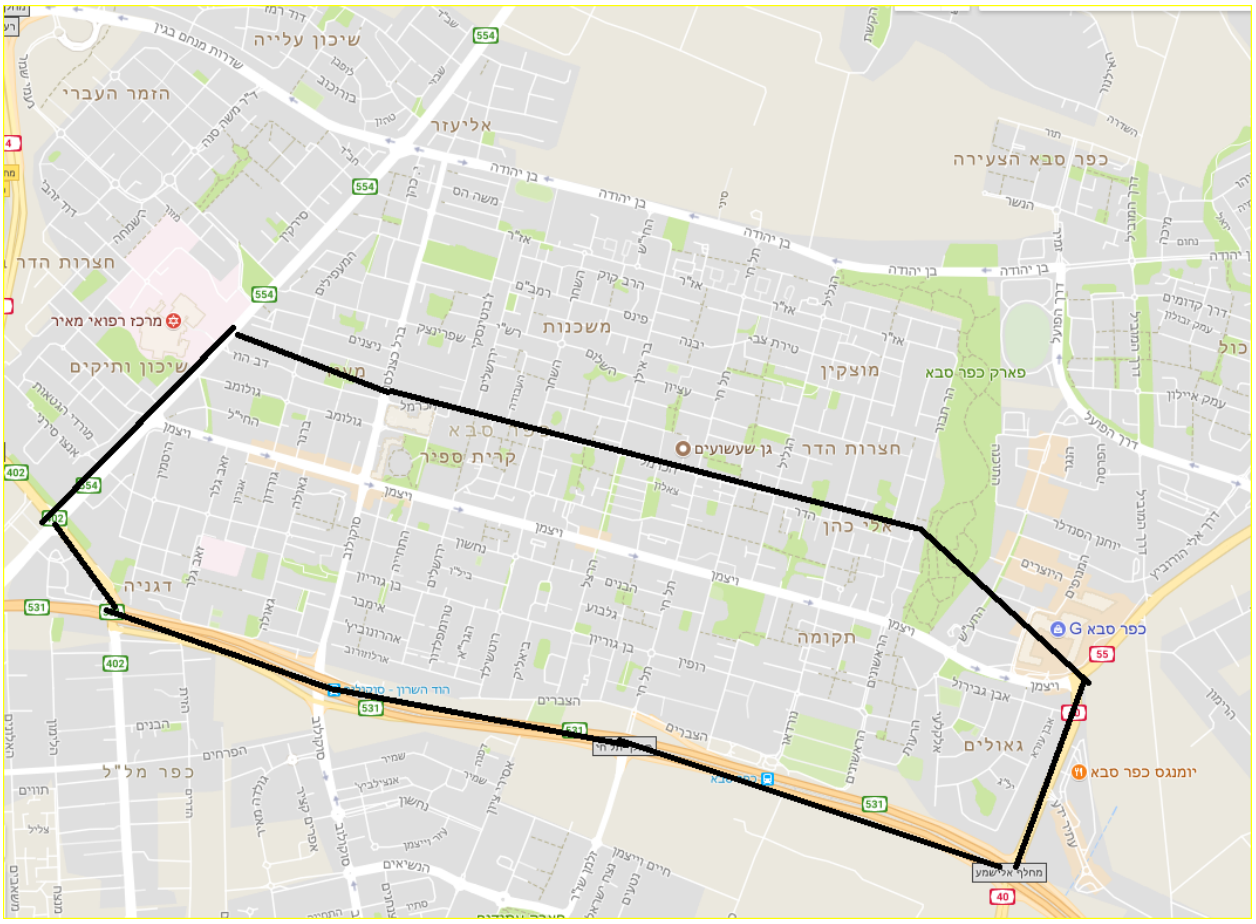


Figure 4.3.1.1. Neighborhood #1: Kfar Saba city center.

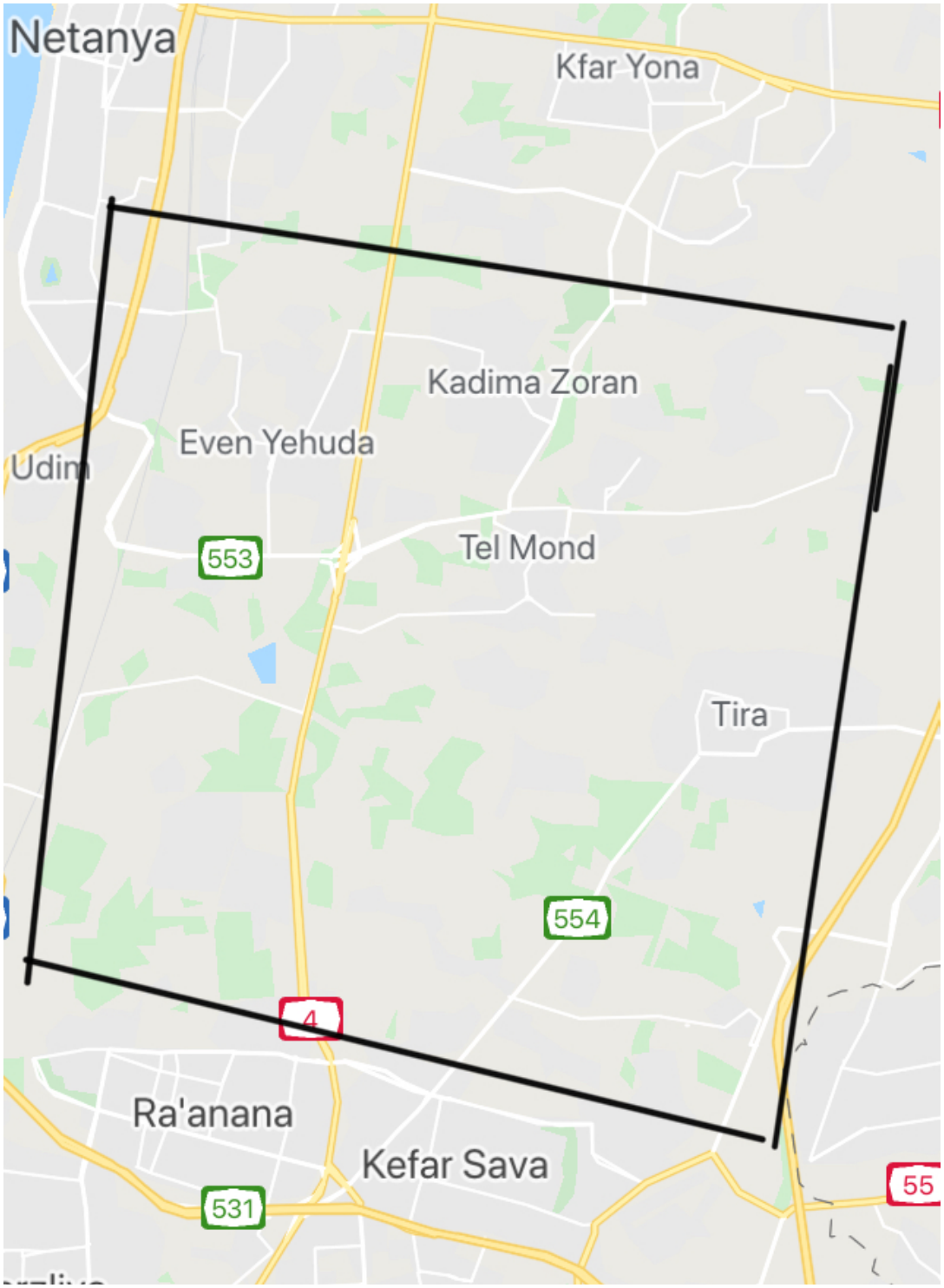


Figure 4.3.1.2. Neighborhood #2: North Kfar Saba.

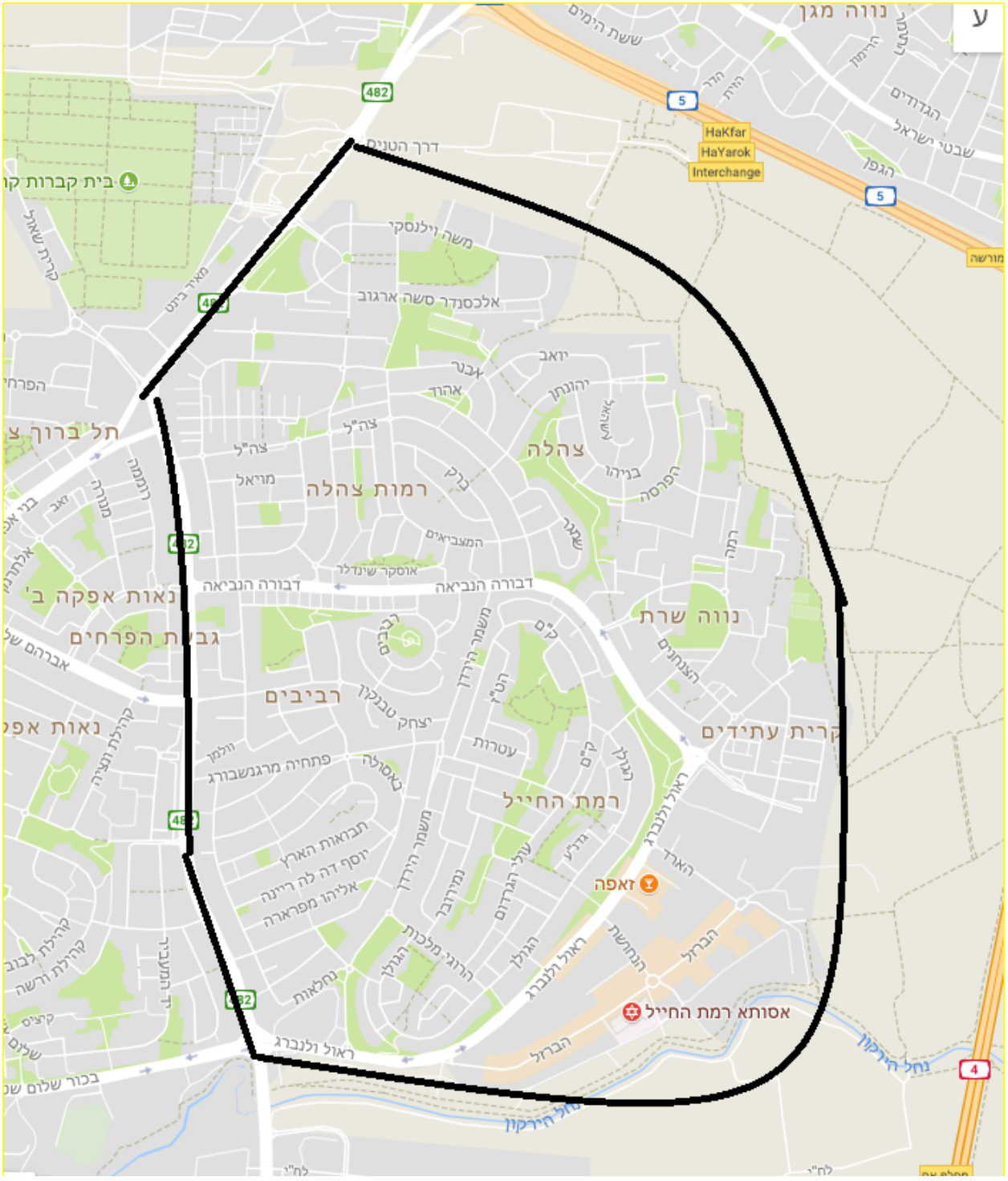


Figure 4.3.1.3. Neighborhood #3: Ramat HaChayal, Tel Aviv.

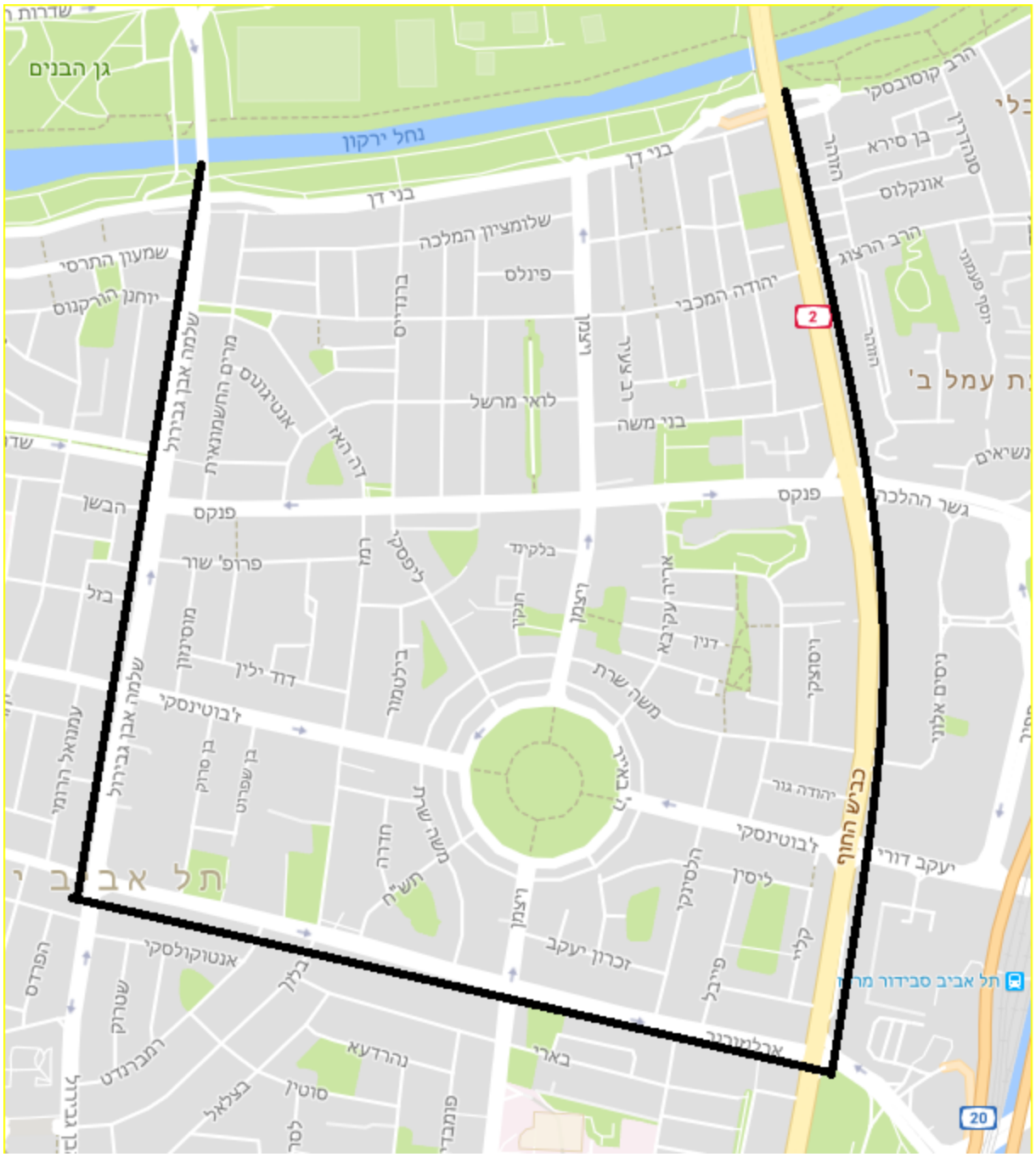


Figure 4.3.1.4. Neighborhood #4: Kikar HaMedina, Tel Aviv.

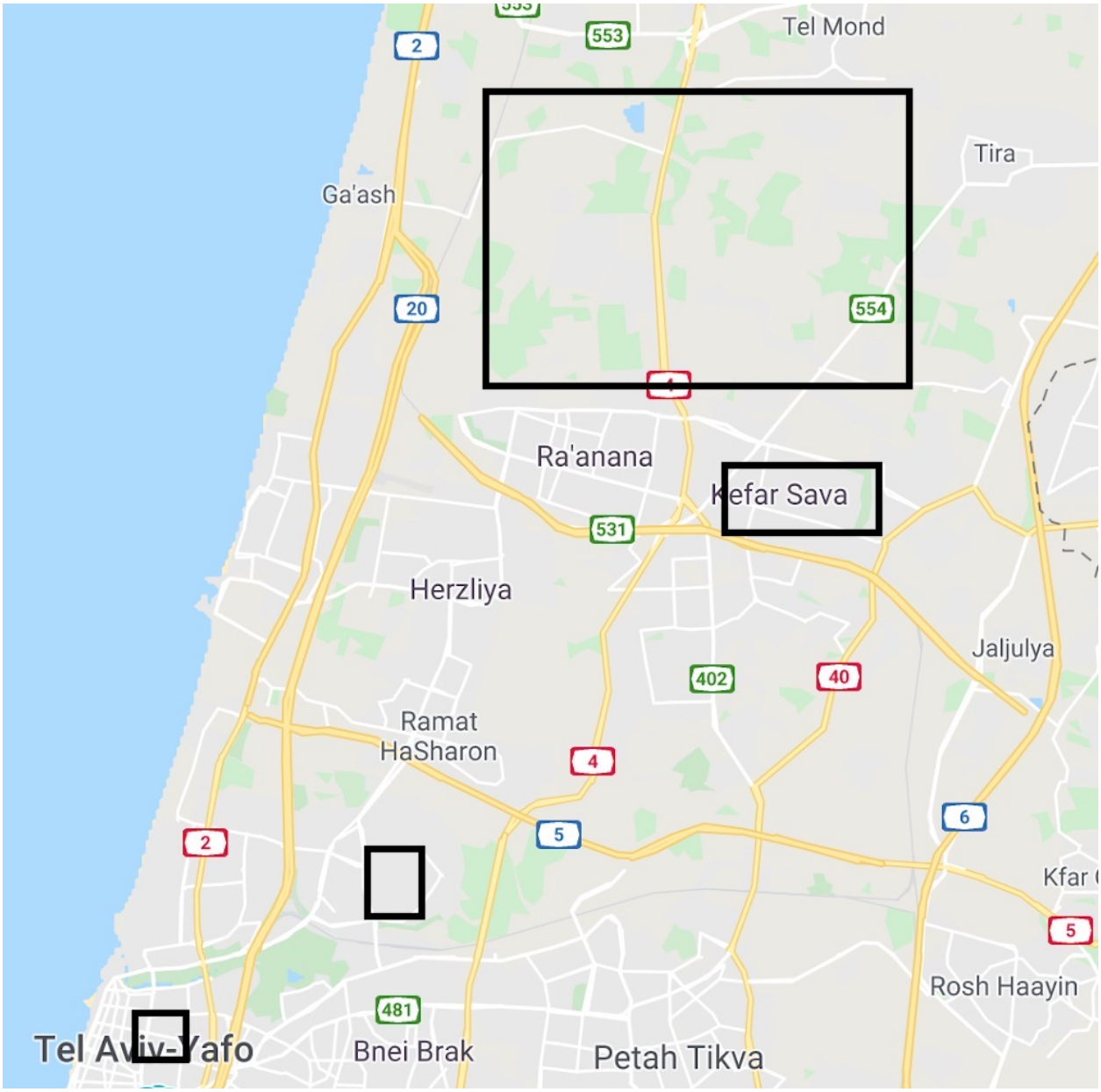


Figure 4.3.1.5. All four neighborhoods.

For three of the four selected areas, there is information available from the Israeli Central Bureau of Statistics (CBS), some from the 2008 census and some from the more recent 2017 census. The area comprising numerous small settlements is not a designated statistical area by the CBS and therefore there are no sufficient data for comparison with the survey's responses (Table 2, Table 3, Table 4 at the appendix).

4.3.2. Respondents' characteristics

Below are the survey responses by absolute numbers and by percentage.

Table 4.3.2.1. Descriptive Statistics by Demographic Parameters and Variable Values

Statistic		Value	N	%
Gender	Men	1	818	41%
	Women	2	1192	59%
	Total		2010	100%
Income	Much less than average income	1	134	7%
	Less than average income	2	113	6%
	Average income	3	271	13%
	More than average income	4	450	22%
	Much more than average income	5	509	25%
	Total		2010	100%
No car	Car in household, no problem using it	1	1617	81%
	No car or problem using it	2	388	19%
	Total		2005	100%
Parenthood	Non-parent	1	1093	58%
	Parent	2	791	42%
	Total		1884	100%
Young adult	Age 25+	0	1904	95%
	Age 18–24 (young)	1	106	5%
	Total		2010	100%
Older people	Age 18–64	0	1483	74%
	Age 65+ (older)	1	527	26%
	Total		2010	100%
Disability	No disability	1	1877	93%
	Could use aid	2	60	3%
	Disability	3	73	4%
	Total		2010	100%
North KS	North Kfar Saba	1	502	25%
	Other neighborhoods	2	1508	75%
	Total		2010	100%

After defining the new variables, the respondents' characteristics were analyzed. Inevitably, there are some populations with over-representation, for example, there are more women than man – 6%–8% more than their share of the population in the chosen areas. The same over-representation occurred for the older population and for people with higher levels of income. A simple explanation might be that women and older people are more often at home and are more likely to answer surveys than younger people, who are often not home and often do not have a landline (Table 5.4). In addition, CBS data divides age groups differently for younger ages, which makes it less comparable with our data. When redistributing strictly for ages 25 and above and comparing to the survey, the lower age groups appear to have a lower response rate.

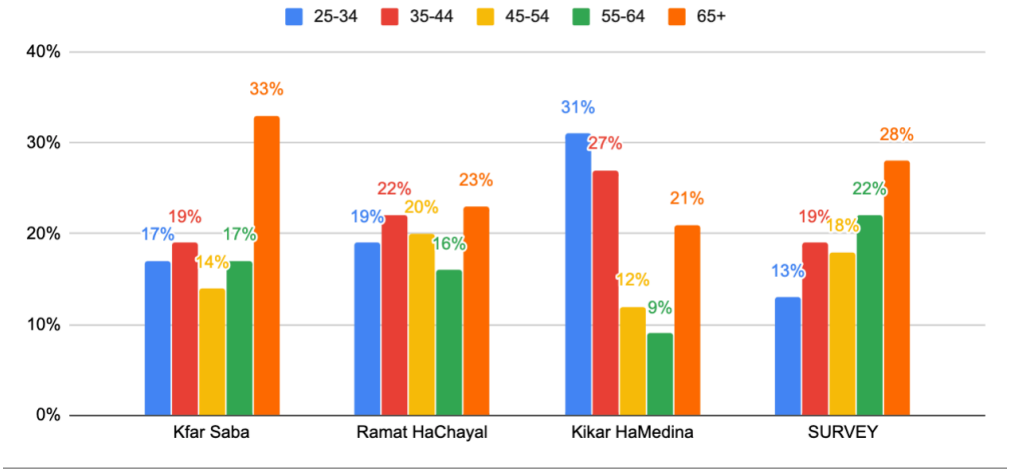


Figure 4.3.2.1. Age distribution in three of the four neighborhoods; 25 year old and older compared to survey distribution.

Regarding income, at least 47% of the respondents make more than the average wage in Israel of 9,543 ILS per month in 2017 (Table 1.1.2). The average income per capita (not per household) in the chosen neighborhoods is estimated between 7,694 ILS and 10,271 ILS. When the average household in the chosen areas is between 1.9 and 2.9 people, it is evident that the people living there are relatively wealthy.

Table 4.3.2.2. Average Income Per Capita

Category	Available data	Kfar Saba city center	North Kfar Saba	Tel Aviv Ramat HaChayal	Tel Aviv Kikar HaMedina
Income	Average income per capita	7,694 NIS	No sufficient data	10,271 NIS	8,739 NIS

Table 4.3.2.2. demonstrates the relatively high income among the respondents, which is in line with the available data from CBS for three of the four areas.

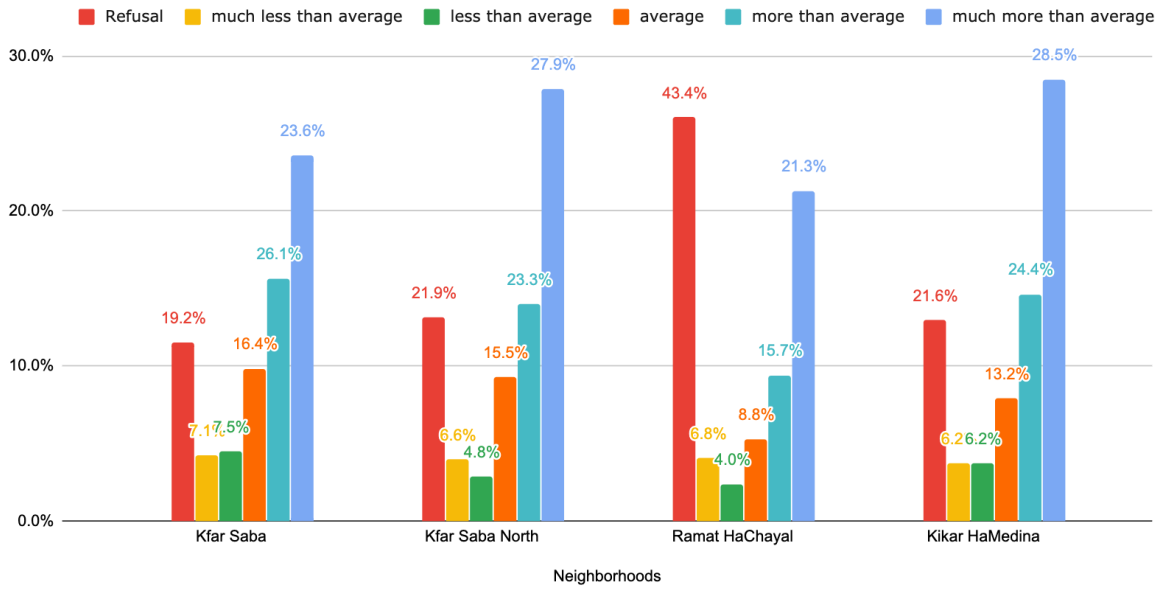


Figure 4.3.2.2. Income levels of respondents by neighborhood.

Regarding other demographic characteristics, 39% of the respondents have children living at home while 54% do not (non-response rate is 7%). Around 75% of the respondents are secular, 17% report being traditional (in Israeli terms, this might mean keeping Shabbat or not, driving on Shabbat or not; specific questions were not asked), and only 8% are religious. Most respondents have an academic education (59%), and around a quarter have a high school education level or less (24%) (see Table 1.1.2).

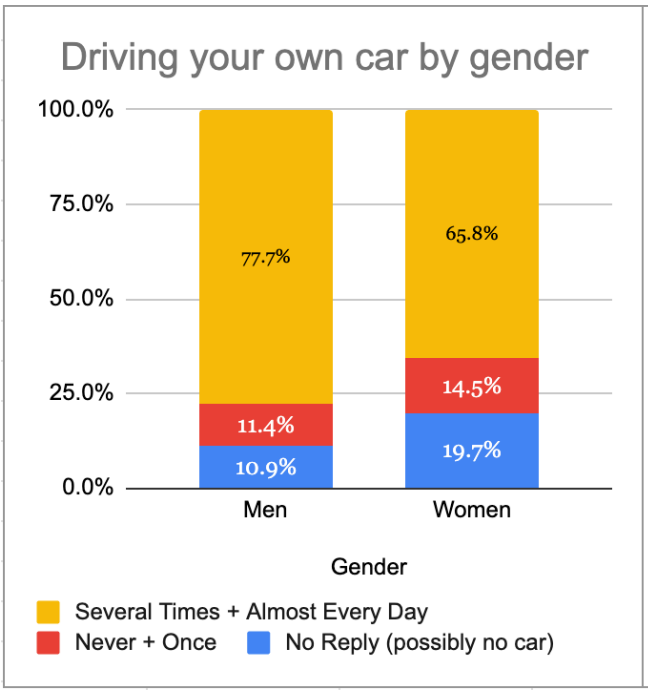
Most of the respondents, 84%, have a car in their household; some, however, cannot drive for physical or emotional reasons. After excluding these respondents, 80% of the respondents have

a car and can also drive it. When compared to the car ownership rate as collected by the CBS in 2017, the ownership rate of our respondents is in line with the general Israeli socio-economic decile 7–8 (see Table 4.3.2.3).

Table 4.3.2.3. Percentage of Households Owning at Least One Car by Socioeconomic Decile

Household Owning at Least One Car (2017)										
Socioeconomic decile	1	2	3	4	5	6	7	8	9	10
	41.1%	47.6%	57.9%	65.1%	74.2%	77.3%	84.4%	84.8%	91.9%	94.5%

When asked whether they drive their car regularly (possible responses were every day, several times a week, once, never) (see Fig. 4.3.2.3), twice as many women didn't respond in comparison to men, perhaps because they don't own or don't feel that the term "your car" also refers to their spouse's car. Of those who responded that they do have a car (see Fig. 4.3.2.4), it seems that men are more likely to drive their car.



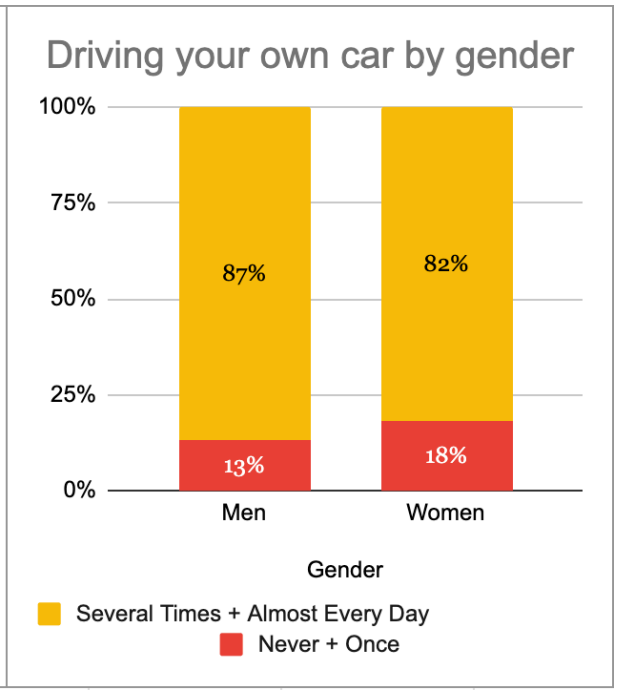


Figure 4.3.2.3 (left). Percentage of respondents driving their own car by gender.

Figure 4.3.2.4 (right). Percentage of respondents driving their own car by gender (excluding no reply).

4.4. Statistical Methods

The dataset was analyzed using a range of statistical techniques and measures:

1. Cronbach's alpha measures internal consistency and thus shows whether a survey's questions are closely related and to what extent they measure the same thing – in our case, transport problems.

2. T-test and ANOVA show whether or not the means of the populations differ from each other and to what extant (e.g., regarding gender – do men and women have significantly different means when they answer Q2.1?).

3. Spearman's correlation coefficients show if and how two ordinal variables are linearly linked (e.g., regarding gender – do the answers to Q2.1 vary according to respondents' gender?).

4. Mean weighted difference allows for the comparison of the mean results of (in our case) two population groups and the detection of whether one group has significantly different chances of reporting differently from the other. This specific case is weighted to give the same importance to each of the groups, even when there are more items in one of them (e.g., women have a 12% higher chance of reporting trip dependency than men).

5. Multivariate analysis shows how several independent variables affect a single dependent variable (e.g., when collecting various personal attributes into a multivariate model, car ownership and disability affects transport problems more than gender, which is seen to be insignificant).

In this thesis I first show how Cronbach's alpha validates the three segments of the survey and then present the t-tests, ANOVA, mean comparisons, and Spearman's correlations by population groups. Since bivariate analyses (correlation, t-test, etc.) are preliminary, we need to see their combined effect on the entire survey or on an overall model. For this reason, the final step is to display a multivariate analysis using different divisions of the results.

4.4.1. Cronbach's Alpha

Cronbach's alpha shows that the items Q2.1 to Q4.5 can be combined to measure a single phenomenon – transport problems. Table 4.4.1.1 presents 0.843 Cronbach's alpha, which is higher than the traditional threshold of 0.7 for a set of questions in a survey. Table 4.4.1.2, "Cronbach's Alpha if item deleted" calculates Cronbach's Alpha or the internal consistency for the survey when extracting one question each time. If the value in the second table is higher than Cronbach's Alpha in the first reliability table, than the specific question can be removed, and the survey would be more reliable. In this case, none of the questions should be removed.

Table 4.4.1.1. Cronbach's Alpha by Survey Q1.1 to Q4.5

Reliability Statistics		
Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.843*	0.848	12

Table 4.4.1.2. Cronbach's Alpha if item deleted by Survey Q1.1 to Q4.5

	Cronbach's alpha if item deleted
Q2.1	0.837
Q2.2	0.826
Q2.3	0.835
Q2.4	0.823
Q3.1	0.841
Q3.2	0.837
Q3.3	0.837
Q4.1	0.819
Q4.2	0.822
Q4.3	0.831
Q4.4	0.819
Q4.5	0.836

4.5. Descriptive Statistics

4.5.1. Descriptive and preliminary statistical analysis

The first general question of the questionnaire sought to gain a general understanding of the convenience of travel. One quarter (24.1%) of the respondents answered that it is either not at all or not so convenient for them to reach their destinations.

Regarding the first segment of questions, the largest share of respondents indicated the highest rate of difficulty when asked about spending too much time reaching their destinations (38% said they spend too much time on more than half or almost all of their trips). The next largest share (24%) reported of inconveniences as a problem disturbing their trips.

The second segment dealt with dependency on others. The vast majority of people don't rely solely on others for their journeys; however, 39% of respondents answered that they rely daily on distant relatives and colleagues for more than half or almost all of their trips. While this is not a majority and depending on others for trips could also be seen as positive with potential social benefits, this nonetheless indicates a gloomy reality (this is discussed further in the last section of this thesis). It is also possible, however, that people are dependent on others for their trips because driving with someone else provides a better alternative (e.g., carpools).

The last segment of the questionnaire concerns forgoing trips entirely due to transport-related issues. Among all respondents, 16% reported forgoing trips several or many times over the previous three days. By including those who reported forgoing just one trip in the three days and adding it to the other rates, the numbers double and it appears that 32% forwent at least one trip over the course of the three days. The second reason for forgoing trips is inconvenience in travel (14% reported forgoing trips several or many times, 27% reported at least once). Physical effort is third in the line of reasons, followed by money. In this segment, not having a means to return home might be caused by late night trips or it being Shabbat, both occasions where there is no proper public transport (5% forwent trips several or many times, 11% at least once).

When analyzing the response by day of answering the survey (and not the previous three days), the results do suggest that people forgo slightly more trips on weekends than weekdays because they won't be able to get back home, possibly due to reduced public transport on Shabbat (mean score 1.20 versus 1.15, sig < 0.005).

4.5.2. Correlations between the various personal variables

Before introducing the results according to personal attributes, it is imperative to compare the various correlations between the most important variables. Table 4.5.2.1 shows most prominently that car ownership and ability to use a car is correlated with most of the different variables (income, age, disability). In addition, owning car was found to be more likely among people with higher incomes, men, parents, and older people.

The same sort of correlation is evident between income and parenthood (parents with children aged 0–18 in their households earn more money) and between older people and disability (older people are more likely to have a disability).

Table 4.5.2.1. Correlations of Personal Attributes by Spearman's Correlation Coefficient

		Correlations by Spearman's Correlation Coefficient									
		Young People	Older People	Income (devided by low income\else)	Car Possible	Tel Aviv	City-Center	North Kfar Saba	Disability	Parenthood	Gender
Young People	Correlation Coefficient			-0.048	.049*	0.035	-0.027	0.002	-0.018	0.041	-.099**
	Sig. (2-tailed)			0.068	0.028	0.115	0.227	0.913	0.408	0.075	0.000
	N			1477	2005	2010	2010	2010	2010	1884	2010
Older People	Correlation Coefficient			-.079**	.128**	-0.025	0.019	0.028	.191**	-.385**	-0.008
	Sig. (2-tailed)			0.002	0.000	0.264	0.404	0.214	0.000	0.000	0.716
	N			1477	2005	2010	2010	2010	2010	1884	2010
Income (devided by low income\else)	Correlation Coefficient	-0.048	-.079**		-.298**	0.01	-0.007	-0.035	-.092**	.129**	-.065*
	Sig. (2-tailed)	0.068	0.002		0.000	0.697	0.775	0.177	0.000	0.000	0.012
	N	1477	1477		1477	1477	1477	1477	1477	1444	1477
Car Possible	Correlation Coefficient	.049*	.128**	-.298**		-.051*	0.03	.055*	.168**	-.116**	.118**
	Sig. (2-tailed)	0.028	0.000	0.000		0.023	0.179	0.014	0.000	0.000	0.000
	N	2005	2005	1477		2005	2005	2005	2005	1883	2005
Tel Aviv	Correlation Coefficient	0.035	-0.025	0.01	-.051*				0.034	0.016	0.034
	Sig. (2-tailed)	0.115	0.264	0.697	0.023				0.125	0.493	0.127
	N	2010	2010	1477	2005				2010	1884	2010
City-Center	Correlation Coefficient	-0.027	0.019	-0.007	0.03				0.022	-.090**	-0.005
	Sig. (2-tailed)	0.227	0.404	0.775	0.179				0.321	0.000	0.814
	N	2010	2010	1477	2005				2010	1884	2010
North Kfar Saba	Correlation Coefficient	0.002	0.028	-0.035	.055*				0.002	-.077**	-0.031
	Sig. (2-tailed)	0.913	0.214	0.177	0.014				0.941	0.001	0.163
	N	2010	2010	1477	2005				2010	1884	2010
Disability	Correlation Coefficient	-0.018	.191**	-.092**	.168**	0.034	0.022	0.002		-.120**	-0.002
	Sig. (2-tailed)	0.408	0.000	0.000	0.000	0.125	0.321	0.941		0.000	0.923
	N	2010	2010	1477	2005	2010	2010	2010		1884	2010
Parenthood	Correlation Coefficient	0.041	-.385**	.129**	-.116**	0.016	-.090**	-.077**	-.120**		-0.038
	Sig. (2-tailed)	0.075	0.000	0.000	0.000	0.493	0.000	0.001	0.000		0.101
	N	1884	1884	1444	1883	1884	1884	1884	1884		1884
Gender	Correlation Coefficient	-.099**	-0.008	-.065*	.118**	0.034	-0.005	-0.031	-0.002	-0.038	
	Sig. (2-tailed)	0.000	0.716	0.012	0.000	0.127	0.814	0.163	0.923	0.101	
	N	2010	2010	1477	2005	2010	2010	2010	2010	1884	

4.5.3. Results by personal attributes

4.5.3.1. Transport problems and gender

The first question of the questionnaire asked the respondents about general transport problems in their trip-making. In contrast to expectations, the results of the t-test showed that women report to have less problems than men.

A bivariate analysis indicated a significant correlation between gender and all questions of trip dependency (Q3.1, Q3.2, Q3.3). Women do not differ significantly in rates of reported difficulties and trips forgone, but when it comes to dependency, it is evident that women are more dependent on others than men in their daily travel. Across all questions regarding dependency women more frequently reported relying on others for their travel, whether on household members (on average 9% more dependent on their household members than men, mean score 1.24 vs. 1.36, sig<0.000) or close or distant friends and relatives (on average 8% more dependent, mean score 1.17 vs. 1.27, sig<0.000). Women forgo more trips than men across all categories, but the differences are insignificant.

4.5.3.2. Transport problems and income

Previous research pointed at people with low incomes as being more likely to suffer from transport problems (Litman, 2017). This is strongly related to not having a car due to its high cost, having to deal with poor transit and cycling infrastructures, and living in areas which might not be walkable or provide sufficient destinations.

The first question about general transport problems was consisted with expectations, that travel is less convenient for those with lower than average incomes (32%) than for those with higher than average incomes (21%). This result is significant and shows that, those with lower incomes are 11% more likely to have a lower general convenience of overall travel (mean score 1.99 vs. 2.15, sig>0.05). The general reporting on transport problems (Q1.1) resembles the rest of the answers (Q2.1 to Q4.5), showing that respondents with lower incomes report less convenient travel overall.

When performing a t-test comparing respondents with low incomes with respondents with average or high incomes, 10 of the main 12 questions about transport problems (Q2.1 to Q4.5) turn out to have a significant difference. People with lower than average incomes were found to

experience more transport difficulties (mean score 2.57 vs. 2.32, sig<0.000) than people with higher than average incomes. The results were also significant for trip dependency. Those with lower incomes are in average 42% more likely to forgo trips compared to average or higher than average income (mean score 2 vs. 1.5, sig<0.000).

For the questions regarding difficulties relating to trips made, the greatest difference in answers was for physical effort (23% for lower than average incomes, more than double the difficulty rate of those with higher than average incomes). A clear difference was also found regarding spending an excessive amount of money on travel (25% report of spending too much money during travel, exactly double the higher than average incomes). Dependency on distant relatives or colleagues (10%) among respondents with lower than average incomes is almost identical to the dependency level on household members (13%) and is five times higher than among those with average incomes.

Surprisingly, financial difficulty is not the main reason for forgoing trips among low income groups; in fact, the order of reasons remains the same as among respondents with higher incomes. However, 15% of those with lower incomes reported forgoing trips for financial reasons compared to only 4% of those with higher than average incomes. Four times more people with low incomes were found to forgo trips due to a lack of transport returning home, and differences in other categories are also two to three times higher when comparing lower and higher than average incomes.

4.5.3.3. Transport problems and car access

The literature shows a clear connection between ease of movement and car availability. Here we describe the results of the bivariate analysis between car availability and transport problems. There is clearly a relationship between income and car ownership, which we explore in the multivariate analysis. In order to analyze whether this relationship also holds for the sample population, the respondents have been divided in two groups: those who own a car, can drive it, and do not suffer from any physical or emotional problem that prevent from driving and everyone else. The survey uses two variables to make this distinction: car ownership which is termed “car users” and the inability to use a car which is termed “non-users.”

After analyzing the results, it is clear that dividing the results by income has significant results for the same questions as dividing it by car owners. In fact, the only question for which car

ownership was not a significant factor was the question asking about time loss in travel (Q2.1); neither car ownership nor income were significant indicators for time-related problems in travel (sig=0.681).

A small difference was found between car users and non-users in the general rate of convenience (Q1.1) (mean score 2.12 vs. 2.01, sig<0.05), and in the level of physical effort necessary for daily travel (Q2.2, mean score 1.79 vs. 1.4, sig<0.000). Interestingly, respondents who drive their own car and respondents who don't did not report any significant self-rated difference regarding time, contrary to initial expectations. More non-users than car users reported spending an excessive amount of money on their trips. However, again in contrast to expectations, much fewer car users reported difficulties related to travel. This may be because out-of-pocket costs of car use are often low or perceived to be low. As expected, car users are far less dependent on others; they were found to be four times less dependent on colleagues and distant relatives than non-users. Regarding forgone trips, non-users indicated giving up on a trip due to excessive travel time. The findings showed an average of 33% more trips forgone by non-users than car users, while mean weighted difference suggested that the chances of forgoing a trip are 26% higher for non-users than car users (mean score 1.93 vs 1.52, sig<0.000). Not making a trip due to the problem of returning home on the same day (Q4.5) suggested that people who don't use or don't have cars don't have sufficient transport options at night or at the weekend. The same gap is emerging when examining trips forgone due to financial reasons (three times more likely for non-users to forgo trips) and physical effort (twice as high).

4.5.3.4. Geographical differences in transport problems

ANOVA was used to analyze whether there were differences in the answers given by respondents from different neighborhoods. Responses for the four neighborhoods differ significantly for questions Q1.1, Q2.1, Q2.3, and Q2.4. One neighborhood, north Kfar Saba, was found to be "suffering" more than others. This is, perhaps, not surprising, as this "neighborhood" encompasses a variety of small non-urban settlements, which comprise few destinations and virtually no public transport. A comparison with Ramat Chayal, the less urban neighborhood of Tel Aviv, would show that north Kfar Saba has less mixed land use and more car dependency, thus justifying the results.

When creating a variable with just this area (North Kfar Saba) compared to the other neighborhoods, reports of more transport difficulties can be expected as it is a non-urban area and is the furthest from Tel Aviv city center. In this case, the t-test showed a higher score (meaning more transport problems) in this specific neighborhood for questions Q1.1, Q2.1, Q2.3, Q2.4, and Q4.4. Surprisingly, in questions Q3.2 (dependency on friends and close family members who live nearby) and Q4.5 (trips forgone due to lack of means to return home) the results demonstrated that residents of north Kfar Saba have less transport problems (although the difference is insignificant) than other neighborhoods. People from north Kfar Saba are therefore 13% more likely to report transport inconvenience (Q1.1) than people from the other three areas (mean score 2.22 vs. 1.96, sig<0.000). The lower rates of dependency on friends and family outside of the household can be linked to the fact that dependency is directed more toward household members. Overall results pointed slightly toward more trip dependency and trips forgone in north Kfar Saba, as is explored further in the multivariate analysis.

Urban (city center) versus less urban areas (city outskirts). People living in an urban, walkable, relatively dense part of the city (Kikar HaMedina in Tel Aviv and Kfar Saba city center) reported having more transport problems than those living in less urban and more car-oriented areas (Ramat HaChayal in Tel Aviv and north Kfar Saba). This finding diverged from my expectations, which were based there is a larger variety of travel means in the city and more available destinations in close proximity.

Living in the city does not correlate with any one of our three scales for transport problems. When analyzing only the significant results, the t-test showed that those who live in the urban city center reported suffering from more transport problems, mostly relating to time and inconvenience, as in questions Q1.1, Q2.1, Q2.4, and Q4.4. Regarding question Q3.2, it seems that those who live in less urban areas tend to be more dependent on family and close friends who are not members of their household.

All the differences mentioned above were statistically significant but quite small, especially when compared to car ownership and income. Moreover, five out of 12 questions indicated better results for the less urban areas, while the remaining five leant significantly toward the opposite direction, namely, more transport problems in these areas. This means that the impact of city center versus city outskirts can perhaps only be observed if other variables are taken into account in a multivariate analysis.

City (Tel Aviv) versus suburb (Kfar Saba). When dividing the results by neighborhood, respondents from north Kfar Saba did not report experiencing more difficulties than the two neighborhoods in Tel Aviv. Only two of the questions indicated the suburban town of Kfar Saba as having significantly more transport problems than Tel Aviv: Q1.1 about general convenience in travel (mean score 2.09 vs. 1.97, sig<0.000) and Q2.1 about time difficulties (mean score 2.29 vs. 2.19, sig<0.000). The same phenomenon is repeated as with the variable "urban": eight out of 13 questions showed people in Kfar Saba and in the rural and suburban villages surrounding it (north Kfar Saba) as suffering more, while the remaining five questions showed the opposite. Regardless of the low significance rate, other results were significant but inconsistent (facing different directions for each question), and thus this variable could not be used in the final regression.

4.5.3.5. Transport problems and parenthood

Parenthood is a category for those with children in their household – a category tested for possible difficulty in trip-making. Parents report having less problems in travel in general and being less dependent on others for their travel. The following table sheds light on possible explanation to parents' relatively low reported dependence.

Table 4.5.3.5.1. Car Possibility (Ownership & Ability to Use) by Parent vs. Non-Parent

			Parenthood (ages 25–64)		
			Non-Parents	Parents	Total
Car ownership and ability to use car	Car owner with no problem using it	Count	493	614	1107
		% within parenthood (ages 25–64)	81.5%	88.7%	85.4%
	No Car/problem using their car	Count	112	78	190
		% within parenthood	18.5%	11.3%	14.6%
Total		Count	605	692	1297
		% within parenthood (ages 25–64)	100%	100%	100%

The results showed that parents are more likely to have a car and, therefore, that people who aren't parents are more likely to be dependent on others (Q3.1, Q3.2, and Q3.3). In addition, none of the questions about trips forgone (Q4.1, Q4.2, Q4.3, Q4.4, and Q4.5) showed a significant difference between parents and non-parents.

These mixed results and car ownership rate show that the bivariate analysis of parenthood does not show results in line with expectations; the regression, however, might be able to deal with these effects.

4.5.3.6. Transport problems and age

Unlike my approach toward the "income" and "neighborhood" variables, for an age-based comparison, I chose to use a t-test in order to focus on the suspected vulnerable age groups: 18–24 (young adults) and 65+ (older people). For each variable, the opposite vulnerable group was nullified in order to compare it strictly with ages not suspected as being vulnerable: the 18–24s were compared with the 25–64s and the 65+ were compared with the 25–64s. Starting with the 65+, significant results indicated that they tended to report less trip difficulties and forgone trips. For questions Q2.1, Q2.3, Q2.4, and Q4.1, the 25–64 age group reported more transport difficulties (e.g., Q2.4, convenience in trip-making, mean score 1.87 vs. 1.6, sig<0.000, proving that older people are 15% less likely to report inconvenient travel than those aged 18–64). This is not in line with expectations and could be caused by several things. First, older people might have higher car availability when they are still able to drive. Second, as mentioned before, we might not have enough information and might have obtained different results had there been a better separation between the ages 65–74, 75–84, and 85+. In addition, in spite of suffering from some of these transport problems, it is possible that older people don't complain as much. Another possible explanation is that older people make fewer trips, and when asked about the previous three days, they might not have made many or any trips at all. Having not forgone trips, they are not noted in the questionnaire as being deprived in that sense; however, being used to not having many mobility options, it is not that they forwent a trip but rather that they didn't plan a trip from the outset, not even seeing it is a possibility.

Regarding young adults (18–24), time appeared to be their major concern in daily travel (37.8% of them reported time difficulties in more than half or almost all of their trips). Nonetheless, they suffered less than those in the 25–64 age group (40.9%).The only transport

difficulty from which young people suffer more than the other age groups is the cost of travel (22.7% compared to 17.1% among the 25–64s and 12.3% among the 65+). This result is insignificant for transport difficulty and significant for trips forgone: young people forgo, on average, 25% more trips due to lack of means to return home (Q4.5) than people aged 25–64 (mean score 1.16 vs. 1.46, sig<0.000). Young adults were found to very dependent on others for daily travel, mostly on household members (Q3.1) (16% compared with 26.1% in the 25–64 age group and 8.9% of older people). The rate of dependency on others is highest among young adults for all questions regarding dependency, with them relying mostly on direct household members, probably because car ownership and car licenses are expensive and many at this age don't own a car. Surprisingly, trips forgone as an aggregation or scale are significantly correlated with being young; it seems the older you are, the less transport problems you are likely to have.

4.5.3.7. Transport problems and disabilities

As expected, people with one or more disabilities reported suffering more from physical problems than those with no disability when trying to reach their destinations. They are two to three times more dependent on others in all of the relevant questions (Q3.1, Q3.2, and Q3.3) and are more likely to forgo trips for all the aforementioned reasons (time, money, physical effort, or discomfort). Almost half of respondents with disabilities stated forgoing a trip over the last three days due to extensive travel time.

When performing a t-test, disabilities seem to be significant for almost all questions (except for Q2.1, time difficulty in trip-making, and Q2.3, difficulty related to costs). This finding points out just how severely physical impairment affects transport experience and overall mobility. The need to use any one of the mobility aids mentioned in our questionnaire (walking stick, walker, wheelchair, white cane, guide dog) can probably predict greater dependency on others than the able-bodied population as well as the likelihood of forgoing trips (31% more likely to report trips forgone the able-bodied population, mean score 1.56 vs. 2.06, sig<0.000).

4.6. Scaling

4.6.1. Scaling the survey by segments

In order to proceed to a multivariate analysis that may explain people's transport problems, a decision had to be made regarding the dependent variable. The questionnaire contains a range of questions that could be used separately or in conjunction as an indication of a person's transport problem. In an attempt to avoid running a broad range of analyses for each separate dimension of transport problems, I have employed two different ways of combining the questions of each segment (transport difficulty in actual trip-making, transport dependence, and trips forgone): first, an aggregation (sum) of all the questions of each section, and second, the creation of a scale that uses a more complex rule to combine questions.

1. **Sum** – the aggregation of the results of each respondent to all questions in the relevant segment. A new variable was created for each of the transport problems in the survey:

    a. Trip difficulty sum (TDiffSum) is an aggregation of each respondent's answers to Q2.1, Q2.2, Q2.3, and Q2.4.

    b. Trip dependency sum (TDepSum) is an aggregation of each respondent's answers to Q3.1, Q3.2, and Q3.3.

    c. Trips forgone sum (TFGSum) is an aggregation of each respondent's answers to Q4.1, Q4.2, Q4.3, Q4.4, and Q4.5.

This type of aggregation creates a variable that uses all available information about each segment, but it is hard to interpret its results. When exploring the different values of TDiffSum, one can assume both the meaning of results 0–4 (the respondents either had some small difficulty in all dimensions (time, money, etc.) or didn't reply) and the meaning of results 13–16 (the respondents answered at least once 4 – they experience a certain difficulty in nearly all of their trips). As for the rest of the results (5–12), it is harder to explain the respondents' situations, since they might have reported only two types of difficulties as present in all of their trips or simply stated experiencing all types of difficulties at a relatively low rate.

A descriptive analysis of TDiffSum showed that 26% of the respondents reported not experiencing any difficulty in their trips, at least 8% reported experiencing one type of difficulty or more in almost all of their trips, and the rest of the respondents were in between, with no possible conclusive explanation.

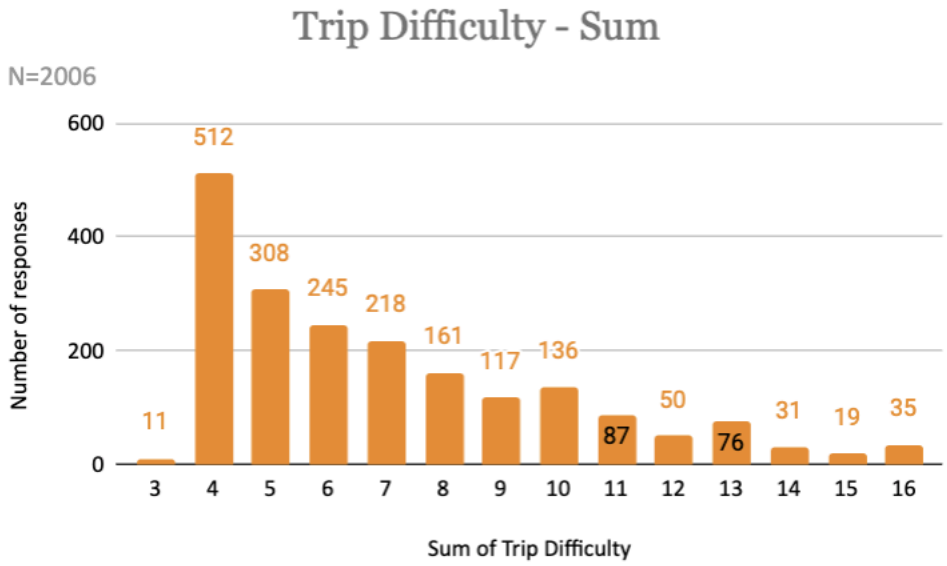


Figure 4.6.1.1. Trip difficulty by sum of results (Q2.1 to Q2.4).

TDepSum indicated that 70% of the respondents reported not being dependent on anyone for their transport needs over the previous three days. As for the rest of the results, an aggregation would not allow for other assumptions other than indicating that very few people had to rely on household members, family members, or distant relatives or colleagues for their daily trips.

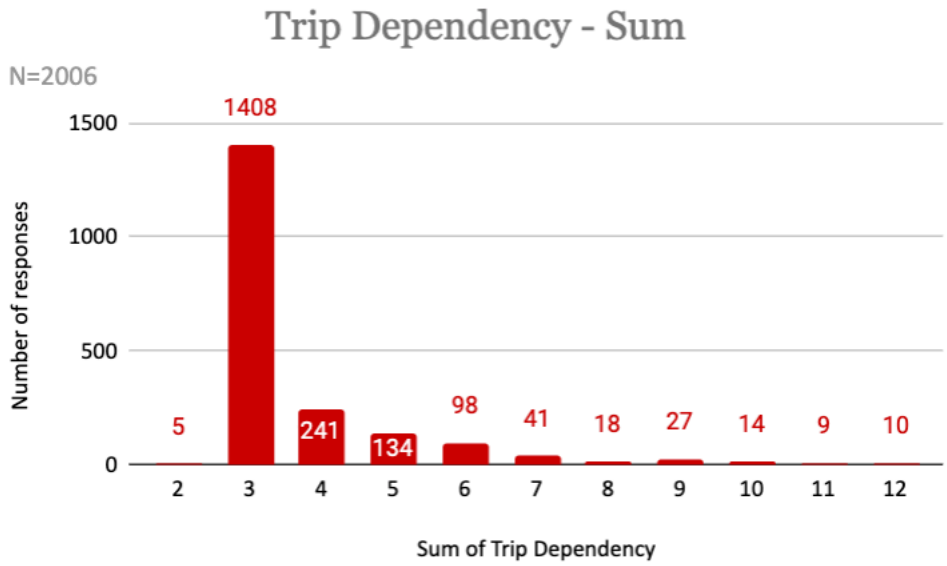


Figure 4.6.1.2. Trip dependency by sum of results (Q3.1 to Q3.3).

TFGSum concluded that 59% of the respondents did not forgo trips due to transport difficulties in the three days prior to the questionnaire. At least 2% reported experiencing one type of difficulty or more in almost all of their trips.

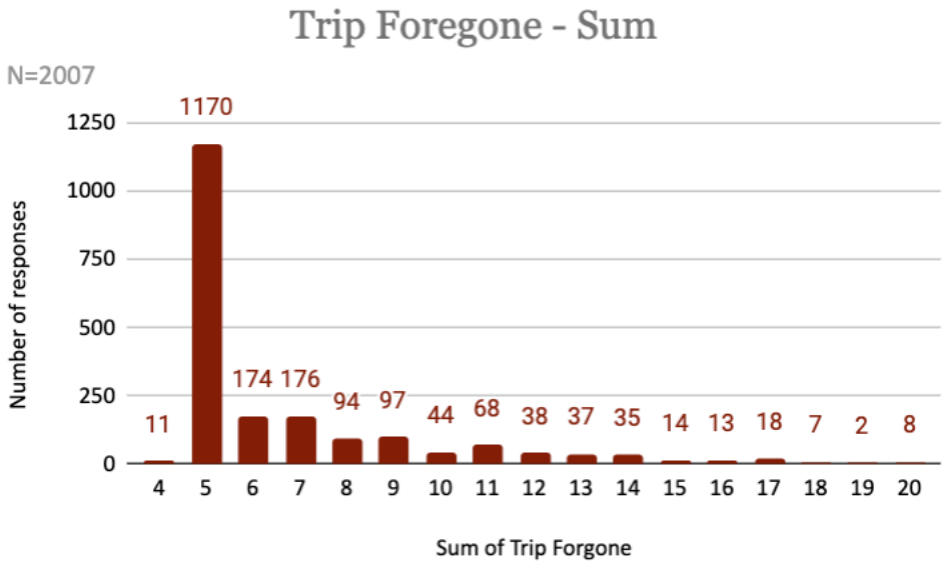


Figure 4.6.1.3. Trips forgone by sum of results (Q4.1 to Q4.5).

As previously mentioned, plain aggregation does not generate a clear understanding of the results; it allows us to understand those at the edges (i.e., those with many problems or those with hardly any problems) but not to differentiate between the various levels of difficulties of those reporting them. A second variable is therefore suggested.

2. **Scale** – a rule distinguishing the respondents according to the most severe level of problem experienced for each of the three types (problems related to trip-making, dependence on others, trips forgone). This scaling is applied differently for each type of transport problem:

    a. Trip difficulty: the highest rated trip difficulty scale (TDiffScale) is the highest level of reported trip difficulty by the respondent's answers to Q2.1, Q2.2, Q2.3, and Q2.4. For example, if a respondent answered 4 at least once (experiencing at least one of the difficulties in nearly all of trip trips), their TDiffScale would be 4. If the respondent didn't answer 4 to any of the questions of this segment (Q2.1, Q2.2, Q2.3, and Q2.4) but answered 3 at least once (experiencing at least one of the difficulties in more than half of their trips), their TDiffScale would be 3, and so on.

    b. Trip dependency: the highest rated trip dependency scale (TDepScale) is the highest level of reported trip dependency by the respondent's answers to Q3.1, Q3.2, and Q3.3. The same rule applies as to TDiffScale.

    c. Trips forgone: the highest rated trips forgone scale (TFGScale) is the highest level of reported trips forgone by the respondent's answers to Q4.1, Q4.2, Q4.3, Q4.4, and Q4.5. The same rule applies as to TDiffScale and TDepScale.

Both the sum approach and the scale approach have advantages and disadvantages. The scale approach creates a variable that ranks the answers to each segment, favoring knowing exactly how much difficulty (or dependence or forgoing trips) is present in the respondent's daily experience. Although it does not mention the exact cause of the type of problem in each segment (time, physical effort, money, or discomfort), it does inform us of the prevalence of this type of difficulty and allows for an interpretation of all the implications of the available results.

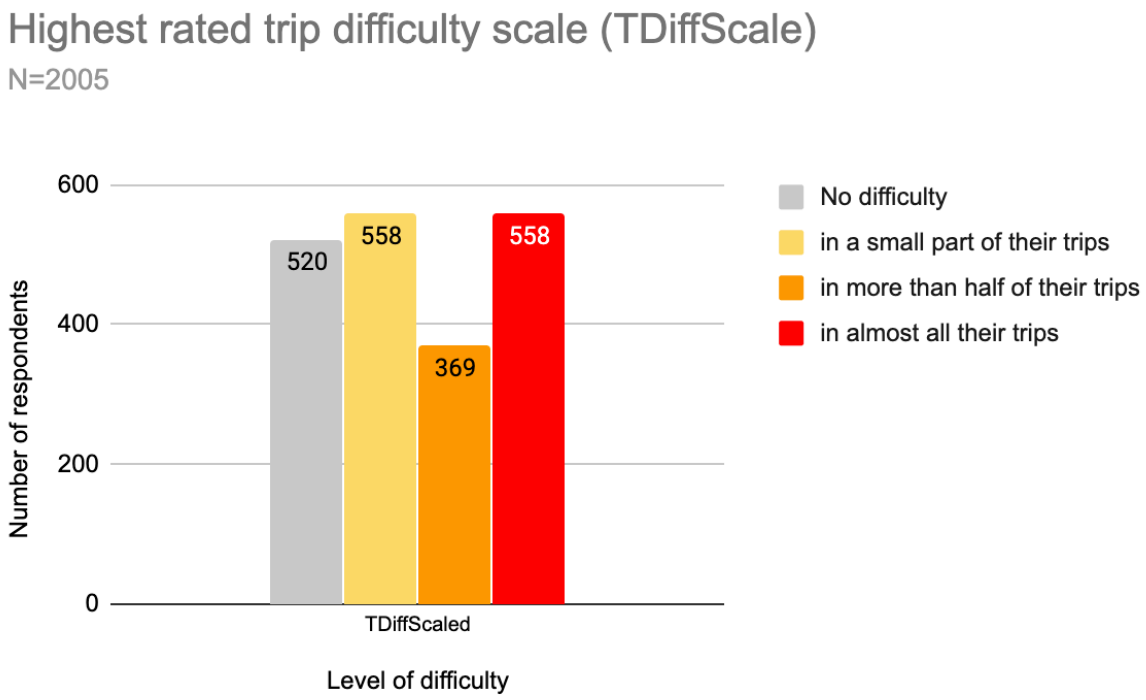


Figure 4.6.1.4. Highest rated trip difficulty by scaling (Q2.1 to Q2.4).

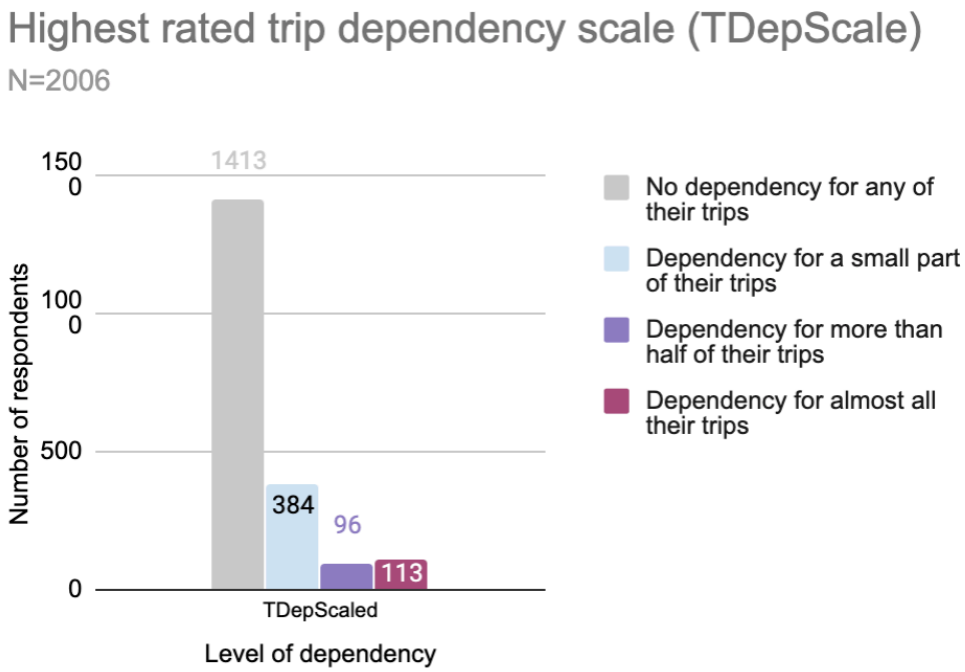


Figure 4.6.1.5. Highest rated trip dependency by scaling (Q3.1 to Q3.3).

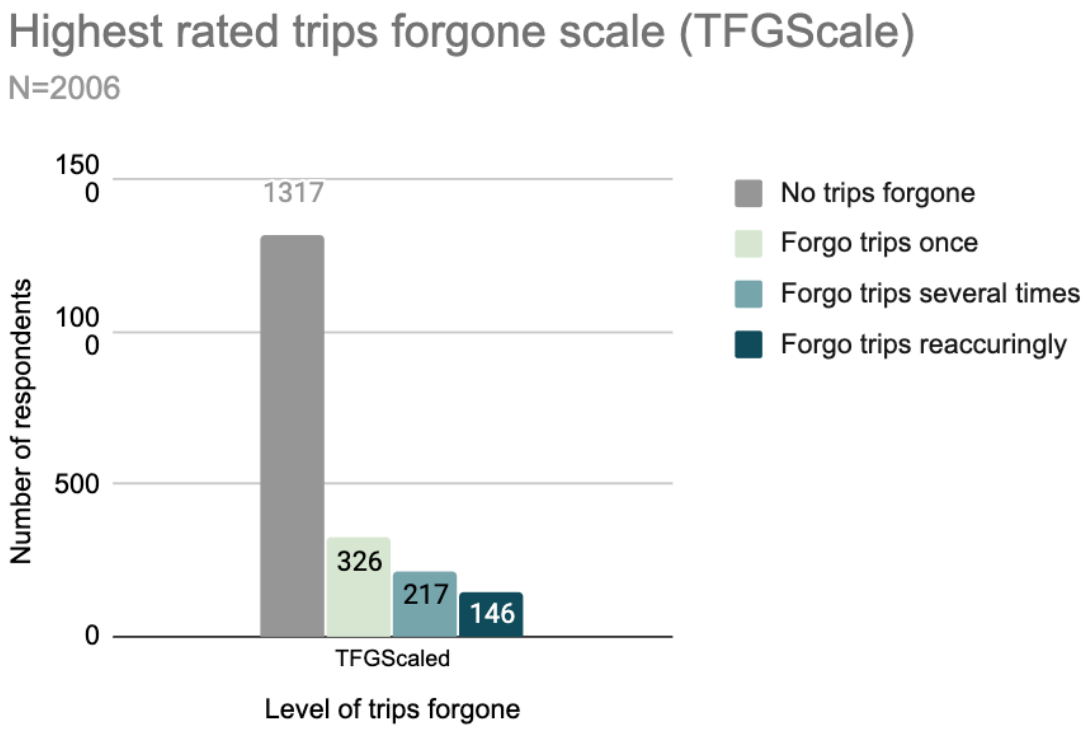


Figure 4.6.1.6. Highest rated trips forgone by scaling (Q4.1 to Q4.5).

The second, scaled variable allows us to interpret the data in a more reliable manner and is therefore preferred for the continuation of the analysis.

The descriptive analysis for the scaled group of variables showed that 26% of the respondents experienced no trip difficulty in any of their trips, 28% experienced difficulty in a small part of their trips. Overall, 74%, i.e., three out of every four respondents, reported experiencing at least one type of difficulty in their daily travel.

Regarding dependency, 70% reported not experiencing dependency in their trip-making over the previous three days, 19% reported being dependent on others in a small part of their trips, 5% said they were dependent on others for more than half of their trips, and 6% said they were dependent on others for almost all of their trips. Adding up the last two answers, it seems that one out of 10 respondents depended on others for more than half of their daily trips. Knowing that 84% of the respondents had cars in their households and that 52% owned a car for which they were the sole drivers might have affected the answers to this question.

TFGScale is the variable concerned with forgone trips due to transport problems. It showed that 61% of respondents reported not forgoing any trips, 15% reported forgoing trips once for at least one of the mentioned reasons, 7% forwent trips several times due to at least one of the reasons, and 7% forwent trips repeatedly due to one or more of the reasons. Since forgoing trips might indicate transport exclusion, the finding that 13% of respondents forwent trips several times or repeatedly due to transport-related issues can be seen as alarming.

It is thus clear that this second, scaled variable allows for a more detailed analysis of the data. The bivariate analysis of both types of variables, sum and scale, concludes they have highly correlated means (at the correlations table below, sig < 0.000). Means of the scaled variables are slightly lower, as are the standard deviations, but this is acceptable given the nature and the intention behind them, namely, to eliminate "noise" (i.e., similar answers to the overall questions of difficulty, dependency, and trips forgone). For example, if a respondent reported experiencing difficulty in relation to (only) the time spent on travel for almost all of their trips, they are given the same score on the TDiffScale as a respondent who reported difficulty in travel in relation to time,, physical effort, costs and discomfort for almost all of their trips. This contributes to the higher variances.

Having explored these two approaches, Table 4.6.1.1 and Table 4.6.1.2 show the extremely high correlation between them, and in light of the aforementioned considerations, I proceed with only the second approach - scale.

Table 4.6.1.1. (left). Descriptive Statistics of Survey Segments by Sum and by Scale

Table 4.6.1.2. (right). Correlations of Survey Segments by Sum and by Scale

Descriptive		
	Mean	Std. Deviation
TDiffSum	7.036	3.096
TDepSum	3.726	1.545
TFGSum	6.697	2.920
TDiffScale	2.360	1.176
TDepScale	1.453	0.828
TFGScale	1.596	0.948

Correlations			
	TDiffSum	TDepSum	TFGSum
TDiffScale	.905		
TDepScale		.988	
TFGScale			.909

4.6.2. Scaling the survey by issues

Another type of scaling can be based on the number of times issues are repeated in the respondents' responses. For example, questions about difficulties in trip-making due to an excessive amount of time (Q2) and forgoing trips due to time (Q4) can together create a single variable concentrating on time as a transport issue. Learning from the previous analysis of the three scales, I developed another scale for each of the issues in the questionnaire (time, physical effort, money, discomfort), drawing each time on two survey questions (see Table 4.6.2.1). The scale can be applied to each of the possible pairs:

- Q2.1, Q4.1 – time
- Q2.2, Q4.2 – physical effort
- Q2.3, Q4.3 – money
- Q2.4, Q4.4 – discomfort

The scales were created according to the following logic:

> 1 – Slight problem: those reporting difficulty in "some of their trips" or more but not forgoing any trips and those reporting one forgone trip but who didn't report it as being a difficulty in the earlier set of questions about trip difficulty. The logic: these people are suffering slightly from the problem but either it doesn't make them forgo a trip or they don't perceive it as a difficulty when asked about it from two different aspects.
>
> 2 – Severe problem: those reporting forgoing at least one trip and reported difficulty in at least some of their trips and those forgoing more than one trip for the same reason, irrespective of their responses to the other questions.

Table 4.6.2.1. Scaling Calculation of Transport Problem by Repeating Issues in Q2 & Q4

		Trip Difficulty (Q2)			
		1 – for none of my trips	2 – for some of my trips	3 – for more than half of my trips	4 – for almost all my trips
Trips Forgone (Q4)	1 – never	0	1	1	1
	2 – only once	1	2	2	2
	3 – a few times	2	2	2	2
	4 – repeatedly	2	2	2	2

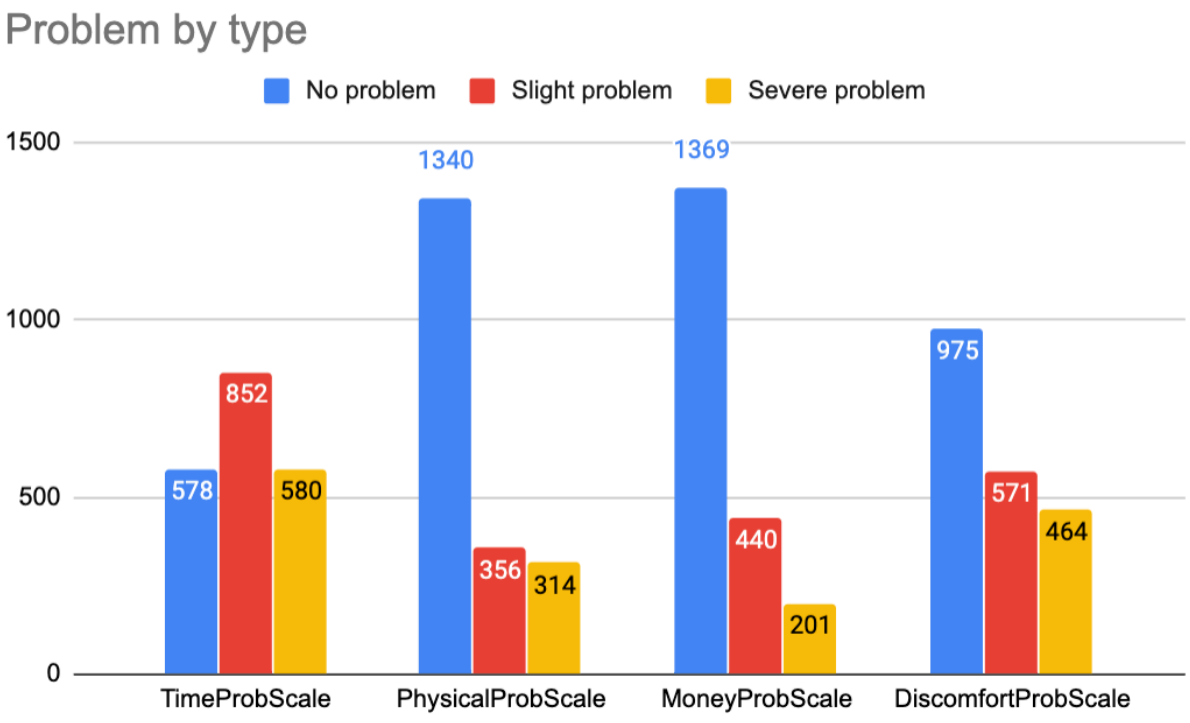


Figure 4.6.2.1. Transport problem level scaled by types of issues**.**

The results of this analysis show that time is the most common problem reported, while discomfort is again in second place, and the other two factors follow. Interestingly, when

combining those who have slight physical problems in trip-making and those with big problems, the physical effort factor outnumbers the financial factor.

Since these are not individual segments of our survey and are merely a suggested interpretation, there is not a mean comparison or correlation analysis for these scales. They are only tested as possible dependent variables in the next part of this thesis as the basis for further development of the survey.

4.7. Components Analysis

Principal component analysis (PCA) allows for the conversion of several correlated variables into a single set of uncorrelated variables. It is a method of data reduction which helps us to understand how to combine the three chosen scales into a single variable and attempt to create a linear regression. This attempt is executed not as a simple aggregation but is based on the different variances of each scale and supported by the table of correlations of the three scales presented earlier (section 4.6.1).

PCA was performed on the three scaled variables: TDiffScale, TDepScale, and TFGScale. Within the analysis, I tested: 1. scree plot which shows the eigenvalues' contribution of each of the chosen components; 2. component matrix which estimates the correlations of each of the components and the loading of each or its contribution to the new proposed combined variable; and 3. total variance explained which is the sum of variances of all individual principal components. Since the total variance explained Table 4.7.1 extracted just one component (only a single line under "extraction sums of squared loadings"), this analysis suggests that the three scaled components – TDiffScale, TDepScale, and TFGScale – could represent a combined typology of problems that this sample faces (i.e., a single overall group that will represent the three segments of questions).

Using the automated output of the analysis, I grouped the three scaled components into a single variable, using the coefficients for each of those scales suggested by the PCA (component matrix table, by the scales suggested for each component). The new variable will be the dependent variable in my subsequent analysis.

Table 4.7.1. Components Analysis – Total Variance Explained

Total Variance Explained						
Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	1.651	55.019	55.019	1.651	55.019	55.019
2	0.789	26.307	81.326			
3	0.56	18.674	100			
Extraction Method: PCA.						

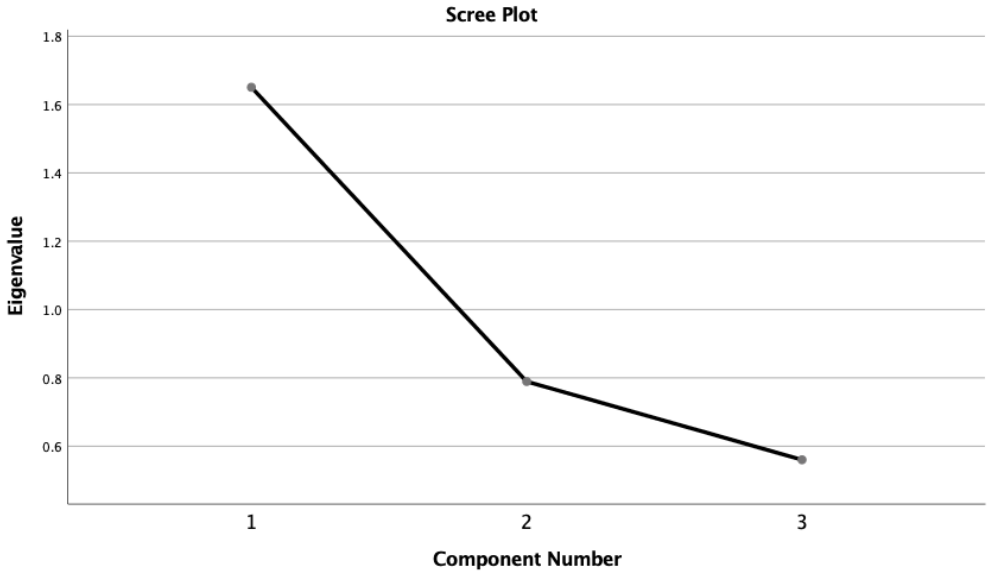


Figure 4.7.1. Scree plot of principal component analysis

Table 4.7.2. Components Matrix and Descriptive Statistics of PCA

Component Matrix	
	Component
	1
TDiffScale	0.756
TDepScale	0.652
TFGScale	0.809

Extraction Method: PCA.

1 component extracted.

Descriptive Statistics	
Overall Transport Problems (PCA variable)	
N	2010
Mean	0
Std. dev.	1
Minimum	-2.438
Maximum	3.097

4.8. Explanatory Analysis of Transport Problems

In previous sections the result of the correlation and mean comparisons showed that respondents with higher income and of older age reported less transport problems, while lack of car ownership and physical disability contributed to a higher incidence of transport problems. These relationships are now tested in a multivariate regression analysis (See Table 4.8.1). First, I present the results of the general variable created using the PCA, which is a combination of the three scales: difficulty, dependency, and trips forgone. In all ensuing multivariate analysis layouts, I present descriptive data about the significant variables that were considered in the regression and then the results of the multivariate analysis.

Table 4.8.1. Results of the Regression of Overall Transport Problems (PCA Variable)

Descriptive Statistics			
	Mean	Std. Dev.	N
Overall transport problems	0.000	1	2005
Disability	1.103	0.406	2005
No car	1.194	0.395	2005
Not north KS	1.751	0.433	2005
Young	0.052	0.223	2005
Older people	0.262	0.440	2005
Income	2.750	1.968	2005

Adjusted R Squared	ANOVA	
0.084	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	-0.577	0.126		-4.569	0.000
Disability	0.357	0.055	0.145	6.545	0.000
No car	0.493	0.056	0.195	8.770	0.000
Not north KS	-0.156	0.049	-0.068	-3.150	0.002
Young	0.261	0.097	0.058	2.681	0.007
Older people	-0.208	0.050	-0.091	-4.114	0.000
Income	-0.034	0.011	-0.066	-3.016	0.003

The PCA variable representing all transport problems reported in this survey is affected positively (more transport problems) by disability (0.357), lack of car (0.493), and younger age (0.261) and affected negatively (less transport problems) by neighborhoods which aren't north of Kfar Saba (-0.156), not being an older person (-0.208), and higher income (-0.034). The variables with the highest effect on the dependent variable are car ownership and disability. All parameters are significant at a 0.05 level, while other factors such as gender, parenthood, and other geographical sub-divisions (urban vs. suburban) were not significant or close to the significance level $p<0.05$. Another interesting result is the extremely low adjusted R squared, which represents the level of variance in the dependent variable (PCA variable) explained by the independent variables (car ownership, income, age, etc.).

A low adjusted R squared might suggest that the results are very scattered around the regression line and that each person's characteristics could not precisely predict their responses. This could be due to a lack of data on the actual trips people make or want to make. It also raises the question of whether the responses to the questionnaire are affected by subjectivity bias and the gap in different people's expectations. For example, a wealthy person with a car living in a central neighborhood in Tel Aviv might report a time-related transport problem when having to drive through traffic for 40 minutes instead of 20 minutes; similarly, a young mother with no car might not take her daughter to the doctor due to an expected 90 minutes of traveling on a poor public transport service. Another possibility is that the suggested survey might have a different model for describing its variables, not necessarily a linear model.

4.9. Models Based on Survey Segments

In order to find if and how the personal characteristics (income, gender, parenthood, etc.) affect different types of transport problems (general difficulties, dependency, trips forgone) and various issues within trip-making (time, physical effort, money, discomfort), I created several other regressions. Each of these are briefly discussed below.

4.9.1. Trip difficulty

The results of the regression by TDiffScale (Table 4.9.1) show that disability (0.245), lack of car (0.248), and living in north Kfar Saba (-0.245) were related to reports of more transport difficulty; being an older person (-0.281) was found a good predictor of having less transport difficulties. Income was insignificant in this regression – most likely due to its correlation with car ownership.

Table 4.9.1. Results of the Regression by Trip Difficulty

Descriptive Statistics			
	Mean	Std. Dev.	N
TDiffScale	2.361	1.174	2005
Disability	1.103	0.406	2005
No car	1.194	0.395	2005
Not north KS	1.751	0.433	2005
Older people	0.262	0.440	2005

Adjusted R Squared	ANOVA	
0.028	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	2.298	0.142		16.208	0.000
Disability	0.245	0.066	0.085	3.696	0.000
No car	0.248	0.067	0.083	3.691	0.000
Not north KS	-0.245	0.060	-0.090	-4.090	0.000
Older people	-0.281	0.060	-0.105	-4.643	0.000

4.9.2. Trip dependency

The results of the regression by TDepScale (Table 4.9.2) show that lack of car (0.425), being a young adult (0.442), disability (0.205), and being a woman (0.144) were significantly related to reports of more transport dependency; higher income (-0.101) was found a good predictor of having less transport difficulty. It is worth noticing that once income is addressed, about 25% of the sample is excluded due to a lack of answers to the question about income level. I nonetheless decided to use the variable income anyway, since it reflected a higher level of adjusted R squared (adjusted R squared=0.099), thus enabling a better explanation of the variances in the dependent variable by the independent variable.

Table 4.9.2. Results of the Regression by Trip Dependency

Descriptive Statistics			
	Mean	Std. Dev.	N
TDepScale	1.459	0.834	1477
Disability	1.107	0.419	1477
No car	1.184	0.387	1477
Gender	1.580	0.493	1477
Young	0.040	0.196	1477
Income low/avg/high	2.482	0.765	1477

Adjusted R Squared	ANOVA	
0.099	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	0.734	0.139		5.279	0.000
Disability	0.205	0.050	0.103	4.071	0.000
No car	0.425	0.057	0.197	7.453	0.000
Gender	0.144	0.042	0.085	3.397	0.001
Young	0.442	0.106	0.104	4.185	0.000
Income low/avg/high	-0.101	0.028	-0.092	-3.544	0.000

4.9.3. Trips forgone

The results of the regression by TFGScale (Table 4.9.3) show that disability (0.419), being a young adult (0.240), and lacking a car (0.233) were significantly related to reports of more trips forgone; higher income (-0.207) and being an older person (-0.213) were found good predictors of having less transport difficulties. As with transport dependency, the sample was reduced due to a lack of sufficient answers to the question about income level.

Table 4.9.3. Results of the Regression by Trips Forgone

Descriptive Statistics			
	Mean	Std. dev.	N
TFGScale	1.584	0.940	1477
Disability	1.107	0.419	1477
No car	1.184	0.387	1477
Young	0.040	0.196	1477
Older people	0.263	0.440	1477
Income low/avg/high	2.482	0.765	1477

Adjusted R Squared	ANOVA	
0.092	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	1.404	0.137		10.228	0.000
Disability	0.419	0.058	0.187	7.220	0.000
No car	0.233	0.065	0.096	3.607	0.000
Young	0.240	0.120	0.050	1.993	0.046
Older people	-0.213	0.055	-0.100	-3.853	0.000
Income low/avg/high	-0.207	0.032	-0.168	-6.43	0

The results of the regressions are summarized in Table 4.9.4. This shows that car ownership and disability affect all types of transport problems, while low income and young age (18–24) affect dependency and trips forgone. Similarly, gender was found to affect dependency and being from north Kfar Saba affects trip difficulty. Only older people were found affected by trip difficulty and trips forgone in the opposite direction to the expectations, suggesting that older people reported less transport problems.

Table 4.9.4. Cross-Segment Analysis of Results of the Regression

Personal Attributes	Difficulty	Dependency	Trips Forgone
Gender		V	
Income		V	V
No car	V	V	V
Urban vs. suburban (city center vs. else)			
Suburb (TLV vs. KS)			
North KS vs. else	V		
Parenthood			
Young		V	V
Older people	V		V
Disability	V	V	V

A different type of analysis might cross the specified segments, namely, asking about a different issue each time: time, physical difficulty, money-related difficulty, and discomfort in trip-making.

4.10. Models Based on Issues

4.10.1. Transport problems related to time

The results of the regression by Time Problems Scale (Table 4.10.1) show that disability (0.230) was significantly related to reports of more time problems in transport; being an older person (-0.230) and having a higher income (-0.130) were found a good predictor of having less time problems in transport. As with the previous scales, the sample was reduced due to a lack of sufficient answers to the question about income level.

Table 4.10.1. Results of the Regression by Transport Problems Related to Time

Descriptive Statistics			
	Mean	Std. dev.	N
Time Problems Scale	0.672	0.817	1477
Disability	1.107	0.419	1477
Income low/avg/high	2.482	0.765	1477
Older people	0.263	0.440	1477

Adjusted R Squared	ANOVA	
0.036	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	0.785	0.095		8.281	0.000
Disability	0.234	0.051	0.120	4.573	0.000
Older people	-0.232	0.049	-0.125	-4.740	0.000
Income low/avg/high	-0.126	0.028	-0.118	-4.553	0.000

4.10.2. Transport problems related to physical effort

The results of the regression by Physical Problems Scale (Table 4.10.2) show that a lack of car (0.320) and disability (0.270) were significantly related to reports of more physical problems in transport; being an older person (-0.140) and having a higher income (-0.030) were found good predictors of having less physical problems in transport.

Table 4.10.2. Results of the Regression by Transport Problems Related to Physical Effort

Descriptive Statistics			
	Mean	Std. dev.	N
Physical Problems Scale	0.672	0.817	1477
Disability	1.107	0.419	1477
Income	2.482	0.765	1477
Older people	0.263	0.440	1477
No car	1.184	0.387	1477

Adjusted R Squared	ANOVA	
0.063	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	-0.075	0.070		-1.059	0.290
Disability	0.268	0.042	0.145	6.464	0.000
Older people	-0.138	0.038	-0.081	-3.636	0.000
Income	-0.026	0.008	-0.069	-3.127	0.002
No car	0.316	0.043	0.166	7.398	0.000

4.10.3. Transport problems related to costs

The results of the regression by Money Problems Scale (Table 4.10.3) show that a young age (0.270), car ownership (0.120), and disability (0.120) were significantly related to reports of more problems in transport; a higher income (-0.120) was found a good predictor of having less problems in transport.

Table 4.10.3. Results of the Regression by Transport Problems Related to Costs

Descriptive Statistics			
	Mean	Std. dev.	N
Money Problems Scale	0.293	0.616	1477
Disability	1.107	0.419	1477
Income low/avg/high	2.482	0.765	1477
Young	0.040	0.196	1477
No car	1.184	0.387	1477

Adjusted R Squared	ANOVA	
0.055	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	0.302	0.092		3.286	0.001
Disability	0.114	0.038	0.078	2.993	0.003
Young	0.274	0.080	0.087	3.429	0.001
Income low/avg/high	-0.119	0.021	-0.147	-5.532	0.000
No car	0.125	0.043	0.079	2.905	0.004

4.10.4. Transport problems related to discomfort

The results of the regression by Convenience Problems Scale (Table 4.10.4) show that suffering from a disability (0.210), living in north Kfar Saba (0.150) and the lack of a car (0.190) were significantly related to reports of more problems in transport; being an older person (-0.170) was found a good predictor of having less problems in transport.

Table 4.10.4. Results of the Regression by Transport Problems Related to Discomfort

Descriptive Statistics			
	Mean	Std. Dev.	N
Convenience Problems Scale	0.520	0.794	2005
Disability	1.103	0.406	2005
Not north KS	1.751	0.433	2005
Older people	0.262	0.440	2005
No car	1.194	0.395	2005

Adjusted R Squared	ANOVA	
0.032	Sig.	0.000

Coefficients					
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	0.366	0.096		3.829	0.000
Disability	0.210	0.045	0.107	4.695	0.000
Older people	-0.175	0.041	-0.097	-4.295	0.000
Not north KS	-0.151	0.040	-0.082	-3.728	0.000
No car	0.194	0.045	0.097	4.283	0.000

4.11. Conclusion of the Results

A summary of the results from our issue-based regressions for comparison (Table 4.11.1) shows that income and disability affect all types of transport issues (time, physical effort, etc.) while lack of car ownership affects all issues except for time due perhaps to congestion and its perception as time-consuming. (This is in contrast to public transport, which can take much longer than car travel but its users have already lowered their expectations regarding trip making and also what they perceive as time-related transport problems).

Likewise, young age (18–24) was found to affect financial problems and discomfort and being from the north Kfar Saba affects inconvenience in trip-making. Only being an older person affected issues of time and physical effort in the opposite direction to the expectations, showing that older people report less transport problems.

Table 4.11.1. Cross-Issue Analysis of Results of the Regression

Personal Attributes	Time	Physical effort	Money	Discomfort
Gender				
Income	V	V	V	V
No car		V	V	V
Urban vs. Suburban (city center vs. else)				
Suburb (TLV vs. KS)				
North KS vs. else				V
Parenthood				
Young			V	V
Older people	V	V		
Disability	V	V	V	V

By comparing the various models (Table 4.11.2), it is clear that disability, car ownership, and income are the variables with the greatest influence on transport problems in terms of both the essence of the problem (i.e., is the trip difficult, are you dependent, did the difficulty make you forgo trips?) and the relevant issue (time, physical effort, money, or discomfort). Gender had an individual effect only when isolating dependency. The only geographical division of the areas that showed conclusive significance was the comparison of north Kfar Saba with the other three areas,

which was significant in the overall model and when specifying the model strictly for trip difficulty. Being young (18–24) was found significant in the model only when asked about money and discomfort in travel, trip dependency, trips forgone, and the final overall model which combines the three segments of questions. Older people affected the model in an opposite direction than expected; in other words, those over 65 were less likely than those aged 18–64 to report time-related transport problems, physical effort problems, trip difficulties in general, or trips forgone.

Unfortunately, as mentioned earlier, most of the models do not explain the variance between the groups to a sufficient degree. This can be noticed in the low level of adjusted R squared – the percentage describes the level of the variances explained by the model. This demonstrates that I was able to explain, at best, only 10% of the differences between people of different groups (different incomes, with or without car, etc.); more than 90% of the reasons for the similarities or differences could not be explained by the models.

Table 4.11.2. Comparison of All Regression Models

Personal Attributes	Time	Physical effort	Money	Discomfort	Difficulty	Dependency	Trips Forgone	Overall model
Gender						V		
Income	V	V	V	V		V	V	V
No car		V	V	V	V	V	V	V
Urban vs. Suburban (city center vs. else)								
Suburb (TLV vs. KS)								
North KS					V			V
Parenthood								
Young			V	V		V	V	V
Older people	V	V			V		V	V
Disability	V	V	V	V	V	V	V	V
	Adjusted R Squared							
	3.6%	6.3%	5.5%	3.2%	2.8%	9.9%	9.2%	8.4%

5. Conclusion

My research objective was to create and validate a tool to identify transport problems. This chapter summarizes the development and findings of the conducted survey in relation to both the questionnaire and to the different populations and their reported transport problems. At the end of the chapter I make recommendations for several improvements.

5.1. Summary of Findings

5.1.1. Development of the survey

As discussed earlier, transport surveys and data collected today do not focus on the measurement and evaluation of transport problems from the user's perspective. In this thesis, a new tool was developed and tested in order to identify and analyze transport problems among a sample population. Following a literature review of various transport problems among different populations, a short questionnaire was formed and refined after three pilot tests. The survey examined three types of transport problems: difficulties in trip-making, dependency on others for trips, and trips forgone. Its reliability was subsequently tested in a range of statistical analyses. The analysis of the survey relied on previous studies and examined how key variables such as age, income, gender, and others contributed to people's transport problems. The survey results enabled me to test the reliability of my hypothesis and the validity of the new proposed tool.

5.1.2. Statistical tests, confirmation of the model, and limitations of low adjusted R squared

The survey tool itself is validated using PCA (internal validity) and by comparing the correlations and t-tests of each personal attribute to the different transport problems (external validity). PCA was able to reduce the number of components in the model and thus succeeded in combining all three segments of the survey (trip difficulty, trip dependency, and trips forgone).

Simple correlations between our independent variables and the various transport problems mostly confirmed expectations; the multivariate model succeeded in confirming most expectations but not all. Unfortunately, only a small part of the variance of the dependent variable is explained by the independent variables in the various multivariate models (adjusted R squared scores of up to 9.9%). There might be various reasons for this, primarily, the subjectivity of expectations, i.e.,

different people have different expectations from their daily trips. This subjectivity can be for sociological reasons (e.g., respondents with a higher income might expect a better trip experience, men might expect a better experience than women, etc.; see Cardozo, 1965 and a range of subsequent studies about the connection between expectations and satisfaction) that deliver models that are hard to interpret or rely on. Subjectivity can also be due to the fact that people rarely change their habits. People do not compare their daily experience to different modes of transport, only to what they are used to, therefore, their answers reflect their existing situation and are not based on a comparison with alternative (possibly worse) travel options.

Another likely reason for the subjectivity of expectations lies in the differences between people in terms of their need or desire for trip-making. While some population groups (have to) travel often and to various destinations, others might not have to or want to travel as much. A lower desire for travel can be related to habits and acquaintance with poor transport options (e.g., older people might not want to make a trip if the bus stop is 700 meters away), but may also be for other reasons (e.g., a woman living in a remote neighborhood might already be used to not meeting her friends at night if public transport isn't frequent and therefore won't even count those as trips forgone).

5.1.3. Populations with significant transport problems

From the analysis of the results, it can be argued that the three demographic groups reporting transport problems more often than others are people with disabilities, people without access to a car, and people with a low income. These results were significant according to most of the different models. The comparison tables show that whenever car ownership was excluded from the model due to low significance, income was included and vice versa. Such a connection was expected and was found in the literature but receives additional validation in the current analysis. As previously mentioned, disability was significant and was included in all the multivariate models of transport problems.

However, in contrast to the literature review, the women in our survey demonstrated relatively similar results to men when calculating the overall model, except in one single field: dependency. This confirms empirical research that has shown that women have lower access to cars than men whenever there are less cars than driving adults in a household.

Regarding the different geographical areas, no significant difference was found between the two urban neighborhoods, Kikar HaMedina in Tel Aviv and the city center of Kfar Saba. Likewise, no significant difference was found between the two urban neighborhoods and the two more suburban and car-based areas (Ramat HaChayal in Tel Aviv and north Kfar Saba). Significant difference was found between the respondents from the area of north Kfar Saba – the most rural neighborhood with the poorest public transport service and located furthest from an urban core – and the other three neighborhoods in a single aspect: respondents from north Kfar Saba reported more transport difficulties. In the remaining geographical comparisons and models, no significant influence was found according to residential location alone. This can be explained by various reasons. First, car ownership rates in the chosen sample were relatively high across all areas (~80%), and as it can be difficult to live outside a city center in Israel without owning a car, reported rates of transport difficulties might have been lower since people had cars. A second option is that people reported their subjective difficulty, which might reflect high frustration among those who live in the city center although their objective difficulties (travel times, inconvenience in travel) might be less than those living in more rural areas. A third explanation is that since the majority of respondents reported owning a car, those living in more rural areas might travel longer distances but possibly suffer less from traffic and stressful driving than urban drivers. A fourth explanation might be that people that decided to live in the suburbs make less trips than people in the cities, who choose to live in cities because they want to do more things and leave their homes more often throughout the day.

In contrast to the literature, older people (65+) were found to experience less difficulty and trips forgone than other age groups, reported less problems of time and physical effort in travel, and were actually a good predictor of *not* having transport problems. While surprising, this can be seen to have several possible explanations. First, the 65+ age group are not a homogenous group of people: they might be aged 65, 80, or even 90. A better age differentiation might lead to different and more precise answers. The chosen population, as mentioned before, had high rates of car ownership, which is an important factor in the self-evaluation of transport problems. A person who has a car, is relatively wealthy (of the 1477 respondents who were willing to state their income level, 65% had a higher than average income), and is already retired might consider himself lucky and not report any problems, especially those concerning money or physical effort. Older people

might also forgo less trips since they might make less trips overall when compared to other age groups and tend to have more time.

When addressing the less studied topic of younger people (18–24), this population group was found to have more transport problems, to be more dependent on others, and to forgo more trips. They also reported more problems related to money and discomfort. While not yet backed by substantial research, young people are, as mentioned in the literature review, less financially established, rely more on public transport, cycling, and being driven by others, and might not own a car or even have a driver's license. Their difficulties are an important research and policy topic that have not yet been specifically addressed in the transport literature.

The final surprising finding of the survey was the fact that parents as a group had no unique effect. Although previous literature has indicated that parents spend more time driving their children and that the various public transport and cycling systems are not always very accommodating for strollers or young children, parents participating in the current survey did not seem to experience more transport problems than non-parents. A slight connection was found between parenthood and car ownership (88.7% of parents with young children in their household were car owners as opposed to 81.5% of non-parents), leading to the assumption that they might have better mobility options, perhaps because in Israel it is difficult to raise children outside a city center without a car. Another possibility is that, as parents' struggles were not the only aim of this survey, more specific questions were omitted from the questionnaire (e.g., "how difficult is it for you to travel with your children?"). Of course, the most obvious blind spot is the fact that parents are only one population in the field of caregivers – a population which is usually (but not only) comprised of women who might also take care of elderly, sick, or disabled family members. As women have less access to cars, as apparent in previous literature and in this survey, it is possible that being a parent of young children is not, on its own, a predicting factor of transport problems and that more focused follow-up questions regarding main caregivers would be more helpful and would reflect the initial intention.

Lastly, the most difficult thing to measure, which was probably not reflected in this survey, is the deeper meanings and implications of transport problems, i.e., life expectations and transport-based life decisions. While measuring the number of trips a person has forgone in the last few days can be challenging, it is much harder to acknowledge the fact that all of a person's needs can be deeply affected by poor transport. In other words, the survey was not designed to identify a

person's job limitations due to transport problems or the fact that a person could access better doctors or cheaper groceries if they had a better (public) transport system or if their neighborhood was more walkable and had mixed land use. The built environment along with the public transport system shapes not only our immediate expectations (e.g., can I meet my friends tonight?) but also our long-term ambitions (e.g., I won't take a job in this workplace since it will take me another hour of daily driving or traveling). Future studies should include a special segment in the questionnaire that specifies long-term life choices affected by transport.

As can be seen, identifying, analyzing, and understanding transport problems is complex due to various reasons: inner correlations, large variations between different population groups, and the need to ask people about things they might not have asked themselves. Most challenging of all is developing a valid model which best explains what makes people perceive themselves as experiencing certain or all of the presented transport problems.

5.2. Suggestions for Further Research

The survey managed to confirm that limited access to a car, low income, and disability have significant implications on transport problems and that gender and age have various effects on trip dependency and other types of problems such as costs and time of transport. These findings, alongside the problem of the subjectivity of expectations which led to smaller differences in reported problems than expected, suggest that the survey design can be substantially improved by some technical additions and reformulations.

It should be recalled that the purpose of the survey was to obtain information on transport problems from a representative sample of the population. Hence, the questionnaire was deliberately designed in such a way that it would take relatively little time to administer per respondent while gleaning as much information on transport problems as possible. Any improvements to the questionnaire must keep this necessary balancing act in mind.

A first suggested improvement regards the questions themselves. These sometimes allowed for a gap between perceived or subjective difficulty and objective, non-negotiable difficulty: for example, car owners don't tend to think of their trips as expensive since they have already paid for the car; likewise, a person trying to cycle through a city with a poor cycling infrastructure might not report a time-related problem, while a car owner driving through the same streets and with an identical overall travel time might report time as a problem as they expect it to take less time and not to experience car-congested streets. Subjectivity allows both very deprived

people and relatively fortunate people to report, for example, the same number of trips forgone, even though one person might forgo a trip because it takes a significantly long time while the other might forgo a trip which takes less time but might be of a less importance. I therefore recommend that the question ask in greater detail about the various problems respondents suffer from, thus providing greater anchors to the problem described and its level of severity: for example, when asking if they spend too much time on travel, specifying whether this is more time than they want to spend or they think should be the case given where they live. This will allow for a comparison and balancing of different levels and severity of problems with people's actual comparable situations.

A second recommendation is to broaden the questions about discomfort in travel and about travel costs. Discomfort is an understudied topic, especially in terms of what different populations groups define as inconvenient travel: for example, low frequency of public transport, overly narrow cycle lanes, difficulty to travel with a stroller due to unsuitable infrastructure, etc. Inconvenience can be examined through the lens of physical infrastructure (width of cycle lanes), transport facilities (availability of accessibility ramps), or transport policy (bus and train frequency). Regarding travel costs, car owners might not always consider themselves as having big expenses since they disregard the 'sunk' cost of the car. It would therefore be beneficial to add questions referring to yearly car expenses (e.g., "Do you think your yearly expense on transport, including buying a car and paying for insurance, accidents, annual inspection, gas, and repairs, is relatively high?") and only then asking about cost-related transport difficulties.

Another general problem of the current survey if that we do not know why people report having transport-related problems. For example, physical difficulty might be due to long walking distance or to the necessity of waiting in the sun without a bench or shade; transport cost might be perceived as too high because they take taxis or because they think the train is too expensive, etc. This problem should be addressed right after receiving the results of the initial, general questions about all transport problems by conducting a second detailed questionnaire addressing the main issues raised in the former and thus deepening understanding of the respondents' problems. For example, if in a certain neighborhood all the different population groups report physical problems in trip-making, this might show that the physical infrastructure (cycle lanes, sidewalks) is poor given the residents' needs and abilities; likewise, if many people report spending too much time on travel,

a second possible questionnaire would be to test how changes in the local public transport service would change people's available destinations.

An additional recommendation concerns the improved collection of basic data: for example, the question about income should have more possible answers, since the 25% non-response rate is too high. Similarly, as stated previously, there should be greater age differentiation, especially in the category of older people which should further be divided into 65–74, 75–84, 85+ age groups and even perhaps including some younger respondents. One other small addition to the demographic data concerns car leasing, which is very common in Israel (as in many countries) and was not asked, as this might influence responses regarding the financial difficulty of travel and the accessibility of cars.

As mentioned earlier, the issue of caregiving should be extended beyond just parenthood to include those who take care of elderly or sick relatives and who might, as a result, experience serious transport problems, regarding in particular issues of trip dependency or time pressure. This recommendation relates to the survey's general limitation in providing very little background about respondents' actual trip-making versus their desire for trip-making.

Future research and development of this survey will help us to better understand the depth and scope of transport problems, as well as identifying in more detail the people who do and who do not suffer from transport problems, as a basis for a more inclusive mode of transport planning.

Appendix

Table 1. Survey Location by Statistical Area or Settlement Name (CBS, 2017)

Tel Aviv Kikar HaMedina	**Tel Aviv Ramat HaChayal**	**Kfar Saba City Center**	**Settlements around Kfar Saba**			
Statistical Areas			Settlement Names*			
413	221+222	33	ינוב	אלישיב	להבות חביבה	קדימה-צורן
414	223	34+35	כפר הס	בורגתה	שדה יצחק	תל מונד
415	224	36	כפר הרא"ה	בית הלוי	גן חיים	פרדסייה
421	225	37	כפר יעבץ	בני דרור	צופית	אליכין
422	226	41	כפר מונש	גאולים	רמת הכובש	כפר יונה
423	231	42	משמרת	גבעת חיים (איחוד)	שדה ורבורג	צור משה
424	232	43	עזריאל	גבעת חיים (מאוחד)	אומץ	המעפיל
	233	44	עין החורש	העוגן	אחיטוב	יד חנה
		45	עין ורד	חגלה	בארותיים	יעף
		51	עין שריד	חיבת ציון	גן יאשיה	ניר אליהו
		52	פורת	חירות	ניצני עוז	בית ברל
		56	תנובות	חניאל	עולש	כפר עבודה
				חרב לאת	שער אפרים	מדרשת רופין

* Chosen settlements around Kfar Saba consist of less than 5,000 people each, therefore there is no division of statistical areas and less data is available.

Table 2. Socioeconomic Information by Survey Area and Survey Respondents (CBS, 2001)

Category	Available Data	Tel Aviv Kikar HaMedina	Tel Aviv Ramat HaChayal	Kfar Saba City Center	North Kfar Saba*	Survey Respondents
Population	Population in 2008	22,628	24,909	40,443	89,569	-
Gender	Men and Women in 2017	52% women 48% men	51% women 49% men	53% women 47% men	No sufficient data	59% women 41% men
Age	Age in 2017	0-19 – 22% 20-24 – 3% 25-34 – 23% 35-44 – 20% 45-54 – 9% 55-64 – 7% 65+ - 16%	0-19 – 29% 20-24 – 6% 25-34 – 12% 35-44 – 14% 45-54 – 13% 55-64 – 10% 65+ - 15%	0-19 – 25% 20-24 – 5% 25-34 – 12% 35-44 – 13% 45-54 – 10% 55-64 – 12% 65+ - 23%	No sufficient data	18-24 – 5% 25-34 – 12% 35-44 – 18% 45-54 – 17% 55-64 – 21% 65+ - 26%
Income	Average income per capita	8,739 NIS	10,271 NIS	7,694 NIS	No sufficient data	12% – less than average (9,543) 13% – average 48% – more than average 26% – refusal
Education	Percentage of bachelors' degree or above among 25-54	70%	57%	48%	No sufficient data	59% of the entire respondents
Household composition	Average of people per household	1.9	2.9	2.9	No sufficient data	54% adult with no children 39% adult with children 7% other
Car ownership	Number of households owning at least one car	No sufficient data	No sufficient data	No sufficient data	No sufficient data	16% no car in household 84% car in household

* Chosen settlements around Kfar Saba consist of less than 5,000 people each, therefore there is no division of statistical areas and less data is available.

Table 3. Income Levels of Respondents by Neighborhood (CBS, 2001)

Category	Tel Aviv Kikar HaMedina	Tel Aviv Ramat HaChayal	Kfar Saba City Center	Survey
Age	0-19 – 22% 20-24 – 3% 25-34 – 23% 35-44 – 20% 45-54 – 9% 55-64 – 7% 65+ - 16%	0-19 – 29% 20-24 – 6% 25-34 – 12% 35-44 – 14% 45-54 – 13% 55-64 – 10% 65+ - 15%	0-19 – 25% 20-24 – 5% 25-34 – 12% 35-44 – 13% 45-54 – 10% 55-64 – 12% 65+ – 23%	18-24 – 5% 25-34 – 12% 35-44 – 18% 45-54 – 17% 55-64 – 21% 65+ – 26%
Age redistributed for age groups 25+	25+ are 75% of respondents	25+ are 64% of respondents	25+ are 70% of respondents	25+ are 94% of respondents
	25-34 – 31% 35-44 – 27% 45-54 – 12% 55-64 –9% 65+ – 21%	25-34 – 19% 35-44 – 22% 45-54 – 20% 55-64 – 16% 65+ – 23%	25-34 – 17% 35-44 – 19% 45-54 – 14% 55-64 – 17% 65+ – 33%	25-34 – 13% 35-44 – 19% 45-54 – 18% 55-64 – 22% 65+ – 28%

Table 4. Comparison of Socioeconomic Information and Survey Respondents (CBS, 2001, 2017)

Category	Tel Aviv, Kikar HaMedina Tel Aviv, Ramat HaChayal Kfar Saba, City Center	Survey	Comparison
Gender	51%-53% women 47%-49% men	59% women 41% men	Survey has many more women
Age	25-34 – 17%-31% 35-44 – 19%-27% 45-54 – 12%-20% 55-64 – 9%-17% 65+ - 21%-33%	25-34 – 13% 35-44 – 19% 45-54 – 18% 55-64 – 22% 65+ – 28%	Survey has less young people and more older people
Income	7,694–10,271 average wage	12% – less than average (9,543) 13% – average 48% – more than average 26% – refusal	Relatively higher income level in the survey
Education	48%-70% between 25-54 have bachelors degree or above	59% of entire respondents are academic	Quite similar
Household composition	1.9-2.9 people per household	54% Adult with no children 39% Adult with children 7% other	No sufficient data
Car ownership	No sufficient data	16% no car in household 84% car in household	No sufficient data

Table 5. Survey Results of Q1.1. to Q4.5

Survey Results						
Q.1	Don't remember/ Don't know	Very convenient	Quite convenient	Not so convenient	Not convenient	Not so convenient + Not convenient
Q.1.1. How convenient is it for you to reach all the places you wish to reach?	0.9%	26.9%	48.0%	16.6%	7.5%	24.1%
Q.2	No reply/Don't know	None of my trips	Small number of my trips	More than half of my trips	Almost all of my trips	More than half of my trips + Almost all of my trips
Q.2.1. Over the last three days, how often have you experienced spending an excessive amount of **time** reaching your destination?	0.7%	32.9%	28.5%	17.6%	20.2%	37.9%
Q.2.2. Over the last three days, how often have you experienced exerting an excessive amount of **physical effort** reaching your destination? (Including Saturdays and holidays)	0.6%	72.6%	13.0%	6.5%	7.3%	13.8%
Q.2.3. Over the last three days, how often have you experienced spending an excessive amount of money reaching your destination?	1.0%	70.3%	12.6%	7.4%	8.8%	16.1%
Q.2.4. Over the last three days, how often have you experienced an excessive amount of discomfort reaching your destination?	0.6%	54.1%	21.4%	12.6%	11.3%	23.9%
Q.3	No reply/Don't know	None of my trips	Small part of my trips	More than half of my trips	Almost all of my trips	More than half of my trips + Almost all of my trips
Q.3.1. Over the last three days, how often have you had to rely on direct household members for your trips, since there was no other suitable solution for your arrival or return?	0.5%	78.8%	13.4%	3.5%	3.8%	7.3%
Q.3.2. Over the last three days, how often have you had to rely on neighbors, friends or (extended) family living in close proximity for your trips, since there was no other suitable solution for your arrival or return?	0.4%	84.0%	10.7%	2.0%	2.9%	4.9%
Q.3.3. Over the last three days, how often have you had to rely on other people (friends or family living outside your own town or city, colleagues) for your trips, since there was no other suitable solution for your arrival or return?	0.3%	86.7%	9.1%	2.2%	1.7%	3.9%

Survey Results						
Q.4	No reply/Don't know	Never	Once	Several times	Repeating problem/Many times	Once + Several times + Repeating problem/Many times
Q.4.1. Over the last three days, how often did you want to make a trip but decided not to do so because it would take an excessive amount of time to reach the destination?	0.4%	67.6%	15.6%	11.2%	5.2%	32.0%
Q.4.2. Over the last three days, how often did you want to make a trip but decided not to do so because it would demand an excessive amount of physical effort to reach the destination?	0.3%	80.4%	8.7%	7.3%	3.2%	19.3%
Q.4.3. Over the last three days, how often did you want to make a trip but decided not to do so because it would cost an excessive amount of money to reach the destination?	0.5%	87.8%	4.8%	4.4%	2.6%	11.7%
Q.4.4. Over the last three days, how often did you want to make a trip but decided not to do so because it would involve an excessive amount of discomfort to reach the destination?	0.5%	72.6%	12.5%	9.6%	4.8%	26.9%
Q.4.5. Over the last three days, how often did you want to make a trip but decided not to do so because you would not have been able to return home on the same day?	0.6%	88.4%	5.7%	3.4%	1.9%	10.9%

Table 6. Correlation by Spearman Coefficient by Grouping Each Question Segment

Correlation by Spearman's Coefficient – TdiffScale, TDepScale, TFGScale								
Gender			**Income**			**Car owner & able to use car**		
TDiffScale	Correlation Coefficient	-0.012	TDiffScale	Correlation Coefficient	-.093**	TDiffScale	Correlation Coefficient	.077**
	Sig. (2-tailed)	0.602		Sig. (2-tailed)	0.000		Sig. (2-tailed)	0.001
TDepScale	Correlation Coefficient	.104**	TDepScale	Correlation Coefficient	-.157**	TDepScale	Correlation Coefficient	.246**
	Sig. (2-tailed)	0.000		Sig. (2-tailed)	0.000		Sig. (2-tailed)	0.000
TFGScale	Correlation Coefficient	0.024	TFGScale	Correlation Coefficient	-.174**	TFGScale	Correlation Coefficient	.155**
	Sig. (2-tailed)	0.278		Sig. (2-tailed)	0.000		Sig. (2-tailed)	0.000
Neighborhood			**Urban vs. Suburban**			**City vs. Suburb (TLV vs. KS)**		
TDiffScale	Correlation Coefficient	-0.025	TDiffScale	Correlation Coefficient	-0.019	TDiffScale	Correlation Coefficient	.057**
	Sig. (2-tailed)	0.271		Sig. (2-tailed)	0.394		Sig. (2-tailed)	0.010
TDepScale	Correlation Coefficient	0.009	TDepScale	Correlation Coefficient	0.041	TDepScale	Correlation Coefficient	-0.015
	Sig. (2-tailed)	0.673		Sig. (2-tailed)	0.067		Sig. (2-tailed)	0.506
TFGScale	Correlation Coefficient	-0.016	TFGScale	Correlation Coefficient	-0.038	TFGScale	Correlation Coefficient	0.017
	Sig. (2-tailed)	0.465		Sig. (2-tailed)	0.086		Sig. (2-tailed)	0.453
Parenthood			**Age**			**Disability**		
TDiffScale	Correlation Coefficient	0.027	TDiffScale	Correlation Coefficient	-.083**	TDiffScale	Correlation Coefficient	.066**
	Sig. (2-tailed)	0.235		Sig. (2-tailed)	0.000		Sig. (2-tailed)	0.003
TDepScale	Correlation Coefficient	-.072**	TDepScale	Correlation Coefficient	-.045*	TDepScale	Correlation Coefficient	.087**
	Sig. (2-tailed)	0.002		Sig. (2-tailed)	0.042		Sig. (2-tailed)	0.000
TFGScale	Correlation Coefficient	0.034	TFGScale	Correlation Coefficient	-.098**	TFGScale	Correlation Coefficient	.101**
	Sig. (2-tailed)	0.141		Sig. (2-tailed)	0.000		Sig. (2-tailed)	0.000

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 7. T-Test by Personal Attributes: Gender, Income, Car Ownership

	Gender						Income - Low income vs. Else						Car in Household and Ability to Drive					
	Group Statistics					t-test for Equality of Means	Group Statistics					t-test for Equality of Means	Group Statistics					t-test for Equality of Means
	Gender	N	Mean	Mean Weighted Difference	Std. Dev.	Sig. (2-tailed)	Income	N	Mean	Mean Weighted Difference	Std. Dev.	Sig. (2-tailed)	Car Possible	N	Mean	Mean Weighted Difference	Std. Dev.	Sig. (2-tailed)
Q1.1	Men	818	2.090	4.924	0.865	0.009	Low	247	2.15	10.80	0.940	0.013	No Car\Problem Using	388	2.120	5.429	0.923	0.037
	Women	1192	1.990		0.887		Average\High	1230	1.99		0.862		Yes Car+No Problem using	1617	2.010		0.868	
Q2.1	Men	818	2.290	4.024	1.123	0.075	Low	247	2.26	2.44	1.125	0.592	No Car\Problem Using	388	2.220	0.897	1.181	0.681
	Women	1192	2.200		1.141		Average\High	1230	2.22		1.123		Yes Car+No Problem using	1617	2.240		1.121	
Q2.2	Men	818	1.490	2.038	0.918	0.461	Low	247	1.750	30.443	1.074	0	No Car\Problem Using	388	1.790	26.498	1.114	0
	Women	1192	1.460		0.904		Average\High	1230	1.420		0.857		Yes Car+No Problem using	1617	1.400		0.834	
Q2.3	Men	818	1.540	1.309	0.966	0.548	Low	247	1.760	24.957	1.088	0	No Car\Problem Using	388	1.690	13.116	1.103	0.001
	Women	1192	1.520		0.974		Average\High	1230	1.480		0.942		Yes Car+No Problem using	1617	1.490		0.933	
Q2.4	Men	818	1.840	3.892	1.043	0.135	Low	247	1.910	9.819	1.132	0.059	No Car\Problem Using	388	1.930	8.906	1.136	0.012
	Women	1192	1.770		1.056		Average\High	1230	1.780		1.036		Yes Car+No Problem using	1617	1.770		1.028	
Q3.1	Men	818	1.240	9.152	0.630	0.000	Low	247	1.470	19.711	0.919	0.001	No Car\Problem Using	388	1.560	23.723	0.975	0
	Women	1192	1.360		0.777		Average\High	1230	1.280		0.671		Yes Car+No Problem using	1617	1.250		0.631	
Q3.2	Men	818	1.170	8.135	0.542	0.000	Low	247	1.480	31.865	0.878	0	No Car\Problem Using	388	1.530	30.117	0.930	0
	Women	1192	1.270		0.682		Average\High	1230	1.190		0.571		Yes Car+No Problem using	1617	1.160		0.509	
Q3.3	Men	818	1.150	4.239	0.486	0.039	Low	247	1.400	28.546	0.799	0	No Car\Problem Using	388	1.380	20.279	0.809	0
	Women	1192	1.200		0.592		Average\High	1230	1.150		0.483		Yes Car+No Problem using	1617	1.140		0.457	
Q4.1	Men	818	1.500	3.269	0.871	0.221	Low	247	1.850	34.797	1.113	0	No Car\Problem Using	388	1.770	18.926	1.067	0
	Women	1192	1.550		0.906		Average\High	1230	1.460		0.818		Yes Car+No Problem using	1617	1.480		0.835	
Q4.2	Men	818	1.300	3.022	0.735	0.265	Low	247	1.640	40.354	0.994	0	No Car\Problem Using	388	1.620	27.142	0.991	0
	Women	1192	1.340		0.766		Average\High	1230	1.250		0.663		Yes Car+No Problem using	1617	1.260		0.667	
Q4.3	Men	818	1.220	1.655	0.657	0.679	Low	247	1.450	34.017	0.909	0	No Car\Problem Using	388	1.400	19.943	0.894	0
	Women	1192	1.200		0.639		Average\High	1230	1.150		0.533		Yes Car+No Problem using	1617	1.160		0.561	
Q4.4	Men	818	1.430	2.752	0.830	0.224	Low	247	1.750	33.782	1.067	0	No Car\Problem Using	388	1.660	17.185	1.027	0
	Women	1192	1.470		0.878		Average\High	1230	1.390		0.792		Yes Car+No Problem using	1617	1.410		0.805	
Q4.5	Men	818	1.160	1.707	0.558	0.349	Low	247	1.400	32.656	0.858	0	No Car\Problem Using	388	1.360	19.631	0.849	0
	Women	1192	1.180		0.598		Average\High	1230	1.120		0.470		Yes Car+No Problem using	1617	1.130		0.485	
TDiffScaled	Men	818	2.377	1.165	1.172	0.606	Low	247	2.575	14.814	1.169	0.002	No Car\Problem Using	388	2.557	10.296	1.215	0.000
	Women	1192	2.349		1.179		Average\High	1230	2.318		1.167		Yes Car+No Problem using	1617	2.314		1.159	
TDepScaled	Men	818	1.352	11.739	0.733	0.000	Low	247	1.753	32.925	1.036	0.000	No Car\Problem Using	388	1.881	36.722	1.074	0.000
	Women	1192	1.523		0.881		Average\High	1230	1.400		0.774		Yes Car+No Problem using	1617	1.349		0.717	
TFGScaled	Men	818	1.573	2.400	0.935	0.375	Low	247	1.996	42.555	1.177	0.000	No Car\Problem Using	388	1.933	26.197	1.146	0.000
	Women	1192	1.612		0.957		Average\High	1230	1.501		0.862		Yes Car+No Problem using	1617	1.516		0.875	

Table 8. T-Test by Personal Attributes: North KS, Urban, City

	Neighborhood - Kfar Saba North vs. Else						Urban vs. rural areas (City center vs. Other areas)						City vs. suburb (TLV vs. KS)					
		Group Statistics				t-test for Equality of Means		Group Statistics				t-test for Equality of Means		Group Statistics				t-test for Equality of Means
	Kfar Saba North vs. Else	N	Mean	Mean Weighted Difference	Std. Dev.	Sig. (2-tailed)	Urban vs. Rural	N	Mean	Mean Weighted Difference	Std. Deviation	Sig. (2-tailed)	Tel Aviv or Kfar Saba	N	Mean	Mean Weighted Difference	Std. Deviation	Sig. (2-tailed)
Q1.1	Kfar Saba North	502	2.220	12.840	0.990	0	Urban	1004	2.080	4.926	0.909	0.01	Kfar Saba and area	1007	2.090	5.911	0.927	0
	Else	1508	1.960		0.830		Rural	1006	1.980		0.846		Tel Aviv	1003	1.970		0.825	
Q2.1	Kfar Saba North	502	2.430	11.633	1.210	0	Urban	1004	2.310	6.712	1.160	0.003	Kfar Saba and area	1007	2.290	4.464	1.175	0
	Else	1508	2.170		1.101		Rural	1006	2.160		1.104		Tel Aviv	1003	2.190		1.090	
Q2.2	Kfar Saba North	502	1.500	2.721	0.966	0.48	Urban	1004	1.470	0.678	0.925	0.73	Kfar Saba and area	1007	1.480	0.678	0.922	0.462
	Else	1508	1.460		0.890		Rural	1006	1.480		0.895		Tel Aviv	1003	1.470		0.898	
Q2.3	Kfar Saba North	502	1.640	9.820	1.052	0.005	Urban	1004	1.550	3.279	0.990	0.232	Kfar Saba and area	1007	1.550	3.279	1.001	0.005
	Else	1508	1.490		0.940		Rural	1006	1.500		0.951		Tel Aviv	1003	1.500		0.940	
Q2.4	Kfar Saba North	502	1.970	12.796	1.165	0	Urban	1004	1.850	5.556	1.089	0.047	Kfar Saba and area	1007	1.840	4.444	1.083	0
	Else	1508	1.740		1.005		Rural	1006	1.750		1.010		Tel Aviv	1003	1.760		1.016	
Q3.1	Kfar Saba North	502	1.310	0.000	0.771	0.98	Urban	1004	1.300	2.281	0.709	0.471	Kfar Saba and area	1007	1.320	0.760	0.767	0.98
	Else	1508	1.310		0.707		Rural	1006	1.330		0.738		Tel Aviv	1003	1.310		0.677	
Q3.2	Kfar Saba North	502	1.190	4.073	0.603	0.127	Urban	1004	1.200	4.878	0.595	0.038	Kfar Saba and area	1007	1.230	0.000	0.642	0.139
	Else	1508	1.240		0.639		Rural	1006	1.260		0.664		Tel Aviv	1003	1.230		0.620	
Q3.3	Kfar Saba North	502	1.170	1.688	0.573	0.504	Urban	1004	1.160	4.219	0.523	0.071	Kfar Saba and area	1007	1.190	0.844	0.588	0.504
	Else	1508	1.190		0.544		Rural	1006	1.210		0.579		Tel Aviv	1003	1.180		0.512	
Q4.1	Kfar Saba North	502	1.530	0.000	0.932	0.999	Urban	1004	1.550	2.614	0.904	0.317	Kfar Saba and area	1007	1.510	2.614	0.900	0.999
	Else	1508	1.530		0.879		Rural	1006	1.510		0.879		Tel Aviv	1003	1.550		0.883	
Q4.2	Kfar Saba North	502	1.330	0.000	0.780	0.95	Urban	1004	1.330	0.755	0.765	0.73	Kfar Saba and area	1007	1.320	0.755	0.759	0.95
	Else	1508	1.330		0.745		Rural	1006	1.320		0.742		Tel Aviv	1003	1.330		0.748	
Q4.3	Kfar Saba North	502	1.260	5.797	0.753	0.078	Urban	1004	1.220	2.490	0.680	0.294	Kfar Saba and area	1007	1.230	4.149	0.706	0.078
	Else	1508	1.190		0.606		Rural	1006	1.190		0.611		Tel Aviv	1003	1.180		0.579	
Q4.4	Kfar Saba North	502	1.520	6.196	0.928	0.052	Urban	1004	1.500	5.480	0.879	0.036	Kfar Saba and area	1007	1.450	0.687	0.863	0.04
	Else	1508	1.430		0.833		Rural	1006	1.420		0.836		Tel Aviv	1003	1.460		0.854	
Q4.5	Kfar Saba North	502	1.140	4.246	0.561	0.156	Urban	1004	1.160	2.553	0.561	0.307	Kfar Saba and area	1007	1.170	0.851	0.600	0.165
	Else	1508	1.190		0.588		Rural	1006	1.190		0.601		Tel Aviv	1003	1.180		0.563	
TDiffScaled	Kfar Saba North	502	2.534	9.808	1.231	0.000	Urban	1004	2.387	2.224	1.194	0.317	Kfar Saba and area	1007	2.287	6.182	1.145	0.005
	Else	1508	2.302		1.151		Rural	1006	2.334		1.157		Tel Aviv	1003	2.433		1.202	
TDiffScaled	Kfar Saba North	502	1.436	1.555	0.870	0.596	Urban	1004	1.425	3.840	0.811	0.131	Kfar Saba and area	1007	1.444	1.314	0.783	0.605
	Else	1508	1.459		0.813		Rural	1006	1.481		0.844		Tel Aviv	1003	1.463		0.871	
TDepScaled	Kfar Saba North	502	1.659	5.294	1.006	0.097	Urban	1004	1.628	3.941	0.960	0.137	Kfar Saba and area	1007	1.574	2.719	0.924	0.305
	Else	1508	1.575		0.928		Rural	1006	1.565		0.935		Tel Aviv	1003	1.618		0.972	

Table 9. T-Test by Personal Attributes: Parenthood, Older People, Young adults

	Parenthood						Elderly					
		Group Statistics				t-test for Equality of Means		Group Statistics				t-test for Equality of Means
	Parenthood	N	Mean	Mean Weighted Difference	Std. Deviation	Sig. (2-tailed)	Elderly	N	Mean	Mean Weighted Difference	Std. Deviation	Sig. (2-tailed)
Q1.1	Non Parent	1093	2.030	1.055	0.900	0.569	Else	1483	2.040	1.971	0.868	0.358
	Parents	791	2.010		0.827		Elderly	527	2.000		0.909	
Q2.1	Non Parent	1093	2.190	5.248	1.130	0.026	Else	1483	2.320	14.311	1.126	0
	Parents	791	2.300		1.129		Elderly	527	2.000		1.128	
Q2.2	Non Parent	1093	1.470	1.460	0.906	0.549	Else	1483	1.460	2.720	0.891	0.513
	Parents	791	1.450		0.886		Elderly	527	1.500		0.961	
Q2.3	Non Parent	1093	1.500	4.197	0.954	0.153	Else	1483	1.570	11.820	0.990	0
	Parents	791	1.560		0.985		Elderly	527	1.390		0.902	
Q2.4	Non Parent	1093	1.760	5.341	1.034	0.062	Else	1483	1.870	15.007	1.061	0
	Parents	791	1.850		1.056		Elderly	527	1.600		0.997	
Q3.1	Non Parent	1093	1.340	5.698	0.755	0.045	Else	1483	1.310	1.521	0.695	0.478
	Parents	791	1.270		0.648		Elderly	527	1.330		0.798	
Q3.2	Non Parent	1093	1.280	10.412	0.696	0	Else	1483	1.230	0.811	0.613	0.622
	Parents	791	1.160		0.498		Elderly	527	1.240		0.679	
Q3.3	Non Parent	1093	1.220	7.194	0.612	0.002	Else	1483	1.190	1.688	0.547	0.597
	Parents	791	1.140		0.438		Elderly	527	1.170		0.564	
Q4.1	Non Parent	1093	1.510	4.170	0.908	0.179	Else	1483	1.570	9.131	0.897	0.001
	Parents	791	1.570		0.866		Elderly	527	1.430		0.871	
Q4.2	Non Parent	1093	1.330	1.615	0.761	0.714	Else	1483	1.330	0.753	0.743	0.879
	Parents	791	1.310		0.723		Elderly	527	1.320		0.781	
Q4.3	Non Parent	1093	1.190	3.536	0.636	0.194	Else	1483	1.220	4.143	0.663	0.089
	Parents	791	1.230		0.644		Elderly	527	1.170		0.595	
Q4.4	Non Parent	1093	1.450	1.463	0.886	0.727	Else	1483	1.470	3.432	0.857	0.234
	Parents	791	1.470		0.817		Elderly	527	1.420		0.863	
Q4.5	Non Parent	1093	1.180	0.000	0.586	0.95	Else	1483	1.190	4.248	0.590	0.088
	Parents	791	1.180		0.567		Elderly	527	1.140		0.556	
TDiffScaled	Non Parent	1093	2.325	2.648	1.175	0.287	Else	1483	2.415	8.919	1.158	0.000
	Parents	791	2.383		1.165		Elderly	527	2.205		1.213	
TDepScaled	Non Parent	1093	1.506	10.068	0.877	0.000	Else	1483	1.432	5.512	0.793	0.075
	Parents	791	1.369		0.724		Elderly	527	1.512		0.916	
TFGScaled	Non Parent	1093	1.587	1.776	0.969	0.546	Else	1483	1.622	6.140	0.948	0.042
	Parents	791	1.613		0.918		Elderly	527	1.524		0.945	

	Young Adults						Disability					
		Group Statistics				t-test for Equality of Means		Group Statistics				t-test for Equality of Means
	Young	N	Mean	Mean Weighted Difference	Std. Deviation	Sig. (2-tailed)	Disability	N	Mean	Mean Weighted Difference	Std. Deviation	Sig. (2-tailed)
Q1.1	Else	1904	2.030	0.000	0.889	0.999	No Disability	1877	2.010	10.867	0.871	0.013
	Young	106	2.030		0.683		At least one disability	133	2.230		0.976	
Q2.1	Else	1904	2.240	1.784	1.140	0.674	No Disability	1877	2.240	3.580	1.131	0.401
	Young	106	2.280		1.040		At least one disability	133	2.160		1.192	
Q2.2	Else	1904	1.470	2.039	0.910	0.746	No Disability	1877	1.440	31.283	0.884	0
	Young	106	1.500		0.908		At least one disability	133	1.900		1.141	
Q2.3	Else	1904	1.520	10.468	0.968	0.095	No Disability	1877	1.520	8.505	0.961	0.161
	Young	106	1.680		1.010		At least one disability	133	1.650		1.094	
Q2.4	Else	1904	1.800	1.112	1.057	0.864	No Disability	1877	1.780	15.018	1.041	0.012
	Young	106	1.780		0.946		At least one disability	133	2.050		1.160	
Q3.1	Else	1904	1.290	30.509	0.705	0	No Disability	1877	1.300	18.239	0.692	0.009
	Young	106	1.690		0.919		At least one disability	133	1.540		1.048	
Q3.2	Else	1904	1.220	16.253	0.628	0.003	No Disability	1877	1.220	16.218	0.605	0.011
	Young	106	1.420		0.660		At least one disability	133	1.420		0.906	
Q3.3	Else	1904	1.180	10.953	0.545	0.039	No Disability	1877	1.170	16.067	0.528	0.008
	Young	106	1.310		0.653		At least one disability	133	1.360		0.801	
Q4.1	Else	1904	1.520	11.769	0.889	0.049	No Disability	1877	1.510	22.186	0.867	0.001
	Young	106	1.700		0.938		At least one disability	133	1.850		1.151	
Q4.2	Else	1904	1.320	9.798	0.751	0.091	No Disability	1877	1.290	37.053	0.710	0
	Young	106	1.450		0.782		At least one disability	133	1.780		1.117	
Q4.3	Else	1904	1.200	18.158	0.628	0.011	No Disability	1877	1.190	20.720	0.618	0.003
	Young	106	1.420		0.894		At least one disability	133	1.440		0.932	
Q4.4	Else	1904	1.460	2.744	0.863	0.617	No Disability	1877	1.430	24.085	0.833	0.001
	Young	106	1.420		0.779		At least one disability	133	1.780		1.117	
Q4.5	Else	1904	1.160	25.514	0.562	0	No Disability	1877	1.160	22.923	0.533	0.003
	Young	106	1.460		0.807		At least one disability	133	1.430		1.017	
TDiffScaled	Else	1904	2.354	4.987	1.180	0.316	No Disability	1877	2.339	13.333	1.173	0.003
	Young	106	2.472		1.089		At least one disability	133	2.654		1.175	
TDepScaled	Else	1904	1.434	25.330	0.817	0.000	No Disability	1877	1.429	24.779	0.798	0.000
	Young	106	1.802		0.940		At least one disability	133	1.790		1.115	
TFGScaled	Else	1904	1.580	19.236	0.943	0.001	No Disability	1877	1.563	31.147	0.915	0.000
	Young	106	1.887		0.989		At least one disability	133	2.060		1.242	

Table 10. ANOVA by Neighborhood

Anova

Neighborhood

	Neighborhood	N	Mean	Std. Dev.	F	Sig.
Q1.1	Kfar Saba	505	1.95	0.839	11.789	0.000
	Kfar Saba North	502	2.22	0.99		
	Ramat HaChayal	502	1.93	0.795		
	Kikar HaMedina	501	2.01	0.853		
Q2.1	Kfar Saba	505	2.15	1.123	6.882	0.000
	Kfar Saba North	502	2.43	1.21		
	Ramat HaChayal	502	2.19	1.095		
	Kikar HaMedina	501	2.18	1.087		
Q2.2	Kfar Saba	505	1.45	0.876	0.745	0.525
	Kfar Saba North	502	1.5	0.966		
	Ramat HaChayal	502	1.43	0.881		
	Kikar HaMedina	501	1.5	0.913		
Q2.3	Kfar Saba	505	1.47	0.94	3.478	0.015
	Kfar Saba North	502	1.64	1.052		
	Ramat HaChayal	502	1.47	0.917		
	Kikar HaMedina	501	1.53	0.962		
Q2.4	Kfar Saba	505	1.72	0.982	6.162	0.000
	Kfar Saba North	502	1.97	1.165		
	Ramat HaChayal	502	1.73	0.995		
	Kikar HaMedina	501	1.79	1.037		
Q3.1	Kfar Saba	505	1.32	0.764	0.262	0.853
	Kfar Saba North	502	1.31	0.771		
	Ramat HaChayal	502	1.29	0.641		
	Kikar HaMedina	501	1.33	0.711		
Q3.2	Kfar Saba	505	1.27	0.676	1.511	0.210
	Kfar Saba North	502	1.19	0.603		
	Ramat HaChayal	502	1.21	0.587		
	Kikar HaMedina	501	1.25	0.652		
Q3.3	Kfar Saba	505	1.21	0.603	1.161	0.323
	Kfar Saba North	502	1.17	0.573		
	Ramat HaChayal	502	1.15	0.467		
	Kikar HaMedina	501	1.2	0.554		
Q4.1	Kfar Saba	505	1.49	0.869	0.762	0.515
	Kfar Saba North	502	1.53	0.932		
	Ramat HaChayal	502	1.57	0.877		
	Kikar HaMedina	501	1.54	0.891		

	Neighborhood	N	Mean	Std. Dev.	F	Sig.
Q4.2	Kfar Saba	505	1.31	0.738	0.111	0.954
	Kfar Saba North	502	1.33	0.78		
	Ramat HaChayal	502	1.34	0.75		
	Kikar HaMedina	501	1.33	0.747		
Q4.3	Kfar Saba	505	1.21	0.656	1.471	0.220
	Kfar Saba North	502	1.26	0.753		
	Ramat HaChayal	502	1.19	0.598		
	Kikar HaMedina	501	1.18	0.561		
Q4.4	Kfar Saba	505	1.38	0.788	2.341	0.072
	Kfar Saba North	502	1.52	0.928		
	Ramat HaChayal	502	1.47	0.827		
	Kikar HaMedina	501	1.45	0.881		
Q4.5	Kfar Saba	505	1.2	0.636	0.925	0.428
	Kfar Saba North	502	1.14	0.561		
	Ramat HaChayal	502	1.18	0.561		
	Kikar HaMedina	501	1.17	0.564		
TDiffScaled	Kfar Saba	505	2.333	1.165	5.633	0.001
	Kfar Saba North	502	2.534	1.231		
	Ramat HaChayal	502	2.239	1.138		
	Kikar HaMedina	501	2.335	1.150		
TDepScaled	Kfar Saba	505	1.489	0.871	0.852	0.466
	Kfar Saba North	502	1.436	0.870		
	Ramat HaChayal	502	1.414	0.747		
	Kikar HaMedina	501	1.473	0.816		
TFGScaled	Kfar Saba	505	1.576	0.936	1.166	0.321
	Kfar Saba North	502	1.659	1.006		
	Ramat HaChayal	502	1.596	0.912		
	Kikar HaMedina	501	1.553	0.936		

Table 11. ANOVA by Income Level

Anova

Income

	Income	N	Mean	Std. Dev.	F	Sig.
Q1.1	Refusal	533	2.07	0.885	2.425	0.033
	Much less than the average income	134	2.18	1.018		
	Less than the average income	113	2.12	0.843		
	Average income	271	2.05	0.937		
	More than the average income	450	1.93	0.84		
	Much more than the average income	509	2	0.837		
Q2.1	Refusal	533	2.28	1.165	1.167	0.323
	Much less than the average income	134	2.27	1.112		
	Less than the average income	113	2.25	1.146		
	Average income	271	2.21	1.141		
	More than the average income	450	2.13	1.109		
	Much more than the average income	509	2.29	1.124		
Q2.2	Refusal	533	1.47	0.922	8.399	0.000
	Much less than the average income	134	1.67	1.024		
	Less than the average income	113	1.85	1.128		
	Average income	271	1.58	0.989		
	More than the average income	450	1.37	0.782		
	Much more than the average income	509	1.38	0.836		
Q2.3	Refusal	533	1.53	0.965	6.192	0.000
	Much less than the average income	134	1.8	1.149		
	Less than the average income	113	1.71	1.015		
	Average income	271	1.67	1.072		
	More than the average income	450	1.44	0.909		
	Much more than the average income	509	1.41	0.885		
Q2.4	Refusal	533	1.8	1.045	0.748	0.587
	Much less than the average income	134	1.93	1.121		
	Less than the average income	113	1.9	1.149		
	Average income	271	1.77	1.048		
	More than the average income	450	1.77	1.039		
	Much more than the average income	509	1.79	1.03		
Q3.1	Refusal	533	1.32	0.727	3.898	0.002
	Much less than the average income	134	1.53	0.963		
	Less than the average income	113	1.41	0.862		
	Average income	271	1.33	0.709		
	More than the average income	450	1.28	0.68		
	Much more than the average income	509	1.25	0.642		
Q3.2	Refusal	533	1.2	0.599	13.902	0.000
	Much less than the average income	134	1.57	0.961		
	Less than the average income	113	1.37	0.758		
	Average income	271	1.31	0.775		
	More than the average income	450	1.2	0.554		
	Much more than the average income	509	1.12	0.431		
Q3.3	Refusal	533	1.17	0.538	9.992	0.000
	Much less than the average income	134	1.41	0.787		
	Less than the average income	113	1.38	0.816		
	Average income	271	1.22	0.617		
	More than the average income	450	1.12	0.42		
	Much more than the average income	509	1.13	0.451		
Q4.1	Refusal	533	1.56	0.907	10.713	0.000
	Much less than the average income	134	1.84	1.162		
	Less than the average income	113	1.87	1.056		
	Average income	271	1.61	0.979		
	More than the average income	450	1.44	0.774		
	Much more than the average income	509	1.39	0.752		
Q4.2	Refusal	533	1.35	0.783	13.423	0.000
	Much less than the average income	134	1.65	1.042		
	Less than the average income	113	1.63	0.937		
	Average income	271	1.38	0.802		
	More than the average income	450	1.23	0.606		
	Much more than the average income	509	1.21	0.621		
Q4.3	Refusal	533	1.23	0.708	10.997	0.000
	Much less than the average income	134	1.51	0.971		
	Less than the average income	113	1.39	0.828		
	Average income	271	1.23	0.653		
	More than the average income	450	1.14	0.492		
	Much more than the average income	509	1.12	0.493		
Q4.4	Refusal	533	1.47	0.87	8.232	0.000
	Much less than the average income	134	1.76	1.105		
	Less than the average income	113	1.74	1.025		
	Average income	271	1.48	0.906		
	More than the average income	450	1.37	0.741		
	Much more than the average income	509	1.37	0.769		
Q4.5	Refusal	533	1.19	0.63	10.965	0.000
	Much less than the average income	134	1.45	0.889		
	Less than the average income	113	1.34	0.82		
	Average income	271	1.19	0.582		
	More than the average income	450	1.11	0.432		
	Much more than the average income	509	1.1	0.433		
TDiffScaled	Refusal	533	2.358	1.191	2.895	0.013
	Much less than the average income	134	2.590	1.158		
	Less than the average income	113	2.558	1.187		
	Average income	271	2.443	1.197		
	More than the average income	450	2.251	1.153		
	Much more than the average income	509	2.310	1.159		
TDepScaled	Refusal	533	1.437	0.810	10.984	0.000
	Much less than the average income	134	1.866	1.089		
	Less than the average income	113	1.620	0.957		
	Average income	271	1.531	0.897		
	More than the average income	450	1.400	0.767		
	Much more than the average income	509	1.330	0.699		
TFGScaled	Refusal	533	1.630	0.970	13.417	0.000
	Much less than the average income	134	2.022	1.198		
	Less than the average income	113	1.965	1.157		
	Average income	271	1.638	0.979		
	More than the average income	450	1.484	0.831		
	Much more than the average income	509	1.442	0.815		

Table 12. ANOVA by Age Group

Anova

Age

	Age	N	Mean	Std. Dev.	F	Sig.
Q1.1	18-24	106	2.03	0.683	0.431	0.650
	25-64	1377	2.04	0.881		
	65+	527	2	0.909		
Q2.1	18-24	106	2.28	1.04	15.733	0.000
	25-64	1377	2.32	1.132		
	65+	527	2	1.128		
Q2.2	18-24	106	1.5	0.908	0.320	0.726
	25-64	1377	1.46	0.89		
	65+	527	1.5	0.961		
Q2.3	18-24	106	1.68	1.01	7.257	0.001
	25-64	1377	1.56	0.989		
	65+	527	1.39	0.902		
Q2.4	18-24	106	1.78	0.946	13.548	0.000
	25-64	1377	1.88	1.069		
	65+	527	1.6	0.997		
Q3.1	18-24	106	1.69	0.919	16.513	0.000
	25-64	1377	1.28	0.666		
	65+	527	1.33	0.798		
Q3.2	18-24	106	1.42	0.66	5.317	0.005
	25-64	1377	1.21	0.607		
	65+	527	1.24	0.679		
Q3.3	18-24	106	1.31	0.653	3.024	0.049
	25-64	1377	1.18	0.537		
	65+	527	1.17	0.564		

	Age	N	Mean	Std. Dev.	F	Sig.
Q4.1	18-24	106	1.7	0.938	6.334	0.002
	25-64	1377	1.56	0.893		
	65+	527	1.43	0.871		
Q4.2	18-24	106	1.45	0.782	1.570	0.208
	25-64	1377	1.32	0.74		
	65+	527	1.32	0.781		
Q4.3	18-24	106	1.42	0.894	6.961	0.001
	25-64	1377	1.21	0.64		
	65+	527	1.17	0.595		
Q4.4	18-24	106	1.42	0.779	0.937	0.392
	25-64	1377	1.47	0.862		
	65+	527	1.42	0.863		
Q4.5	18-24	106	1.46	0.807	14.304	0.000
	25-64	1377	1.17	0.565		
	65+	527	1.14	0.556		
TDiffScaled	18-24	106	2.472	1.089	6.393	0.002
	25-64	1377	2.411	1.163		
	65+	527	2.205	1.213		
TDepScaled	18-24	106	1.802	0.940	13.371	0.000
	25-64	1377	1.404	0.774		
	65+	527	1.512	0.916		
TFGScaled	18-24	106	1.887	0.989	6.575	0.001
	25-64	1377	1.601	0.942		
	65+	527	1.524	0.945		

Table 13. Summary of Comparison of Personal Attributes by T-Test, ANOVA, and Correlations

Personal attributes	Anova or T-test	T-test/Anova						Correlation		
		All questions (Q2.1 to Q4.5)			Only by scaled variables			Only by scaled variables		
		Difficulty	Dependency	Trips forgone	TDiffScaled	TDepScaled	TFGScaled	TDiffScaled	TDepScaled	TFGScaled
Gender	T-test		all			V			V	
Income (all levels)	Anova	Q2.2, Q2.3	all	all	V	V	V	V	V	V
Income (low vs. else)	T-test	Q2.2, Q2.3	all	all	V	V	V	V	V	V
Car ownership & availability	T-test	Q2.2, Q2.3, Q2.4	all	all	V	V	V	V	V	V
Neighborhood	Anova	Q2.1, Q2.3, Q2.4			V					
Urban vs. Rural (City center vs. else)	T-test	Q2.1,Q2.4	Q3.2	Q4.4						
Suburb (TLV vs. KS)	T-test	Q2.1,Q2.3, Q2.4		Q4.4	V			V		
North KS vs. else	T-test	Q2.1, Q2.3, Q2.4			V			V		
Parenthood	T-test	Q2.1	all			V			V	
Age (18-24, 25-64, 65+)	Anova	Q2.1, Q2.3, Q2.4	all	all		V		V	V	V
Young adults (18-24, 25-64)	T-test		all	Q4.1, Q4.3, Q4.5		V	V		V	V
Elderly (25-64, 65+)	T-test	Q2.1, Q2.3, Q2.4		Q4.1	V		V	V		V
Disability	T-test	Q2.2, Q2.4	all	all		V		V	V	V

- Correlating in the opposite direction from expectation.

Q2.1, Q4.1 - Time
Q2.2, Q4.2 - Physical effort
Q2.3, Q4.3 - Money
Q2.4, Q4.4 - Inconvenience
Q4.5 - No way to return home

Q3.1 - dependent on household
Q3.2 - dependent on close family/friends
Q3.3 - dependent on others

Bibliography

1. Arentze, T., Timmermans, H., Jorritsma, P., Kalter, M. J. O., & Schoemakers, A. (2008). More gray hair—but for whom? Scenario-based simulations of elderly activity travel patterns in 2020. *Transportation*, 35(5), 613-627.

2. Banister, D., & Hall, P. (1981). Transport and public policy planning. London: Maxwell.

3. Banister, D. (1994). Equity and acceptability in internalising the social costs of transport. *EMCT, Internalising the social costs of transport*, 153-175.

4. Beirão, G., & Cabral, J. S. (2007). Understanding attitudes towards public transport and private car: A qualitative study. *Transport Policy*, 14(6), 478-489.

5. Benenson, I., Martens, K., Rofé, Y., & Kwartler, A. (2011). Public transport versus private car GIS-based estimation of accessibility applied to the Tel Aviv metropolitan area. *The Annals of Regional Science, 47*(3), 499-515.

6. Berger, Tamar. (2015). *Autotopia - Suburbian In-between Space in Israel*. Israel: HaKibbutz HaMeuchad.

7. Bocarejo, Juan Pablo S., Oviedo, Daniel Ricardo H. (2012). Transport accessibility and social inequities: a tool for identification of mobility needs and evaluation of transport investments. *Journal of Transport Geography, 24,* 142-154.

8. Buehler, R., & Pucher, J. (2009). Sustainable transport that works: Lessons from Germany. *Bicycle Education*.

9. Cardozo, R. N. (1965). An experimental study of customer effort, expectation, and satisfaction. *Journal of Marketing Research, 2*(3), 244-249.

10. Casas, I., Horner, M. W., & Weber, J. (2009). A comparison of three methods for identifying transport-based exclusion: a case study of children's access to urban opportunities in Erie and Niagara Counties, New York. *International Journal of Sustainable Transportation*, 3(4), 227-245.

11. Central Bureau of Statistics, Israel, 2001 ,29 סטטיסטיקל, "סקר הוצאות משק הבית וסקר הכנסות". Retrieved: 08/08/2019.

12. Central Bureau of Statistics, Israel, 2017, Press publication from 13th of October 2015, "Findings from the Household Expenditure Survey 2014, Data on the Israeli Households Income, Expenditure and Durable Goods Ownership". Retrieved: 08/08/2019.

13. Central Bureau of Statistics, Israel, 2017, Press publication from 17th of May 2017, "4.11 Million Licensed Drivers in Israel (by the end of 2016)". Retrieved: 28/07/2019.

14. Cervero, R., J.S. Neil & B.B. Paul (2001). *Transportation planning*, in *International 25 Encyclopedia of the Social & Behavioral Sciences.* p.15873-15878. Oxford: Pergamon.

15. Cervero, R., & Duncan, M. (2006). 'Which Reduces Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing?. *Journal of the American Planning Association*, 72(4), 475-490.

16. Clarke, M., Dix, M., & Jones, P. (1981). Error and uncertainty in travel surveys. *Transportation, 10*(2), 105-126.

17. Cronbach Lee J. (1951). "Coefficient alpha and the internal structure of tests". *Psychometrika*. *16 (3)*: 297–334.

18. Currie, G., & Delbosc, A. (2013, October). Exploring trends in forced car ownership in Melbourne. In *Proceedings of the 36th Australasian Transport Research Forum (ATRF), Brisbane, Queensland, Australia* (pp. 1-9).

19. Dargay, J., Gately, D., & Sommer, M. (2007). Vehicle ownership and income growth, worldwide: 1960-2030. *Energy Journal-Cambridge MA then Cleveland OH, 28*(4), 143.

20. Delbosc, A., & Currie, G. (2011). Transport problems that matter – social and psychological links to transport disadvantage. *Journal of Transport Geography, 19,* 170-178.

21. Delbosc, A. (2012). The role of well-being in transport policy. *Transport Policy, 23*, 25-33.

22. Delbosc, A., & Vella-Brodrick, D. (2015). The role of transport in supporting the autonomy of young adults. *Transportation Research Part F: Traffic Psychology and Behavior*, 33, 97-105.

23. de Dios Ortuzar, J., & Willumsen, L. G. (2011). *Modelling transport*. Chichester: John Wiley & Sons.

24. Ewing, R., & Cervero, R. (2001). Travel and the built environment: a synthesis. *Transportation Research Record, 1780*(1), 87-114.

25. Fan, Y., & Huang, A. (2011). How affordable is transportation? *A context-sensitive framework. Center for Transportation Studies: University of Minnesota*.

26. Fan, Y. (2015). Household structure and gender differences in travel time: spouse/partner presence, parenthood, and breadwinner status. *Transportation, 44(2)*, 271-291.

27. Fielbaum, A., Jara-Diaz, S., & Gschwender, A. (2016). Optimal public transport networks for a general urban structure. *Transportation Research Part B: Methodological*, *94*, 298-313.

28. Frank, L., Bradley, M., Kavage, S., Chapman, J., & Lawton, T. K. (2008). Urban form, travel time, and cost relationships with tour complexity and mode choice. *Transportation, 35(1),* 37-54.

29. Gliem, J. A., & Gliem, R. R. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for likert-type scales. *Midwest Research to Practice Conference in Adult, Continuing, and Community Education,* The Ohio State University, Columbus, Ohio.

30. Haustein, S. (2012). Mobility behavior of the elderly: an attitude-based segmentation approach for a heterogeneous target group. *Transportation*, 39(6), 1079-1103.

31. Hine, J., & Mitchell, F. (2001). Better for everyone? Travel experiences and transport exclusion. *Urban Studies*, 38(2), 319-332.

32. Hine, J., & Mitchell, F. (2017). *Transport disadvantage and social exclusion: exclusionary mechanisms in transport in urban Scotland*. London: Routledge.

33. Hjorthol, R. J., Levin, L., & Sirén, A. (2010). Mobility in different generations of older persons: The development of daily travel in different cohorts in Denmark, Norway and Sweden. *Journal of Transport Geography*, *18*(5), 624-633.

34. Holz-Rau, C., & Scheiner, J. (2019). Land-use and transport planning–A field of complex cause-impact relationships. Thoughts on transport growth, greenhouse gas emissions and the built environment. *Transport Policy, 74*, 127-137.

35. Hong, J., Shen, Q., & Zhang, L. (2014). How do built-environment factors affect travel behavior? A spatial analysis at different geographic scales*. Transportation, 41(3),* 419-440.

36. Jiao, J., & Dillivan, M. (2013). Transit deserts: The gap between demand and supply. *Journal of Public Transportation, 16*(3), 2.

37. Johnson, T. P. (2014). *Handbook of health survey methods* (Vol. 565). Hoboken, NJ: John Wiley & Sons.

38. Jones, P. M. (1987). Mobility and the Individual in Western Industrial Society. *Transportation Planning in a Changing World*. P. Nijkamp and S. Reichman. Aldershot, Gower: 29-47.

39. Karner, A., & Niemeier, D. (2013). Civil rights guidance and equity analysis methods for regional transportation plans: a critical review of literature and practice. *Journal of Transport Geography, 33*, 126-134.

40. Kenworthy, J. (2012). Don't shoot me, I'm only the transport planner (apologies to Sir Elton John*). World Transport Policy and Practice, 18*(4): 6-26.

41. Kim, S. (2011). Assessing mobility in an aging society: Personal and built environment factors associated with older people's subjective transportation deficiency in the US. *Transportation research part F: Traffic Psychology and Behaviour, 14(5)*, 422-429.

42. The Knesset Research and Information Center (2013). *Investment of public transport in Israel and in the world.* Retrieved: 17/10/2019.

43. Lay, M. G. (2005). The history of transport planning. Button, K. and Hensher D. (Ed.) *Handbook of transport strategy, policy and institutions, vol 6*. Oxford: Emerald Group Publishing Limited. 156-174.

44. Lescaroux, F. (2010). Car ownership in relation to income distribution and consumers' spending decisions. *Journal of Transport Economics and Policy (JTEP), 44*(2), 207-230.

45. Levitas, R., Pantazis, C., Fahmy, E., Gordon, D., Lloyd, E., & Patsios, D. (2007). The multi-dimensional analysis of social exclusion. *Department of Sociology and School for Social Policy, Townsend Centre for the International Study of Poverty and Bristol Institute for Public Affairs, University of Bristol*.

46. Li, H., Guensler, R., Ogle, J., & Wang, J. (2004). Using Global Positioning System Data to Understand Day-to-Day Dynamics of Morning Commute Behavior. *Transportation Research Record, 1895*(1), 78–84.

47. Litman. T. (2002) "Evaluating Transportation Equity," *World Transport Policy & Practice* (http://ecoplan.org/wtpp/wt_index.htm), Volume 8, No. 2, Summer, pp. 50-65; updated version at www.vtpi.org/equity.pdf.

48. Litman, T. (2007). Developing indicators for comprehensive and sustainable transport planning. *Transportation Research Record: Journal of the Transportation Research Board*, (2017), 10-15.

49. Litman, T., & Steele, R. (2012). Land use impacts on transport: How land use factors affect travel behavior. Victoria Transport Policy Institute, Canada.

50. Litman, T. (2017). Transportation affordability. Victoria Transport Policy Institute, Canada.

51. Loader, C., & Stanley, J. (2009). Growing bus patronage and addressing transport disadvantage—the Melbourne experience. *Transport Policy*, *16*(3), 106-114.

52. Loomis, J. B. (2014). Strategies for overcoming hypothetical bias in stated preference surveys. *Journal of Agricultural and Resource Economics, 39*(1), 34-46.

53. Lucas, K. (2012). Transport and social exclusion: Where are we now? *Transport Policy, 20*, 105-113.

54. Mallett, W. J. (2001). Long-distance travel by low-income households. *TRB Transportation Research Circular E-C026—Personal Travel: The Long and Short of It,* 169-177.

55. Marletto, G., Franceschini, S., Ortolani, C., & Sillig, C. (eds.) (2016). *Mapping Sustainability Transitions: Networks of innovators, Techno-economic competences and Political discourses*. Springer.

56. Marottoli, R. A., de Leon, C. F. M., Glass, T. A., Williams, C. S., Cooney Jr, L. M., & Berkman, L. F. (2000). Consequences of driving cessation: decreased out-of-home activity levels. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *55*(6), S334-S340.

57. Martens, K. (2006). Basing Transport Planning on Principles of Social Justice. *Berkeley Planning Journal*, *19*. 1-17.

58. Martens, K. (2015). *Traditional transportation planning and its alternatives*. Paper presents at the 94th Annual Meeting of the Transportation Research Board (No. 15-5961), 11-15 January 2015, Washinton DC, USA

59. Martens, K. (2017a). *Transport justice: Designing fair transportation systems*., Routledge, New York, USA.

60. Martens, K. (2017b). Traditional transport planning and its critics [Lecture]. Retrieved from the Technion course תכנון תחבורה מוטה-אנשים (People-Centered Transport Planning).

61. Martens, K., Lucas, K., Di Ciommo, F., Dupont-Kieffer, A. (eds.) (2019). Measuring Transport Equity. Elsevier.

62. Matthies, E., Kuhn, S., & Klöckner, C. A. (2002). Travel mode choice of women: the result of limitation, ecological norm, or weak habit?. *Environment and behavior*, *34*(2), 163-177.

63. Mattioli, G. (2014). Where sustainable transport and social exclusion meet: Households without cars and car dependence in Great Britain. *Journal of Environmental Policy & Planning, 16(3),* 379-400.

64. McDonald, N. C. (2005). Does Residential Density Affect the Travel "Gender Gap"?. In *Conference Proceeding 35: Research on Women's Issues in Transportation,* Transportation Research Board of the National Academies, Washington D.C., Vol. 2, *68*-75.

65. Millonig, A., & Fröhlich, P. (2018). Where Autonomous Buses Might and Might Not Bridge the Gaps in the 4 A's of Public Transport Passenger Needs: a Review. In: *Proceedings of the 10th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*. ACM. 291-297.

66. Mollenkopf, H., Marcellini, F., & Ruoppila, I. (Eds.). (2005). *Enhancing mobility in later life: personal coping, environmental resources and technical support; the out-of-home mobility of older adults in urban and rural regions of five European countries* (Vol. 17). Ios Press.

67. Moriarty, P. (2016). Reducing levels of urban passenger travel. *International Journal of Sustainable Transportation*, 10(8), 712-719.

68. Morris, J. M., Dumble, P. L., & Wigan, M. R. (1979). Accessibility indicators for transport planning. *Transportation Research Part A: General, 13*(2), 91-109.

69. Moser, C., & Kalton, G. (1971). *Survey methods in social investigation*. (2nd Edition). Routledge, London, UK.

70. Moudon, A. V., Lee, C., Cheadle, A. D., Collier, C. W., Johnson, D., Schmid, T. L., & Weather, R. D. (2005). Cycling and the built environment, a US perspective. *Transportation Research Part D: Transport and Environment, 10(3)*, 245-261.

71. Newbold, K. B., Scott, D. M., Spinney, J. E., Kanaroglou, P., & Páez, A. (2005). Travel behavior within Canada's older population: a cohort analysis. *Journal of Transport Geography*, *13*(4), 340-351.

72. Nordbakke, S., & Schwanen, T. (2014). Transport, unmet activity needs and wellbeing in later life: Exploring the links. *Transportation*. Springer, Vol. 42(6). 1129-1151.

73. OECD-Organisation for Economic Co-operation. (2001). *Ageing and transport: Mobility needs and safety issues*. Organization for Economic. OECD Publishing, Paris.

74. Owens, S. (1995). From 'predict and provide' to 'predict and prevent'?: Pricing and planning in transport policy. *Transport Policy, 2*(1), 43-49.

75. Oxley, P. R., & Richards, M. J. (1995). Disability and transport: A review of the personal costs of disability in relation to transport. *Transport Policy, 2*(1), 57-65.

76. Páez, A., Scott, D., Potoglou, D., Kanaroglou, P., & Newbold, K. B. (2007). Elderly mobility: demographic and spatial analysis of trip making in the Hamilton CMA, Canada. *Urban Studies*, *44*(1), 123-146.

77. Páez, A., Ruben, M., & Faber, S. (2009). Mobility and Social Exclusion in Canadian Communities: An Empirical Investigation of opportunity access and deprivation from the perspective of vulnerable groups. Policy Research Directorate, Strategic Policy and Research. Hamilton, ON.

78. Perez, C. C. (2019). *Invisible Women: Exposing data bias in a world designed for men.* Harry N. Abrams, New-York, USA.

79. Pucher, J., & Renne, J. L. (2005). Rural mobility and mode choice: Evidence from the 2001 National Household Travel Survey. *Transportation, 32(2),* 165-186.

80. Richardson, A. J., Ampt, E. S., & Meyburg, A. H. (1995). *Survey methods for transport planning*. Eucalyptus Press, Melbourne, Australia.

81. Rosenbloom, S. (2001). Sustainability and automobility among the elderly: An international assessment. *Transportation*, *28*(4), 375-408.

82. Rutherford, B. M., & Wekerle, G. R. (1988). Captive rider, captive labor: spatial constraints and women's employment. *Urban Geography*, 9(2), 116-137.

83. Scheiner, J. (2006). Does the car make elderly people happy and mobile? Settlement structures, car availability and leisure mobility of the elderly. *European Journal of Transport and Infrastructure Research*, *6*(2). 151-172.

84. Schwanen, T., Dijst, M., & Dieleman, F. M. (2001). Leisure trips of senior citizens: determinants of modal choice. *Tijdschrift voor Economische en Sociale Geografie*, *92*(3), 347-360.

85. Scott, D., & Horner, M. (2008). Examining the role of urban form in shaping people's accessibility to opportunities: an exploratory spatial data analysis. *Journal of transport and land use, 1(2).*

86. Shay E. & Khattak A. (2012). Household Travel Decision Chains: Residential Environment, Automobile Ownership, Trips and Mode Choice. *International Journal of Sustainable Transportation*,6:2, 88-110.

87. Shiftan, Y., Button, K., & Nijkamp, P. (2007). *Transportation planning.* Edward Elgar Publishing, Cheltenham, UK.

88. Siren, A., & Hakamies-Blomqvist, L. (2004). Private car as the grand equaliser? Demographic factors and mobility in Finnish men and women aged 65+. *Transportation Research Part F: Traffic Psychology and Behaviour*, *7*(2), 107-118.

89. Siren, A. (2007). Older women's mobility and its vulnerability. Paper presented at the 11th International Conference on *Mobility and Transport for Elderly and Disabled Persons (TRANSED) Transport Canada Transportation Research Board*.18-21 June 2007, Montreal, Quebec, Canada.

90. Siren, A., & Haustein, S. (2013). Baby boomers' mobility patterns and preferences: What are the implications for future transport?. *Transport Policy*, *29*, 136-144.

91. Smith, G. C., & Sylvestre, G. M. (2001). Determinants of the travel behavior of the suburban elderly. *Growth and Change*, *32*(3), 395-412.

92. Social Exclusion Unit. (2003). Making the Connections: Final report on Transport and Social Exclusion. Office of the Deputy Prime Minister, London.

93. Stokes, G., & Lucas, K. (2011). National travel survey analysis. In *Transport Studies Unit, School of Geography and the Environment.* University of Oxford, London, UK.

94. Stopher, P. R., & Greaves, S. P. (2006). Household travel surveys: Where are we going? *The Institute of Transport and Logistics Studies, the University of Sydney,* (41), 367–381.

95. Umberson, D., Pudrovska, T., & Reczek, C. (2010). Parenthood, childlessness, and well-being: A life course perspective. *Journal of Marriage and Family, 72*(3), 612-629.

96. Van Acker, V., & Witlox, F. (2011). Commuting trips within tours: how is commuting related to land use?. *Transportation, 38*(3), 465-486.

97. Van Acker, V., Mokhtarian, P. L., & Witlox, F. (2014). Car availability explained by the structural relationships between lifestyles, residential location, and underlying residential and travel attitudes. *Transport Policy, 35,* 88-99.

98. Van Egmond, P., Nijkamp, P., & Vindigni, G. (2003). A comparative analysis of the performance of urban public transport systems in Europe. *International Social Science Journal*, 55(176), 235-247.

99. Wachs, M., & Kumagai, T. G. (1973). Physical accessibility as a social indicator. *Socio-Economic Planning Sciences*, *7*(5), 437-456.

100. Walker, J. (2012). *Human transit: How clearer thinking about public transit can enrich our communities and our lives.* Island Press, Chicago.

101. Webster, F. V., Bly, P. H., & Paulley, N. J. (1988). *Urban land use and transport interaction; policies and models.* Avebury, Brookfield, USA.

102. Wegener, M. (2004). Overview of land-use transport models. *Handbook of Transport Geography and Spatial Systems*, 5, 127-146.

103. Weiner, E. (1986). *Urban transportation planning in the United States: An historical overview*. Department of Transportation, Washington, DC (USA). No DOT-1-86-09, DOT. Washington D.C.

104. Wilson, L. M. (2003). An overview of the literature on disability and transport. *Disability Rights Commission*, London, UK.

105. Worthington, D. L., & Bodie, G. D. (2017). *The sourcebook of listening research: Methodology and measures.* John Wiley & Sons.

106. Zhang, M. (2006). Travel choice with no alternative: can land use reduce automobile dependence?. *Journal of Planning Education and Research, 25*(3), 311-326.

Websites

1. Problem. (n.d.) *Collins COBUILD English Usage*. (1992, 2004, 2011, 2012). Retrieved November 21 2018 from https://www.thefreedictionary.com/problem.

קשיי תחבורה באופן מובהק, אך קיימים אלמנטים נוספים שלא נכנסו למודל והם בעלי השפעה על רמת הקושי שחווה המשתמשת. בזכות שילוב בין ניתוח דו-משתני וניתוח רב-משתנים ניתן לומר כי הממצאים מצביעים על כך שחלק משמעותי מתוך השאלון שפותח אכן מתאים לזיהוי שיטתי של בעיות תחבורה וקשיים באוכלוסייה.

בסיום התזה הוצגו סיבות אפשריות לכך שהמודלים לא הסבירו בצורה מלאה את ההבדל בין האוכלוסיות השונות. הסיבות האפשריות הן סובייקטיביות בחוויית קושי וכן שוני ברצון לבצע נסיעות. ייתכן ומי שמבצעים נסיעות נוחות הם גם ביקורתיים יותר כלפי חוויית הנסיעה שלהם או מצפים לחוויה ברמה גבוהה יותר מאשר מי שכבר התרגלו לחוויה גרועה. לצד זאת, ייתכן שמי שעושה מעט נסיעות לא מעוניין לנסוע בתדירות גבוהה, ולכן גם לא חווה קשיים ברמה יומיומית. הוצעו רעיונות לעיגון התשובות במציאות לצורך השוואה שעדיין תסתמך על החוויה האישית של הנשאלת אך גם תאפשר תשובה מדידה (למשל, כאשר הנשאלת מדווחת על קושי בנסיעה מטעמים של זמן, לשאול כמה זמן לקחה הנסיעה; או, כאשר הנשאל ויתר על נסיעה מטעמים של חוסר נוחות, לשאול האם הנסיעה הייתה לצרכי עבודה, בילוי, קניות, צורך רפואי וכו').

תקציר

תהליך תכנון התחבורה בצורתו הנוכחית מתמקד בפתרון גודש תנועה, תוך הנחה שתפקוד רע של המערכת משמעותו בעיות תחבורה. מאחר ותכנון תחבורה מתמקד בכשלי מערכת, הוא מסתכן בהתעלמות מבעיות תחבורה שלא ניתן לתפוס אותן כאשר רק מנתחים את מצבה של המערכת.

בעבודת תזה זו אני שואפת לפתח ולאמת כלי שיעזור לזהות ולהעריך את הרמה, העומק וההיקף של בעיות התחבורה שנחוות היום על ידי קבוצות שונות באוכלוסייה. מאפייני האוכלוסייה שנבדקו היו מגדר, גיל, רמת הכנסה, בעלות על רכב, הרכב משק בית, נכות וכן פילוחים גיאוגרפיים שונים הקשורים למיקום במטרופולין, רמת פירוור ועוד. קשיי התחבורה בקרב קבוצות אלו נחקרו ברמות שונות בעבר, אך לא קיים אף כלי שמודד באופן ישיר קשיי תחבורה ומאפשר להשוות בין הקשיים של אוכלוסיות שונות. הכלי המוצע הוא סקר שעוצב כדי לזהות בעיות תחבורה מנקודת המבט של המשתמש/ת. הסקר מתייחס אל מספר סוגיות המשפיעות על נסיעות בפועל ונסיעות שאותן המשתמש רוצה לבצע (מכל מקום ולכל מקום, ובכל אמצעי אפשרי – ברגל, באופניים, בתחבורה ציבורית, ברגל וכו'). אותן סוגיות לעיתים מסכנות את היכולת שלו לנסוע ממקום למקום ולהגיע ליעדים אליהן הוא חפץ להגיע.

המחקר כלל שלושה סקרים-מקדימים בהיקף קטן ולאחריהם סקר רב-משתתפים. הסקר הסופי נערך בקרב 2010 נשאלים בארבעה אזורים במטרופולין תל-אביב, כ-500 נשאלים בכל אזור, והתייחס אל חוויית הנסיעה של שלושת הימים שקדמו לסקר.

הסקר מורכב משלושה חלקים ובהם שאלות הקשורות אל: (1) קשיים בנסיעה ממקום למקום; (2) תלות באחרים בנסיעה ממקום למקום; (3) נסיעות שלא נעשו, כלומר, נסיעות שהמשתמשת ביטלה בשל בעיות הקשורות לתחבורה. הנשאלים התבקשו לדווח האם הקשיים בנסיעה והנסיעות שלא נעשו היו קשורים לסוגיות של זמן, קושי פיזי, עלות או חוסר נוחות. בנוסף, נשאלו שאלות הנוגעות לבעלות על אמצעי תחבורה, לשימוש באמצעי תחבורה בפועל ועוד, על מנת לנתח בהמשך על פי מרכיבים אישיים.

לאחר קבלת התוצאות, נבדקו האמינות והתוקף של הסקר באמצעות שימוש באלפא של קרונבך, ניתוח רכיבים עיקריים (Principal Components Analysis), מבחני-טי (T-tests), אנובה (ANOVA) ובדיקת מודלים שונים באמצעות רגרסיה. תוצאות מבחני התוקף הראו שהכנסה נמוכה, מחסור ברכב, נכות וגיל צעיר (18-24) היו קשורים באופן מובהק לדיווח על בעיות בתחבורה, אך מגדר ומיקום גיאוגרפי היו קשורים רק באופן חלקי לדיווח על בעיות תחבורה. בניגוד לכך, הורים לילדים צעירים (עד גיל 18) ואנשים בגיל מבוגר (65+) היו קשורים לדיווח על פחות בעיות בתחבורה בהשוואה למי שאינם הורים ולאנשים בגילאים צעירים יותר. עם זאת, בניתוח רב-משתנים ניכר כי המודלים השונים לא הצליחו להסביר אחוז גבוה מספיק של השונות בין האוכלוסיות השונות. המשמעות היא שישנם מרכיבים שמשפיעים על

המחקר נעשה בהנחיית פרופ"ח קרל מרטנס בפקולטה לארכיטקטורה ובינוי ערים.

אני מודה לטכניון על התמיכה הכספית הנדיבה בהשתלמותי.

זמן, כסף ונסיעות שלא עשיתם:

בעיות תחבורה מנקודת מבט רחבה

חיבור על מחקר

לשם מילוי חלקי של הדרישות לקבלת התואר מגיסטר למדעים

תכנון ערים ואזורים

גליה פרוינד

הוגש לסנט הטכניון – מכון טכנולוגי לישראל

שבט תש"פ, חיפה, ינואר 2020

זמן, כסף ונסיעות שלא עשיתם:

בעיות תחבורה מנקודת מבט רחבה

גליה פרוינד