



GOAL
Growing Older, staying mobile:
Transport needs for an ageing society

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Executive Summary

The increasing share of older people in the European population produces considerable challenges for future transportation systems. Older people are usually regarded as a group with particular limitations and needs; hence the consideration of specific requirements of this growing group has been attached great importance in transportation research. The GOAL project aims at comprising current knowledge and identifying research gaps in order to develop an action plan for innovative solutions to fulfil the transport needs of an ageing society.

In many studies, older people are seen as a single homogeneous group with specific – mainly physical and mental – limitations. In reality, though, the group of older people is extremely heterogeneous, only joined by their age. In order to efficiently evaluate whether current research and development activities are appropriate for fulfilling the differing needs of older people with dissimilar characteristics, it is therefore necessary to comprehensively investigate and categorise the main relevant determinants of elderly mobility and identify typical combinations of such characteristics. For this reason, the initial part of the GOAL project was especially focusing on the development of plausible profiles of older people. The consideration of typical combinations of aspects influencing the mobility of older people provides a valuable basis for performing an inclusive assessment task of current mobility research in this area.

The development of the profiles was based on a multi-stage approach including a multitude of different information resources. In general, the approach comprised of mainly three components:

- the quantitative analysis of available European databases and data from two limited surveys in several European countries,
- the qualitative analysis, categorization and inclusion of relevant findings from international literature and
- the repeated discussion of the results and different versions of the profiles with international experts in the course of two workshops.

In total, five different profiles have been identified which differ in demographics (age range, sex), state of health and life satisfaction, living conditions and social networks, mobility behaviour, living environment, technology and information usage ,and transition points (life-changing events). The final profiles provide comprehensive insight into profile-related mobility determinants. The use of the profiles in the consecutive work packages of the GOAL project enables identifying current and future transport needs of older people in due consideration of the heterogeneity in this population.

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1 Introduction

1.1 The Project GOAL

The aim of “GOAL – Getting Older, Staying Mobile” is to provide an action plan for innovative solutions to fulfil the transport needs of an ageing society. This action plan will be developed through the interaction with different stakeholders, state-of-the-art reviews, identification of possible and relevant societal developments and alternatives to transport. We identify relevant research gaps and product developments through high level contacts in the USA and Japan. The focus of GOAL is on land based transport. Current predictions of EUROSTAT show that “The share of people aged 65 years or over in the total population is projected to increase from 17.1% to 30.0% and the number is projected to rise from 84.6 million in 2008 to 151.5 million in 2060. Similarly, the number of people aged 80 years or over is projected to almost triple from 21.8 million in 2008 to 61.4 million in 2060”. In order to keep them actively involved in their daily activities, it is vital that older people, now and in the future, are able to travel and have access to acceptable levels of mobility.

Older people have specific needs with respect to travelling. In GOAL we will first describe the physical and mental characteristics of older people and use these to develop profiles which will represent the range of characteristics to be formed in the population now and in the future. These profiles will be used to explore in a structured way the needs while driving, using public transport, walking and cycling and the relevant information needed before and during travel. The profiles will also be used to address additional issues of older people which may impact on travel decisions. GOAL will also consider other developments that will influence the travel of older people in the future. These will include ICT and driver support technologies. There is considerable expertise in the consortium related to all aspects of the project. However, to validate our work and to ensure that it will have the widest acceptance, we will be running a series of workshops to enable the widest constituency of stakeholder bodies and experts to interact with the study team. The information research and development needs will be identified and used to develop an action plan to achieve the goal of growing older and staying mobile.

1.2 Background

In statistics older people are often described as a single homogeneous group, but behind statistics is a heterogeneous group of people that differ in:

- physical and mental characteristics,
- travel patterns,
- life styles,
- and transport needs.

This heterogeneity of the group of older people aggravates the assessment of current developments in mobility research – solutions which provide considerable support for older people with specific limitations may cause difficulties for others or imply undesirable effects

on the long run (e.g. supporting systems might lead to accelerated decrease of skills due to lack of training, technological supply and care systems may lead to social isolation of older people whose social contacts are few).

Regarding the differences in the transport needs of older people, it is obvious that the numerous approaches in facilitating older people's access to transport systems cannot meet the requirements of all older people alike. Moreover, most efforts are put in the development of solutions that aim at compensating specific physical limitations such as impaired motor skills or sensory disabilities. Though, declines in the mobility of people of higher age are not solely depending on physical characteristics, but can also be significantly related to mental characteristics (e.g. incapability of understanding complex information systems), emotional aspects (e.g. fear of getting lost or hurt) or life-style related factors (e.g. diminishing motivation for following activities away from home).

A comprehensive investigation and assessment of efforts that are currently made in mobility research and development must therefore take into account various evident as well as hidden aspects of older people's mobility in order to reveal potential gaps and provide useful recommendations for an action plan covering future research focuses. The consideration of typical combinations of such aspects influencing the mobility of older people provides a valuable basis for performing an inclusive assessment task.

In Work Package 2 of the GOAL project, the variations in the characteristics of older people were taken as a starting point for developing such an action plan considering the transport needs for an ageing society. Physical and mental capabilities as well as differences in other mobility-related characteristics (e.g. gender, regional, cultural differences) were used to develop profiles of older people, which have been further developed with respect to travel patterns and life styles. These profiles are further used to identify transport needs by taking into account the heterogeneity in the population of older people.

1.3 Methodology

The basic information for the development of profiles of older people comes from the SHARE database¹ and from related literature (studies, reports, data, etc.) identified through desk research. Figure 1-1 gives an overview of the methodology of the elaboration of the profiles of older people.

¹ "The Survey of Health, Ageing and Retirement in Europe (SHARE) is a multidisciplinary and cross-national panel database of micro data on health, socio-economic status and social and family networks of more than 55,000 individuals from 20 European countries aged 50 or over" (<http://www.share-project.org/>)

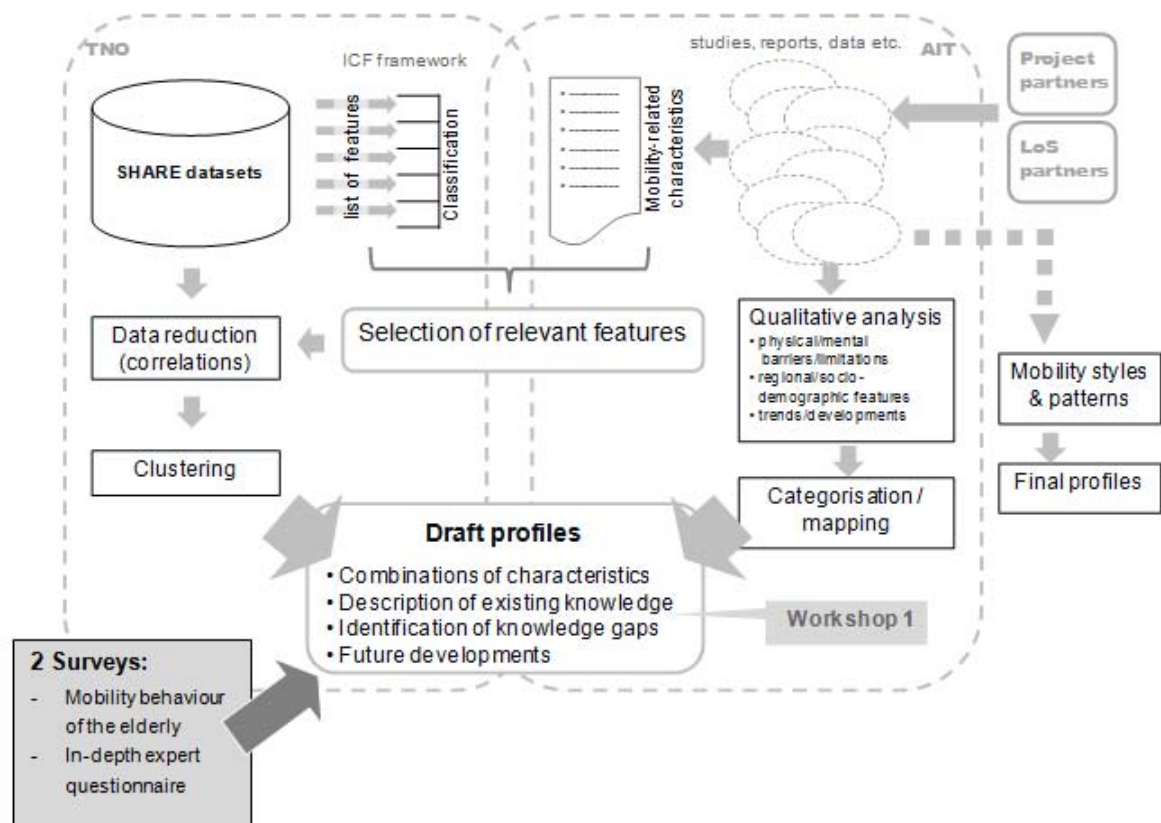


Figure 1-1: Elaboration of the profiles of older people

Initially, a comprehensive literature review was carried out in order to identify mobility-related characteristics (see Chapter 2, Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**). In parallel a list of relevant features was selected from the SHARE database. During an iterative process of discussions among the project team the final selection of the SHARE-features was defined.

After data reduction and correlation a clustering of the data from the SHARE database (mainly features about demographics and health) using the GROUPALS method was carried out (see Chapter 3). To elaborate the clusters additional information from the SHARE database (living environment, mental health, and social activities) was added to the clusters. In the next step information from literature about physical and mental barriers, regional and socio-demographic differences, transport, life satisfaction, living environment, trends and developments, etc. was matched to the clusters (see Chapter 4). The resulting draft profiles (see Chapter 5) were presented at the first workshop in Vienna, where the plausibility of the draft profiles as well as main gaps have been discussed and the procedure for the following two surveys has been defined (see Chapter 5.3).

As the draft profiles were merely based on socio-demographic characteristics but did not yet include behavioural aspects, aspects concerning mobility styles and patterns of older people have been investigated based on related findings in mobility research and by analysing mobility data of older people from different databases (see Chapter 6). In parallel, two

surveys have been conducted in order to collect additional information in relation to the identified knowledge gaps in the draft profiles (see Chapter 7): a survey addressing older people (standardised paper and online questionnaire aiming at collecting data about living conditions, mobility behaviour, transition points, navigation and information) and a web-based survey for experts and intermediaries working directly with older people (focusing on causes and effects of transitions from one profile into another).

Finally, the final profiles have been elaborated by including additional information from the analysis of mobility styles and patterns and from the surveys. The result comprises five profiles representing typical groups of older people, which provide comprehensive descriptions of the most important factors concerning physical and mental characteristics, living conditions, social aspects, residential areas and behavioural aspects relevant for mobility. Additionally, the profiles provide substantial information about factors determining the transition between different profiles and therefore determinants of desirable and undesirable transitions.

For the assessment of current developments in mobility research each profile provides information about specific aspects concerning different levels of mobility behaviour. So, current solutions and development can be matched to respective behavioural levels in order to reveal good practise approaches with high potential of fostering general high activity levels and self-determination of older people, identify potential drawbacks of specific solutions which fail to meet the requirements of older people in particular living situations and disclose knowledge gaps and lacking developments addressing specific aspects of older people's transport needs.

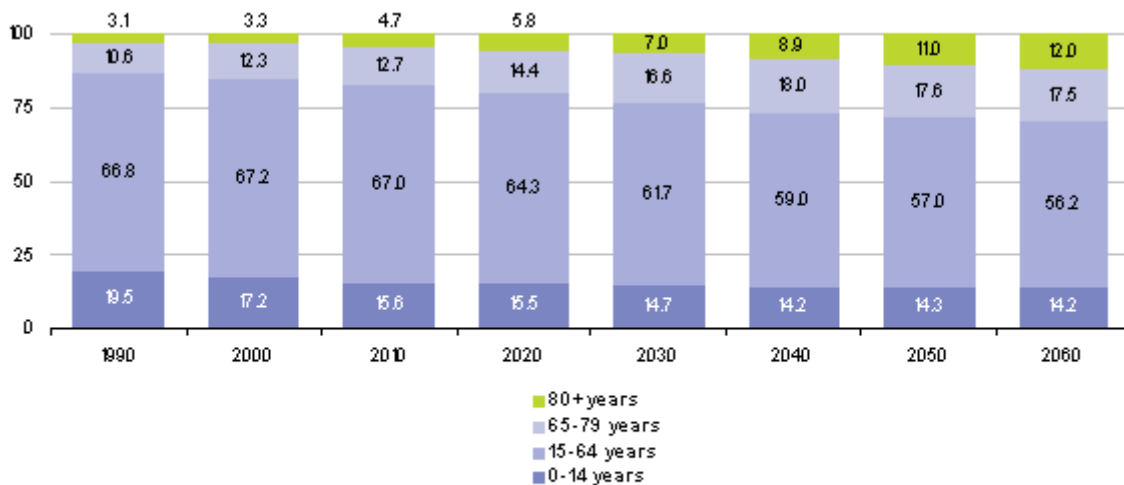


2 Mobility of Older People: State of Knowledge

2.1 General findings

Senior citizens are increasingly being recognised as a growing group with specific characteristics. Constant increase of life expectancy has led to demographic changes in western society and mortality being delayed until higher ages (Nusselder, 1998). This development produces several important consequences. On the one hand, this rapidly growing group represents a rich resource of experiences and skills which should be used to a much larger extend (e.g. as expert advisers for scientific research addressing ageing issues). On the other hand, this groups is also regarded as a group with special needs and specific requirements, as prolonged lives do not necessarily mean longer healthy lives.

In Europe statistics show that population ageing is likely to affect all EU Member states until 2060 (Eurostat, 2011). According to the convergence scenario of EUROPOP2010, the median age is projected to rise from 40.9 years by 2010 to 47.6 years by 2060. Senior citizens aged 65 years or more will account for 29.5% at that time (17.4% in 2010); the share of those aged 80 years or above is projected to almost triple within this period.



(1) Excluding French overseas departments in 1990; 2010, provisional; 2020-2060 data are projections (EUROPOP2010 convergence scenario).
Source: Eurostat (online data codes: demo_pjanind and proj_10c2150p)

Figure 2-1: Population structure by major age groups, EU-27, 1990-2060 (% of total population) (Eurostat (demo_pjanind) and (proj_10c2150p))

The general shift towards longer lives and a growing number of older people is predominantly due to medical advances contributing to the enhanced treatment and control of diseases. However, achievements in the field of medicine can lead to various effects, and related theories about the expansion or compression of morbidity (Doblhammer et al., 2001) propose different scenarios. The “expansion of morbidity” theory (Gruenberg, 1977; Olshansky et al., 1991) assumes that an increase in life expectancy is particularly caused by

a reduction of the fatality rate in chronicle diseases while the probability of occurrence of such a disease does not equally decline, resulting in longer lives in poor health. The “compression of morbidity” theory (Fries, 1989) on the other hand states that morbidity will be compressed into a shorter period at the end of life, as disabling non-fatal diseases are eliminated. Both effects taken together, it may occur that although the elimination of fatal diseases leads to an increase in disability-free life expectancy, life expectancy with disability may increase as well (Nusselder, 1998). In general, this means that the growing group of older people will be characterised of strongly differing health statuses, with seniors being able to grow very old in good health, others who also reach a high age but in poor health. This variety in the group of older people should especially be considered in connection with transport issues.

As the ageing process results in various levels of decline of physical and/or mental capabilities, a number of different effects can be observed in the mobility of older people. The issue has already been tackled in a great number of different research approaches with a corresponding variety of different (and sometimes even contradictory) findings. Due to the fact that the group of older people is not homogeneous in any way, findings can only reveal some aspects of the mobility of older people. Some of the related findings are summarised in the following sections with a focus on available literature from Germany, The Netherlands and Italy. The findings from these and other resources were however not used for a general comparison of existing international results, but have been included in the more profound analysis and description of the profiles developed during this work package. Therefore the examples provided here are not to be seen as exhaustive but rather as an illustration of the complexity of the topic. A list of all related findings together with the documentation of the inclusion of specific findings in the elaboration of the profiles is described in Chapter 4.

2.2 Use of Transportation Means

In Germany, the daily volume of traffic was rising only modestly from 2002 to 2008. The share of private traffic remained on the same level, while the share of cycling and public traffic increased. Figure 2-2 shows the Model Split by age groups in Germany. It became evident, that the rise in traffic volume can be linked to “a more distinctive mobility of today’s senior citizens. They are more active than previous generations and use, owed to their traffic socialization, cars more often” (Follmer et al. 2010, p.1).

The portion of older persons in German suburban regions is about 20%. Widowed female elderly living in these regions never or only very seldom drive a car (little to no driving experience). “Due to their location elderly women are forced to use public transport, which often don’t go with their needs, or drive a car although feeling unsecure. Both are not helping security“ (Lubecki & Jansen 2002, p.351).

Cohort studies show that starting with age 60, car usage decreases constantly while walking increases. Public transportation becomes a more popular alternative for those ages 75 or older. However, it is obvious that throughout all ages the car has a prominent role as a means of transportation (Follmer et al. 2010).

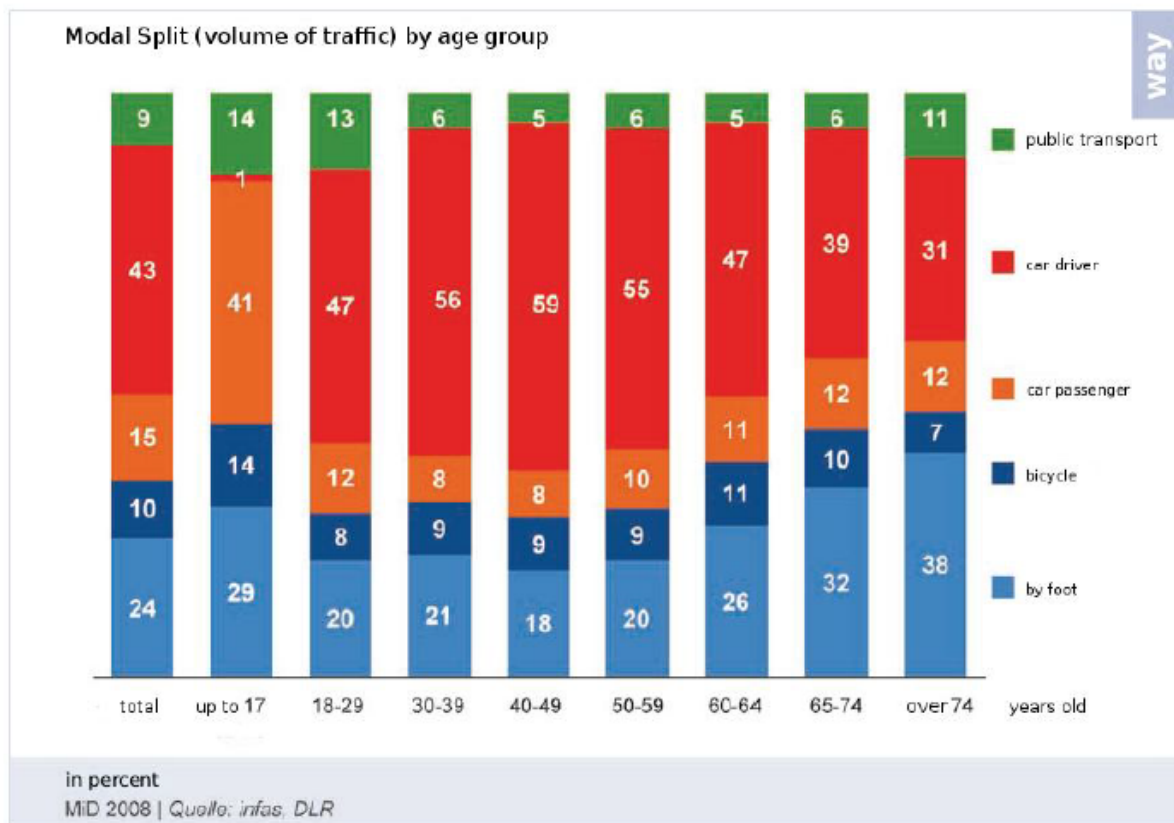


Figure 2-2: Volume of traffic by age group (MiD 2008, Germany)

„Older people continue to have travel needs after retirement and the private vehicle is likely to remain the dominant and safest mode of transport for the elderly. Moreover, to many older people, driving represents a symbol of freedom, independence and self-reliance, and having some control of their life.” ... “Currently in Europe, walking is still an important transport mode for between 30 and 50 percent of journeys made by people aged 65 and over. In contrast, over the past 20 years in the US, there has been sustained decline in walking by those aged over 65” (Whelen et al. 2006, p.4).

These data (Figure 2-3) derive from a report from 2001 made by a research group of OECD-countries (“Ageing and transport: Mobility needs and safety issues“).The report highlights that there are less gender differences with regard to owning a driver’s license, however, women still own less cars and therefore have less opportunities to drive. This leads to the fact that women are more dependent on public transport services (OECD 2001).

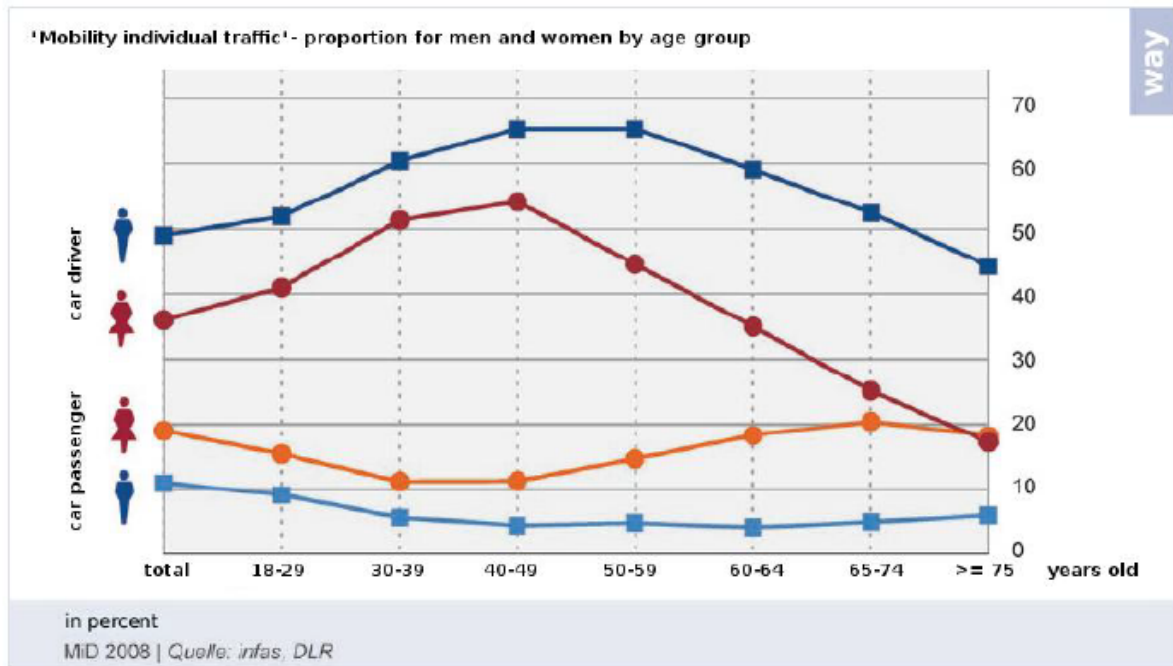


Figure 2-3: Mobility individual traffic by gender (MiD 2008, Germany)

2.2.1 Future Use of Transportation Means

Numerous studies predict that in the future there will be more elderly drivers. Due to the demographic trends from 2020 on every fourth car driver will be more than 65 years old. Especially the proportion of female drivers increases, thus they will influence the growth of motorisation (Diehr 2002).

This trend is also documented by a German study from North Rhine-Westphalia: There are still distinctive gender differences with regard to owning a driver's license with high age (male: 85%, female: 54%) while in younger generations this effect decreases (male: 98%, female: 86%) (Haustein & Stiewe 2010).

Dutch studies by the Netherlands Institute for Transport Policy Analysis (KiM) confirm this trend (KiM 2008). In 2020 the future older person is expected to constitute one fifth of the Dutch population. Older people will have a higher rate of driving licenses and car availability. Public transport is expected to remain to play a small role in the future transport means of older people. Various special mobility services, such as regional taxis, target group transport and individual transportation modes are probably more effective. Due to different lifestyles, older people of the future will have different preferences for household location and are more likely to be focused on out-of-door activities and travelling after the morning peaks.

Research from Switzerland emphasizes that in 30 years about 90% of female elderly (more than 65 years old) will own a license (today about 52%). This development is accompanied by more driving experience (Rytz 2006).

2.2.2 Future Scenarios of Mobility of Older People

The ERA-NET project 'Keep Moving' aimed at identifying research issues in the field of demographic changes and transport and to provide information for transnational discussion at the European level for transport (research) policies (Wallgren & Jorritsma 2007). Within this program, Dutch research concerning the impact of long term demographic on mobility styles and patterns led to the identification of two different groups of older people (van Beek et al. 2011) as explained in detail in section **Fehler! Verweisquelle konnte nicht gefunden werden..** Based on these two groups three different scenarios (1 – Postponing retirement; 2 – Better healthcare; 3 – More socially active older people) have been investigated. The main findings from each scenario-evaluation are:

- **Scenario 1: Postponing retirement** leads to a larger number of trips per older person because it is expected that as older people work longer they will remain more active. However postponing retirement will not affect the modal choice.
- **Scenario 2: Better healthcare** leads to a healthier population of older people which includes more mobility with an active transportation mode (bicycle, walking) at the cost of car mobility.
- **Scenario 3: More socially active older people** (or 'more cosmopolitans' as the authors of the study phrased) does not lead to more mobility, but induces a modal shift towards motorized transport modes such as car and public transport at the cost of active transportation (bicycle, walking).

2.2.3 Overview over the Results of OECD Research

- "Car use is becoming more dominant as a transport mode for older people, but there are differences among countries, especially between Europe and the United States.
- In Europe, walking is still an important mode of transportation for older people, with 30-50% of older people's trip made on foot.
- However, car use seems to be replacing walking and to a lesser extent, public transport.
- Older people use cars less frequently than other adult age groups.
- The gender differences in car use among older people today may be reduced by 2030.
- Currently, public transport is most commonly used by the oldest (over 75 years) age groups and by women.
- Land-use provisions and proper facilities can make bicycling a feasible transport mode for older people in some countries (it currently is in such as Denmark and the Netherlands)." (OECD 2001).

2.3 Reasons for Reduced Mobility

Further scientific research from Germany focused on reasons for reduced mobility behaviour (Figure 2-4) of older persons. It became evident that "almost all older persons, regardless

whether they participate in traffic walking, cycling, driving or using public transport, suffer from the tighter and more aggressive traffic. Lack of consideration and social support as well as hectic pace and aggressiveness are considered problematic.” (Mollenkopf & Flaschenträger 2001). Health restrictions or inconvenient weather are considered not as important.

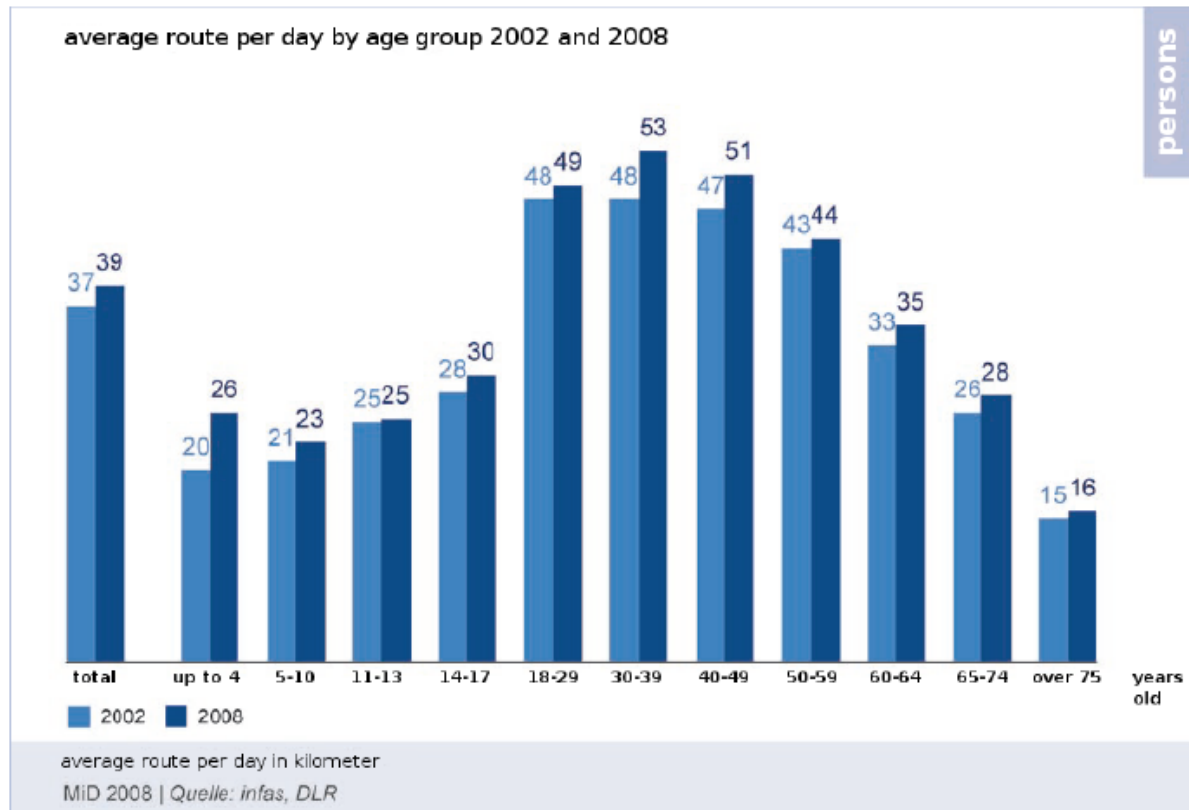


Figure 2-4: average route per day in kilometre by age group (MiD 2008, Germany)

Another result of this study shows that relevant requirements for mobility are physical mobility and health status as well as driving competence and availability of a car. Age is less relevant. Impacts on satisfaction with mobility options have the physical mobility, regional location and the option to drive oneself. Those who are not able to drive a car themselves are less satisfied than active drivers (Mollenkopf & Flaschenträger 2001).

In case of the following, stressful situations older persons avoid driving themselves (OECD 2001):

- At night, during rush hours and when the weather is inconvenient.
- They avoid unknown streets, highways and turns across traffic.
- In Great Britain older drivers also avoid one-way systems and roundabouts.

Thus older people, before quitting driving at all, reduce driving to local trips, known streets and easy driving conditions. Persons living outside of cities or in rather rural areas miss attractive alternatives to driving (since walking is impossible or exhausting). In Great Britain



older people are more likely to relinquish a car if they live in a metropolitan area. There are real transport alternatives: short walking distances, usage of busses and taxis. More reasons to reduce driving are “medical/ability (65%), accident/safety (52%) and financial (41%).” (OECD 2001) According to a US survey from the American Association of Retired Persons older persons (AARP 2001), both male and female, have less health problems driving than using public transportation or walking, but comparing this to Europe the differences in infrastructure for walking and public transport have to be taken into account.

A survey in Berlin showed that insecurities rise significantly with decreasing level of activation. “Persons using walking aids or persons depending upon constant medication, feel less secure walking or using public transport than other persons” (Bakaba & Ortlepp 2010, p.7). The following overview (Table 2-1) demonstrates traffic situations which are associated with great insecurities and are thus avoided:

	cycling (n=800)	walking (n=1.950)	Driving car (n=1.160)
Insecurities	<ul style="list-style-type: none"> • On the lane of main roads without bicycle lanes (75 %), • Turning left into another road (56 %), • One-way streets which may be used by cyclists in opposite direction (47 %), • Intersections with other streets or drive ways (46 %), • Roundabout traffics (46 %), • on bus lanes which may be used by cyclists(43 %). 	<ul style="list-style-type: none"> • Sidewalks and walkways which are used by pedestrians as well as cyclists(66 %), • Crossing intersections without traffic lights (51 %), • Crossing streets with tramway tracks (49 %), • Sidewalks and walkways on which cars are parked (47 %). 	<ul style="list-style-type: none"> • Construction sites (31 %), • Streets with tramway traffic (30 %), • Passing others on country roads (28 %) and • Turning left without traffic lights (20 %).
Avoidance behavior	<ul style="list-style-type: none"> • Slippery roads and walkways • Streets with a lot of heavy vehicles • Uneven or damaged streets and walkways • Bad sight as well as • Streets with speed limits higher 70km/h for cars <p>Women report more avoidance behavior.</p>	<ul style="list-style-type: none"> • Slippers roads and walkways (snow, clear ice, rain) • Uneven or damages walkways (cobblestones, potholes) as well as • Bad sight (darkness, fog, twilight). 	<ul style="list-style-type: none"> • Slippery roads (snow, clear ice, rain) and • Bad sight (twilight, darkness, fog)

Table 2-1: Insecurities and avoidance behaviour (source: GDV)

Research by Su (2007, p. 251) in the London area showed that “with reduced mobility, older people have different travel characteristics compared with younger people”. Su (2007) indicates that because older people have more time, their related travel patterns change as well. Also, since their driving abilities decrease older people tend to use more walking and public transport. This is confirmed by analysis of the “Keep Moving” database, as explained in section **Fehler! Verweisquelle konnte nicht gefunden werden..** Other conclusions from the research include that travel costs are more important than travel time. And since older people have more time and less money they tend to choose alternatives that are cheaper but

with longer travel times. Also the ease of accessing public transport is an important aspect in the use of public transport.

In his PhD dissertation Su (2007) investigates trip chaining of older people in order to understand the changing mobility demand of older people. By studying trip chain complexity it is found that the trip chains of older people are not less complex than trip chains from younger people (especially for the group of young older people ranging from 65 to 75 years old). The travel purposes however are more simple and their mode choice less flexible. Due to the decreased physical ability access to public transport and/or special transport services is becoming more important when growing older.

2.4 Trip Durations and Distances in Mobility of Elderly People

In Norway elderly men (75 years and older) cover a distance of about 25 km daily, while women of the same age travel about 9 km daily. This tendency can also be seen in Germany and Sweden. However in the past years the distance increased for both, women and men. This can be linked to an improved availability of cars (more driving licenses and more driving experience) (OECD 2001).

Compared to younger groups, the length of daily covered distances decreases constantly from age 50 on (50-59 years: 41,1 km; 65-69 years: 26,3 km; 80 and older: 9 km). This can be linked to the lack of transit to and from work starting with retirement (Bakaba & Ortlepp 2010). The following table from the German study MiD 2008 shows similar results (Table 2-2):

age	ways		duration (without regular travel to work)		route per day	
	male	female	male	female	male	female
	quantity		minute		kilometer	
0 - 10	3,0	3,0	65	62	24	24
11 - 13	3,0	3,0	73	69	28	23
14 - 17	2,9	3,2	76	85	27	33
18 - 29	3,7	3,5	86	87	51	47
30 - 39	3,8	3,9	85	81	65	39
40 - 49	3,9	3,9	88	82	62	40
50 - 59	3,7	3,4	85	78	57	32
60 - 64	3,7	3,3	85	80	37	33
65 - 74	3,5	3,0	87	75	33	23
75 and older	2,7	2,0	69	50	20	12

MiD 2008 | Quelle: infas, DLR

Table 2-2: Parameters of mobility by gender and age groups (MiD 2008) [ways = trips]

A Belgian study also presented evidence that male senior citizens travel a longer distance daily. The general frequency of trips depends both on owning a driving license and the monthly income. Elderly with a low income or without a driving license are more likely to stay home and have shorter travel distances. On average a trip takes 60-70 minutes and the average daily distance is about 29 km. This distance decreases with rising age. Furthermore insecurities and problems also rise with increasing age (60 to 80+)” (Christaens, et al. 2009, p. 63). Motives are shopping, visiting as well as leisure time, culture and sports.

Dutch research also indicates that the number of daily trips decreases when growing older (KiM 2008). The lack of outdoor activities, decreased health due to age, sickness or handicap and bad weather conditions lead to a significantly smaller number of trips. Figure 2-5 shows that in The Netherlands almost half of the people above 80 years old do not make a daily trip at all.



Figure 2-5: Share of people that on average does not make a daily trip (KiM 2008, Netherlands)

When looking at travel distance and travel time per day significant decreases are evident when growing older. People in the age group 55 to 64 make on average 3 trips per person per day, while people above 90 years old only make one trip per day outdoors as can be seen in Figure 2-6.

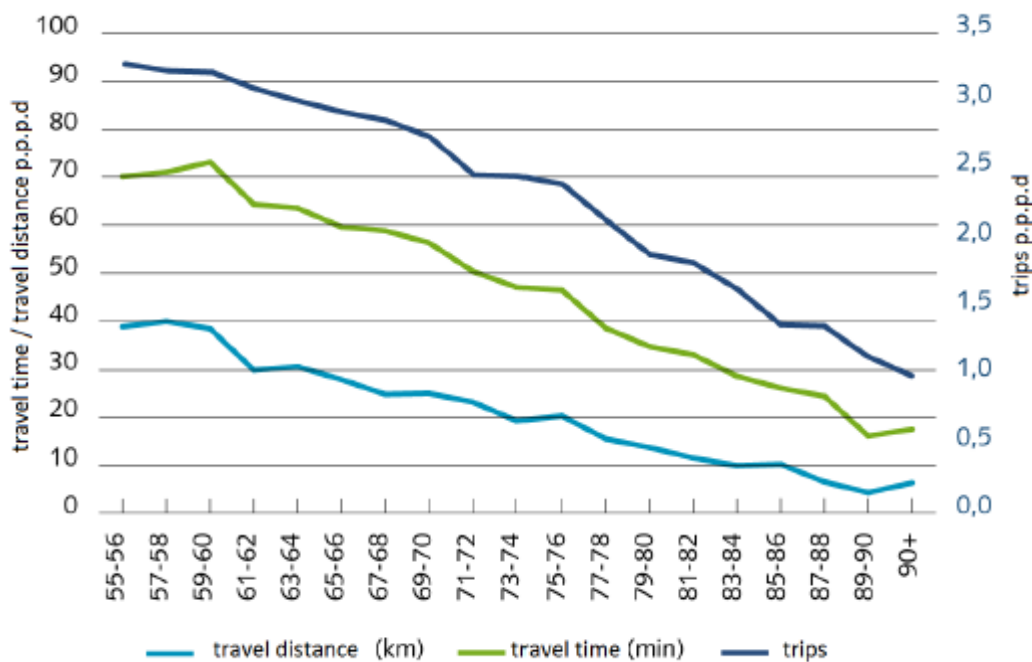


Figure 2-6: Number of trips, travel distance and travel time per person per day from KiM (2008, Netherlands)

2.5 Elderly People Travelling on Vacation

2.5.1 Means of Travel

In 47% of vacation travel cases elderly people chose a car, in 30% a plane and in 14% a bus as means of travel. Only in 6% of the cases older persons would chose the train². The bus as a means of travel means safety, comfort, company and the possibility to organise the trip individually (e.g. breaks). The non-stop travel from door to door, without changing the vehicle and moving luggage is considered comfortable. “Many rural locations and regions can only be reached by bus” (Heitzer-Priem 2011, p.20).

The survey of MiD (2008) presented a different picture with regard to the main means of travel for holiday trips. For the group of the 50 to 80 year olds, travelling by train is the second most frequent means of transportation (21,38%) after travelling by car (52,63%). These are followed by plane (12,88%) and coach (10,00%). Travelling by ship, bike or other means of transportation (e.g. motorbike) is rather rare. Considering the course of time, it becomes evident that the frequency of car and plane use is decreasing with increasing age. However train and coach increase in significance.

² Younger adults: car: 48%, plane: 41%, bus: 5%, train: 4%.

2.5.2 Destinations and Frequencies

In Germany (2008) about 72% (equals 21 million persons) aged 50+ make at least one holiday trip for 5 or more days per year. Short trips are equally common. One third of the trips are within the country, but two thirds are journeys abroad. The group of those of at least 60 years of age has significant travel experience as well as spending power. Until 2035 an increase in this sector (travelling and tourism for this age group) of 13-16% is predicted (Heitzer-Priem 2011).

In 2009, among the 10 million travellers over 65 years a share of 40% travelled within Germany and about 55% made a trip abroad. For those trips, Italy, Austria and Spain were most popular (Haustein & Mischke 2011).

2.5.3 Motives for Travelling

The group of persons 60 years or older stays on average for 14 days at their destination. This is longer than other age groups. Furthermore, nowadays older persons take their grandchildren more often with them on holidays. They are interested in restaurants, active sight-seeing and full accessibility. In addition, service and quality are important for this group. As motives for travelling there is an increasing health orientation, but also nature experiences (such as hiking and visiting natural sights) and culture (e.g. city trips) (Heitzer-Priem 2011).

2.6 General attitudes of older people

2.6.1 Overview of results of the German Federal Bureau of Statistics (regarding Germany and the European Union)

In the report of 2011 'older persons in Germany and the European Union' the German Federal Bureau of Statistics (Statistisches Bundesamt) presented the following results (Haustein & Mischke 2011):

- **Residence**
 - With increasing age more persons are willing to move out of the city into the greener suburbs.
 - Spain is a popular retirement home in the EU. In 2010 about 226.000 EU citizens over 65 were registered in Spain. The biggest groups are citizens from Great Britain and Germany.
 - In Germany only 3% of those over 65years live in nursing homes because they can't look after themselves. This percentage increases for those over 85 years old to 17%.
- **Households**
 - Almost every third person in the EU over the age of 65 lives alone. Because women are widowed more often, two thirds of the singles are female.



- In 2009 about 50% of EU citizens lived in a household with their partner. Other kinds of communal residence may be found especially in Estonia and Latvia.
- **Vehicles and other Expenses**
 - Germany: With increasing age the „portion of households with vehicles which were bought as new cars increases: The biggest share with about 43% is the group of the 70- to 79-year-olds.”
 - Europe: on average senior citizens spend 9% of their income for traffic and 12% for leisure time, culture, education, hotels and restaurants.
- **Fitness**
 - Germany: 28% of the 65- to 79-year-olds use a home trainer to remain fit also at home.
 - In Europe 67% of the persons between 55 and 69 years are not interested in sports (men and women equally). Of the group 70+ only 20% was engaged in sports and this rather outdoors than in fitness centres, clubs or gyms.
- **Use of Internet**
 - The number of “SilverSurfers” rises in Europe. They use the Internet mostly for travel reservations, purchase of medicine, as means of communication (e-mail) and to search information (health topics).
 - In 2010 47% of the Internet users older than 65 years searched their hotels online. 32% used further services such as reservations of tickets and car rentals.

2.6.2 Overview of results of MOBILATE Cohort Study 1995-2000 (regarding Finland, Germany and Italy)

This study was carried out within the MOBILATE project in three of the participating countries: Finland, Germany and Italy. The aim of the project was to analyse and to study the cohort differences of ageing people and the environmental changes affecting them between the years 1995-2000.

Interesting information comes from the analysis of outdoor mobility, including modes of transport and the range of outdoor activities.

- **Mode of transport**
 - The cohort comparison showed that in 2000 the Finnish male cohorts owned a car more often than in 1995. This difference remained significant when data from men and women were combined.
 - As for the Finnish male cohorts, in eastern Germany the older male cohort owned a car more often in 2000 than in 1995, but an opposite trend was found to the same cohort in western Germany: there the owning of a car was rarer in 2000 than in 1995.
 - Also in Italy the older cohorts owned a car more often in 2000 than in 1995.



- Both in Finland and Italy the frequency of car use was seen increased in 2000, with respect to the situation of 1995, while in Germany, especially western Germany, the trend was in the opposite direction.
- While in the later born Finnish cohorts cycling was substantially more frequent, both in Germany and Italy the cohorts did not differ in this respect.
- The use of public transport did not differ among different cohorts, except in Italy where the older cohort used it more frequently in 2000 than in 1995.
- The number of modes of transport used was higher in the Finnish male cohort aged 55-59 in 2000 than in 1995. This was also true for the eastern German male cohorts, whereas in western Germany the cohorts did not differ in this respect.
- In Italy the older cohort used more transport options in 2000 than five years earlier.
- **Outdoor activities**
 - The number of different leisure activities was smaller among the later born cohorts in Finland and among the older male cohort in western Germany.
 - In eastern Germany the corresponding cohort had more leisure activities in 2000 than in 1995.
 - Unfortunately in Italy the figures for 1995 and 2000 are not comparable because in 1995 the questionnaire listed 17 and in 2000 19 alternatives.

2.6.3 Spending Power and Marketing

Companies are aware of the strong spending power of the elderly that makes them an attractive customer group. However, there is a shortage of “offers which fulfil the special requirements of the heterogeneous customer group aged over 50” (Gewalt 2011, p.32). The design of senior-focused products is a particular challenge. “Due to improvement in medicine the perceived age differs from the calendrical age from 10 to 20 years. The play and learn instinct remains the same, but the demands on usability and valence increase with the age” (Müller 2005, p.9).

The marketing of so-called “senior citizen’s products” is considered very critically. Those are avoided by other customer groups, and senior citizens sense it as stigmatisation. For example the car industry had recognised that they will neither build nor market a “senior citizen’s car”. This means that the “senior car buyer will have to choose a car from a variety of offers, depending on his own needs and demands” (Kirchmair 2008, p.8).

2.6.4 The natural ageing process

To increase the knowledge about the target group of older people it is necessary to have an understanding of the natural ageing process (Table 2-3) and the change of needs (regarding wishes, function, comfort, quality) that comes with it. The following list contains age-related changes and their possible consequences for mobility. (Gewalt 2011).



organ/system	Age-related changes	Possible consequences of physiological age-related changes
sense organs	<ul style="list-style-type: none"> • Eyes: presbyopia, cataract • Ears: impaired high-frequency hearing • Decreased sense of touch 	<ul style="list-style-type: none"> • Impairment of visual perception • Single spoken words are harder to distinct and understand, especially with background noises.
musculoskeletal system	<ul style="list-style-type: none"> • Decreased skeletal muscles • reduced flexibility of ligaments, muscles, sinews • reduced mobility of joints 	<ul style="list-style-type: none"> • reduced flexibility and strength • increased vulnerability to bone fracture
breathing/pulmonary tract	<ul style="list-style-type: none"> • reduced pulmonary elasticity • increasing stiffness of the thorax 	<ul style="list-style-type: none"> • impaired and less effective breathing • reduced dioxygen partial pressure

Table 2-3: Age-related changes.

“Being mobile is a basic need of all humans, independent from their age. However, active participation in traffic depends upon the availability of appropriate and affordable means of transportation as well as psychophysical abilities of the person” (Bakaba & Ortlepp 2010, p.4).

In a lecture, Professor Dr. Bernhard Schlag of the Technische Universität Dresden (research area: traffic psychology) presented ten “psychophysical developments with effects on participation in traffic of elderly” (Schlag 2008).

- 1) **Visual Impairment:** during twilight and darkness, far/close acuteness of vision by day (...). Creeping process, awareness often insufficient.
- 2) Reduced ability to **multi-task** and to select and split **attention**, also increased distractibility. Lower inhibition control (e.g. lack of fading out irrelevant information, abidance).
- 3) **Response Time:** From perception over information processing and decision making to motor actions. Increased time need of the elderly: actions appear hesitant and uncertain. Tolerance of environment? Time pressure leads to more mistakes.
- 4) Reduced **physical mobility and resilience:** particular relevance for pedestrians, bicyclists and partially for public transport users. Quicker exhaustion and increased recreation time.
- 5) **Risk of overtaxing:** risk of cognitive and motor overtaxing increases with complex performance requirements, especially with time pressure. The handling of new tasks and rapid changing situations are difficult for the elderly.
- 6) Discrepancy between **self-perception and perception of others** of older drivers: negative social age-based stereotypes versus positive self-perception: interaction in traffic!

- 7) Low **self-acceptance of age-related changes**: unwillingly perceived, offended by comments.
- 8) Frequently diseases and increased **use of pharmaceuticals**.
- 9) At the same time the ageing process requires strong **performance in adaption**.
- 10) How well works **compensation**? Does it require awareness in handling problems?

The accident research facility of German insurance companies (Unfallforschung der Versicherer - UDV) published in 2010 the results of a representative survey among older persons in Berlin. 70% of all persons stated that in traffic they depend upon aids to compensate physical deficits. 62% of these cases are visual impairments which are compensated by glasses or contact lenses. "A fifth of the interviewed persons must take medication which might influence their ability to participate in traffic. Almost every second over the age of 80 (45%) needs a walking aid. Also senior citizens who need aids are less mobile than those who are fine without assistance" (Bakaba & Ortlepp 2010, p.5).

2.7 Examples of Typologies of Older People from the Literature

The consideration of different types of older people has already been utilised in several studies in order to incorporate specific factors, behavioural patterns or needs of older people. Depending on the specific focus of a research activity, particular aspects have been selected as determining factor for identifying different types of older people. Hence, the types are distinguished by various different factors, e.g. aging phases, levels of fitness, severity of physical limitations, use of transport modes, consumer behaviour or social activities.

Among distinct mobility-related approaches, the German study „Mobility behaviour of seniors – development of targeted mobility offers” from 2010 worked out the following four mobility types (Table 2-4). The basis for the representative sample consists of 1500 elderly from North Rhine-Westphalia and a cluster analysis of the collected data (Haustein & Stiewe 2010).

	Fixed on car	Young wealthy mobile	Self-determined mobiles	Forced to using public transport
Age group	74,5 years	68 years (youngest)	Younger than average	about 75 years
Situation of living	Less central, most living alone	On the edge of the city, suburb, most living in strong partnerships (73%)	On the edge of the city, suburb, most living in strong partnerships	Nearby the center of the city, living alone, less contacts
Activity	Small social networks, fewest active	20% employed, very active in free time	very active in free time	very active in free time
Income	Low	High (40% more than 3000€ net)	Average	Lowest
Education	Low	30% university education	? (similar young wealthy mobile)	Low
Owning a car	Common	Almost all	Good	Seldom
Kilometers per year with car	33,7%: 1-5000 km	31,3%: 5-10km	38,3%: 5-10 km	96,5%: 0 km
Autonomy of public transport (use, mobility)	Difficulties by using (0% daily)	Limited (1,2% daily)	Good (2,7% daily)	Highest (10,8% daily), good transport connection
Attitude to car	Very positive (fun, independence)	Average	Average	Negative
Attitude to bicycle	Negative (1,4% daily)	Average (19,6% daily)	Positive (26,5% daily)	Average (14,9% daily)
Attitude to walking	Negative	Average	Positive	Average
Dispersion	57% women, 43% men	51% men (up to 41% of the entire group)	Rather men	83% women
Satisfaction with mobility options	Predominant satisfied	High need of mobility	Highest rate of satisfaction	More satisfied than "fixed on car"
Note	Often mobility impairing handicaps	90% use mobile phones, 72% have an internet connection	Seldom a handicap. No mean of transport is excluded and there is no dependence	Often mobility impairing handicaps Only a third has a driving license

Table 2-4: Types of mobility as a result from a German study (Haustein & Stiewe 2010)

A different approach of classifying the group of older people in the course of the SZENAMO study performed by the Austrian partners within the ERA-NET project 'Keep Moving' defines three different types of mobility (Szenamo 2010). The types have been identified through cluster analysis based on the factors „state of health“ (measured by physical complaints and the contentment with the state of health), household structure and employment status and are characterised as described in Table 2-45.



Fully mobile Seniors	Slightly physically impaired seniors	Highly physically impaired seniors
<ul style="list-style-type: none"> • Mostly still working • Mostly younger than 70 years old • Highest proportion of car drivers • Assess their possibilities to leave home and drive a car better than the other groups • Highest proportion of seniors living in multiperson households • Leave their home more frequently, than the other groups. 	<ul style="list-style-type: none"> • Mostly already retired • Mostly in the older age groups • High contentment with health state • Hardly suffer from physical impairments • Prefer walking and cycling • More than half of the seniors in this group • live in multi-person households. 	<ul style="list-style-type: none"> • Mostly over 70 years old • Mostly dissatisfied with the own state of health • Highest proportion of seniors, who suffer from motor impairments • Highest proportion of seniors who prefer public transportation and special transport • Leave their home less frequently, than the other groups • Highest proportion of seniors, who live in single-person Households

Table 2-5: Types of mobility based on health aspects, household structure and employment status (Szenamo 2010).

The Dutch study within the ERA-NET project ‘Keep Moving’ developed two groups of older people (van Beek 2010). The two groups (Table 2-6) are based on assumptions concerning the future mobility of older people regarded from three perspectives: economic (WLO-scenarios)³ (PBL 2006), spatial and activity-patterns.

³ WLO-scenarios: Global Economy, Strong Europe, Transatlantic Market and Regional Communities (English summary on URL: http://www.welvaartenleefomgeving.nl/context_UK.html last retrieved on April 20, 2012.).

	Senior Cosmopolitan	Future Traditional
Age group	65+ years old	65+ years old
Orientation	(Inter)nationally	Locally
Healthcare	Less care needed	Dependent on family/neighbor care
Activities	Actively involved in communities	Little participation in communities
Trip characteristics	Many short and long trips with all modalities	Many short trips with car and bicycle
Socio-economic/spatial	Living in urban areas, mostly in high-class housing	Living in rural areas, mostly in middle-class housing
WLO-scenario	Global Economy	Regional Communities

Table 2-6: Types of mobility as a result from perspective on future developments (PBL 2006).

A smaller Austrian study „A checklist of mobility scenarios – project “MOTION 55+“ developed the following three types of mobility of older people which are mainly determined by the use of cars as transportation mode (Table 2-7) (Aigner-Breuss, et al. 2010).

	Predominant car users	Selective car users	People without car availability
Age group	66 to 73 years	55 to 65 years	74 years and more (rather women)
Living/Partnership	Almost three quarters living in marriage	Almost three quarters living in marriage	50% living alone, more than the half are widowed
Financial situation	Average	Best	Worst
Education			Low
Driving license	92%, else car passenger	100%	Two-thirds without car license
Bicycle property and using	53% property, seldom (only in free time)	79% property, Daily life mobility	29% property, rather seldom
Motives for mobility	“no alternative to car”	Public transport for travel to work, daily errands by foot, a third use the train too, 11% daily by bicycle	daily errands by foot and by public transport
Reduction in mobility (handicap)	15% (predominant in group age 74+)	5%, Common operate in voluntary work and clubs, 87% daily out (of the house)	50%
New technologies		Strong use	Less use

Table 2-7: Types of mobility based on car use (Aigner-Breuss, et al. 2010).

Apart from studies focusing explicitly on mobility aspects, also other research fields have developed approaches for structuring the heterogenic and complex group of older people. Some of these findings also provide information concerning issues which are of considerable relevance for mobility. Many of the related studies take into account more general living

conditions and life styles, which also determine mobility patterns or attitudes towards certain aspects of mobility.

For market research, the group of older people becomes increasingly important. One of the related studies in this area describes four different types within the “Generation 50+”, which are defined by aspects concerning activity levels, personal preferences and goals in life (GfK Custom Research Sozialforschung 2008). The four types include “the vivid” (who do not consider themselves as being old), “the happy” (who enjoy their life together with friends and family), “the curious” (who treat themselves to new experiences) and “the secluded” (who have mainly given themselves up).

A number of different lifestyle-related approaches have already been developed in social research and psychology. Examples are an activity-based approach based on levels of participation in social activities and on specific preferences and aversions which distinguishes between the “hyper-activist”, the “re-activist”, the “pro-activist” and the “in-activist” (Kräußlich 2008). An approach considering lifestyles and social networks of older people results in rather similar descriptions of four types of older people (Kryspin-Exner 2009): the “outgoing”, the “family-oriented”, the “resigning” and the ones “in need of care”. In addition, this approach also distinguishes between four aging phases: the “go-go” (describing an active and barely limited phase), the “slow-go” (people are increasingly suffering from different limitations), the “no-go” (older people who are no longer self-determined and need care) and the “last-go” (the deceasing phase).

Veolia Mobility Lab also developed three different profiles to characterise different lifestyles of older people in order to develop their transport services (Beaudoux & Deleu 2010):

- **Young active retirees**
 - Doing what they were unable to do before and indulging in a multitude of activities away from home
 - Not less travel than worker
 - Seek comfort and efficiency
 - Car is a tool that permits freedom and abandoning car is a sign of physical decline or ‘social death’
 - Public transport seen as restrictive
- **Retirees in declining**
 - Less good health
 - Mobility is in decline
 - Collective PT >> car
 - Comfort and security play key role in travel
 - Trouble envisaging the use of a special transport service such as ToD



- **Dependent retirees**

- Very elderly, not in good health, limited capacity for mobility
- Collective PT last resource but unable/afraid to travel alone
- Difficulty with understanding all traffic signing, travel information services and Intelligent Transport Systems.

The different approaches described above are proving that the complexity and heterogeneity of the group of older people hardly allows the consideration of this target group as a whole. None of the described approaches, though, can claim to constitute the best or “ideal” way of segmenting the group of older people. Many approaches try to include a great number of aspects in the determination of the denoted types, but still all studies strive for limiting the number of types in order to derive comprehensive and yet still workable types for their respective research focuses.

3 Identifying Initial Profiles of Older People

The elderly European population is heterogeneous in terms of their mobility capabilities and needs. In order to aid conceptualisation of relevant policies for elderly European citizens, it is useful to cluster the heterogeneous elderly in a small number of groups, or profiles.

This chapter describes a quantitative analysis with the goal of developing a useful set of profiles of the population of elderly (50+) European citizens. The requirements formulated for the profiles are as follows:

1. The profiles should adequately describe mobility-related characteristics of the population of interest (European inhabitants 50+);
2. The number of profiles should be small, say 4-6;
3. The profiles should be named with descriptive verbal labels;
4. The profiles should be internally cohesive and discriminate well from each other;
5. A given profile may not be smaller than 5% of the population of interest;
6. The profiles definitions should be transferable to other datasets, i.e., preferably depend on widely used measures like sex, age and so on.

Since these requirements are partially conflicting (e.g. 1 versus 2), we needed to strike a reasonable balance between the different requirements.

3.1 Features influencing the mobility of older people

The physical and mental characteristics of older people together with the demographic developments and gender differences provide the basis for the clustering and development of the profiles of older people. In the first step of the analysis of the physical and mental characteristics of older people a comprehensive literature review was carried out. As main physical impact factors the abilities to see, hear and walk and the general health (suffering from disease e.g. Parkinson, Alzheimer's, Cardiovascular disease...) were identified. Mental limitations and barriers of older people comprise of emotional aspects (e.g. fear of accidents or injuries, assault or crime, ruthless people) as well as depression or hopes for the future and cognitive abilities (ability to read signs, maps, travel alone, use technologies...). Information extracted from available literature (about 70 international reports or publications) has been categorised and prepared for the development of profiles (Chapter 4).

Secondly, the structure and the availability of the data in the SHARE database were checked in parallel. The goal of this task was to identify relevant variables related to physical and mental characteristics of older people. The identified variables from the SHARE database have been additionally allocated to the ICF-Standard (International Classification of

Functioning, Disability and Health) for structuring and linking them to standardised and internationally comparable categories.

Finally, those variables from the SHARE database were selected which are of high relevance concerning the mobility of older people as indicated in the main findings from the literature. To consider all relevant aspects in relation to the following work packages the list of variables was circulated among the GOAL consortium for feedback and the selection of most relevant features. The SHARE database focuses on health status, disabilities, health care and medication usage and covers features concerning physical limitations considerably well, whereas data especially in the fields of emotional aspects, psychological barriers and cognitive abilities is lacking. Respective knowledge gaps have been identified and indicated. Table 3-1 gives an overview of the selected variables for describing physical and mental characteristics of older people.

	Literature	SHARE Database
physical health	Ability to hear, see, walk properly (wheelchair user, walking disability, blind, visually impaired, deaf, impaired hearing,...)	Health in general
		Parkinson
		Hearing
		Eyesight
		Pain in back, knees, hips and other joints
		Fatigue
		Difficulties in mobility: walking 100m, sitting 2 hours, getting up from chair, climbing stairs, stooping/kneeling/crouching, reaching arms above shoulder, pulling/pushing large objects, lifting/carrying weights over 5 kilos, walking across room, getting out of bed
		Usage of aid: cane or walking stick, walker, wheelchair, scooter
mental health	depression emotional barriers fears: darkness, assault, crime, accident, ruthless people	depression
		hopes for the future
		interest in things
cognitive skills	Ability to read signs, maps, travel alone, use technologies,...	Self-related reading skills
		using map in a strange place

Table 3-1: Variables describing physical and mental characteristics of older people (comparison: literature, SHARE-database).

Demographic developments and gender differences were analysed in parallel to the physical and mental characteristics of older people. In the first step a comprehensive literature review was carried out for this topic as well. As main socio-demographic factors age, income and financial resources, education, employment and household information were identified. Gender aspects as well as regional and cultural differences, rural and urban specifics and economic constraints are considered as very important impact factors in older people's mobility in literature (Chapter 4).

The next steps were conducted similar to the approach used for identifying the physical and mental characteristics. After the identification of the important variables related to socio-demographic and regional and cultural characteristics of older people the availability of respective data in the SHARE-Database was checked.

The SHARE-database focuses on health status, disabilities, health care and medication usage and also covers features concerning socio-demographic characteristics. Despite the importance of the quality and equipment of the living environment of older people only a few variables in the SHARE database deal with these aspects. There are knowledge gaps and missing data especially in the fields of residential area (approximately 90% of the data is missing in the SHARE database) and living environment. There is only little information about the quality of infrastructure and facilities within the living environment. Table 3-2 gives an overview of the selected variables for describing socio-demographic and regional characteristics. To address those knowledge gaps in the fields of living environment, regional, cultural as well as rural and urban impacts on the mobility of older people selected aspects was included in the survey (Chapter 7).

	Literature	SHARE Database
Socio-Demographics	gender	gender
	age	age
	income / financial resources	financial resources
	education	education
	employment	employment
	household information	household information
	family status	family status
Living Environment	residential area	residential area (more than 90% of the data missing)
	quality of infrastructure (restrooms, broad sidewalks, safe pedestrian crossings,...)	
	barriers in public space (barrier-free environment)	
	facilities in walking distance (shopping, health care, recreation, socializing, leisure,...)	sufficient supply facilities in area of living
	perceived safety	vandalism or crime in area of living
	availability of public transport	sufficient supply with public transport

Table 3-2: Variables describing demographic developments and gender differences (comparison: literature, SHARE-database).

Mobility needs are determined by an interaction of personal characteristics and (living) environment. Including variables about the living environment, it has to be taken into account that the environment is modifiable and not part of personal characteristics. E.g. a person living who is not able to drive anymore can move to the city, where the public transport supply is sufficient.

3.2 Method for Identifying Clusters of Older People from SHARE

3.2.1 General approach

For the general methodology the following approach was selected. The first task was to identify a suitable data set representative for the elderly European population with appropriate measurements. Next, we needed to define a set of active variables that are potentially descriptive of the health and mobility profiles. A statistical model was fitted to the active variables to see how they are related. Next, we calculated solutions that assign the persons into 4 to 6 homogeneous groups, and decided on the appropriate number of groups. We also needed to find a minimal set of descriptive variables to create the groups in other datasets. We now address these steps in more detail.

3.2.2 Materials

The profiles build on the data collected in the Survey of Health, Ageing and Retirement in Europe (SHARE) (Börsch-Supan & Jürges 2005). The SHARE project collects data on health and mobility of elderly citizens living in 15 European countries. The baseline SHARE data were collected in 2004, and new waves are added every 2-3 years. About 25% of the sample participated in two consecutive waves. In our approach, we analyzed data collected in waves 1 and 2, covering a total of 46788 interviews.

3.2.3 Active variables

Two experts on transport issues in an aging population from the GOAL project team drafted an initial list of variables from the SHARE database. This list contained 63 potentially relevant variables for inclusion. It was circulated among the GOAL project team, and supplemented with additional potentially relevant variables. The augmented list was reduced to 30 variables by calculating a number of index variables of similar information (e.g. common daily activities, medication, mobility, eyesight, and so on).

	SHARE	GOAL	Description
	mergeid	mergeid	person identifier (fix across modules and waves)
1	ageInt_cat	age	age categories during interview from which variables are taken
2	gender	sex	gender
3	dn010_	education	highest educational degree obtained
4	mstat	partner	living with spouse/partner
5	ph006d12	parkinson	doctor told you had: parkinson disease
6	ph006d13	cataract	doctor told you had: cataracts
7	ph010d1	pain	bothered by: pain in back, knees, hips or other joint
8	ph010d1	sleep	bothered by: sleeping problems
9	ph006d16	dementia	doctor told you had: alzheimer's disease, dementia, senility
10	ph010d12	fatigue	bothered by: fatigue
11	ph005_	limited	limited activities
12		health	INDEX: ph002_, ph003_

13	ph010d5	swollenleg	bothered by: swollen legs
14	ph010d3	breathless	bothered by: breathlessness
15		hearing	INDEX: ph046_, ph047_r, ph055_, ph056_
16	ph006d16	hearingaid	use hearing aid
17		eyesight	INDEX: ph042_, ph043_, ph044_
18	ph041_	glasses	use glasses
19		mobility ⁴	INDEX: ph048d1, ph048d2, ph048d3, ph048d4, ph048d5, ph048d6, ph048d7, ph048d8, ph048d9, ph049d2, ph049d5
20		usesaid	INDEX Walking aid: ph059d1, ph059d2, ph059d3, ph059d4,
21	ph049d7	canusema	difficulties: using a map in a strange place
22		falling	INDEX: ph011d7, ph011d8, ph011d9, ph011d10
23		drugs	INDEX: drugs affecting mobility: ph011d7, ph011d8, ph011d9,
24		earning	INDEX income: ep205ub, ep207ub
25	AS049_	cars	number of cars
26	co007_	endsmeet	is household able to make ends meet
27	ho037_	area	area where respondent lives
28	ho056_	areafacil	area facilities
29	ho057_	areatrans	area public transportation
30	ho059_	areacrime	area vandalism or crime

Table 3-3: Selection of active variables, identified by SHARE name, GOAL name and description. Eight of the variables are defined as an index of SHARE variables.

Table 3-3 provides an overview of the selected variables, both with their names in SHARE and in GOAL. Eight indices were derived from multiple SHARE variables (see INDEX in Tab. 3). After careful selection, there are 30 potentially relevant variables to build the profiles.

3.2.4 Statistical analysis

In order to eliminate the redundancies in the data, a three-dimensional homogeneity analysis (HOMALS) was performed on the data (Gifi 1990). The data from 514 respondents (1.2%) that had fewer than 12 (out of 30) observed data values were deleted. Data of five respondents were deleted because of inconsistent or extreme data patterns. The analysis was based on the data obtained in 44286 interviews. An initial run revealed that the variables *glasses*, *hearing aid*, *areafacil*, *areatrans* and *areacrime* had very limited predictive power. These five variables were deleted from the data, thus leaving 25 active variables.

As a next step, the *k*-means clustering algorithm (MacQueen 1967) was applied on the location of every person as calculated by HOMALS solution. The number of clusters, *k*, was varied from 4 to 6. All calculations were done in R 2.14-2 using the package 'homals' (De Leeuw & Mair 2009).

⁴ In this context "mobility" represents a domain of the ICF Activities classification. In SHARE, this is measured through 11 variables, see table 3.1 for description of the variables

3.3 Results

3.3.1 Dimensional structure

Figure 3-1 displays the scree plot and the location of the persons in the analysis in a three-dimensional space. The percentage of variance explained by the first three principal components (PC) is 13.7%, 5.8% and 4.6%, respectively.

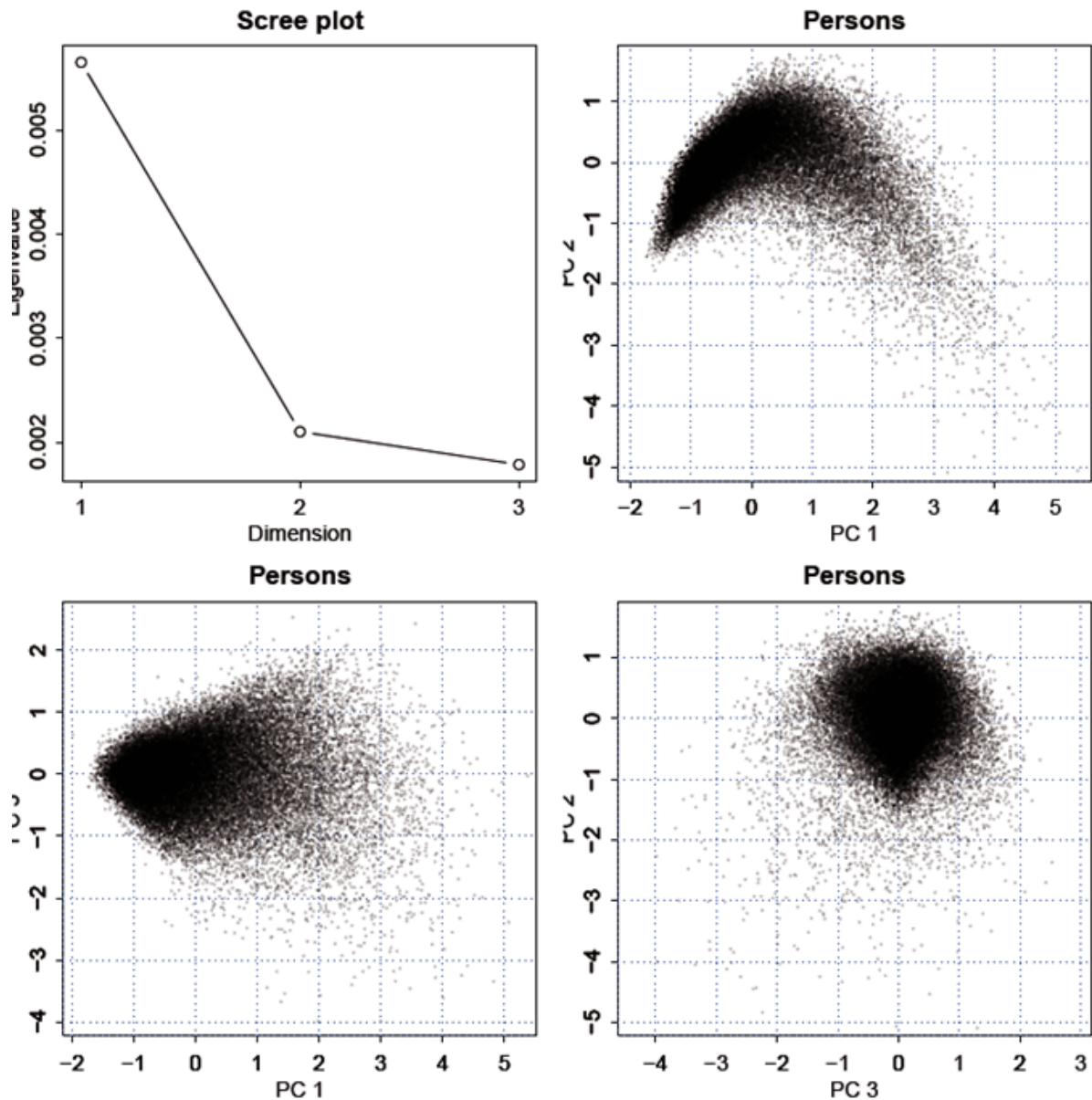


Figure 3-1: Scree plot of the 3-dimensional HOMALS solution, plus scatterplots of the respondents in three different planes

The configuration of person points in the scatter plot of PC 2 versus PC 1 is quite tight at the left hand side, with little variation. The spread increases as we move to the right hand side of



the figure. Observe that also the variability in PC 2 increases with PC 1. A similar phenomenon occurs for the variability of PC 3.

The three-dimensional representation of the points resembles a fountain. The “nozzle” appears as the large number of young and healthy subjects located at the left hand side of the graph of PC 2 versus PC 1. Subjects farther away from the nozzle are more heterogeneous. The graph of PC 2 versus PC 1 is a side view, PC 3 versus PC 1 is the top view, and PC 2 versus PC 3 is the front view with the “water” coming towards to the viewer.

The interpretation of person scatter is aided by the category quantifications. Figure 3-2 and Figure 3-3 show the locations of each category in the plane of PC 1 and PC 2. Each location corresponds to the average of all persons scoring in that category. For easier visualisation, a line connects the individual categories. Unfortunately, the categories are connected in alphabetic order, which does not always correspond to the meaningful ordering in the data.

The graphs show some interesting features. Persons located in the right-lower region

- belong to the very old,
- have serious chronic health conditions, like Parkinson disease, cataract, dementia, deafness, and poor eyesight,
- are severely limited in their activities, experience difficulties with walking, sitting, and so on,
- have a high risk of falling, and use many fall-related drugs.

Persons on the left-hand side

- are generally younger (50-59 years), live with a partner, and are more often male,
- are not limited in their daily activities, experience no pain, enjoy good or excellent health,
- have no falling risk, and use no fall-related medication,
- are highly mobile,
- have higher incomes, possess more cars, and live in suburbs and small towns.

Persons located on the upper side:

- are aged 70-79 years, and more often female, and live as a single,
- have good to fair health, are bothered by pain and sleeplessness, swollen legs, are easily out-of-breath, have a fair eyesight and use hearing aids,
- experience few difficulties in getting around, and are limited, but not severely,
- use no drug that increase risk of falling, and have no car,
- have some difficulty to make ends meet.

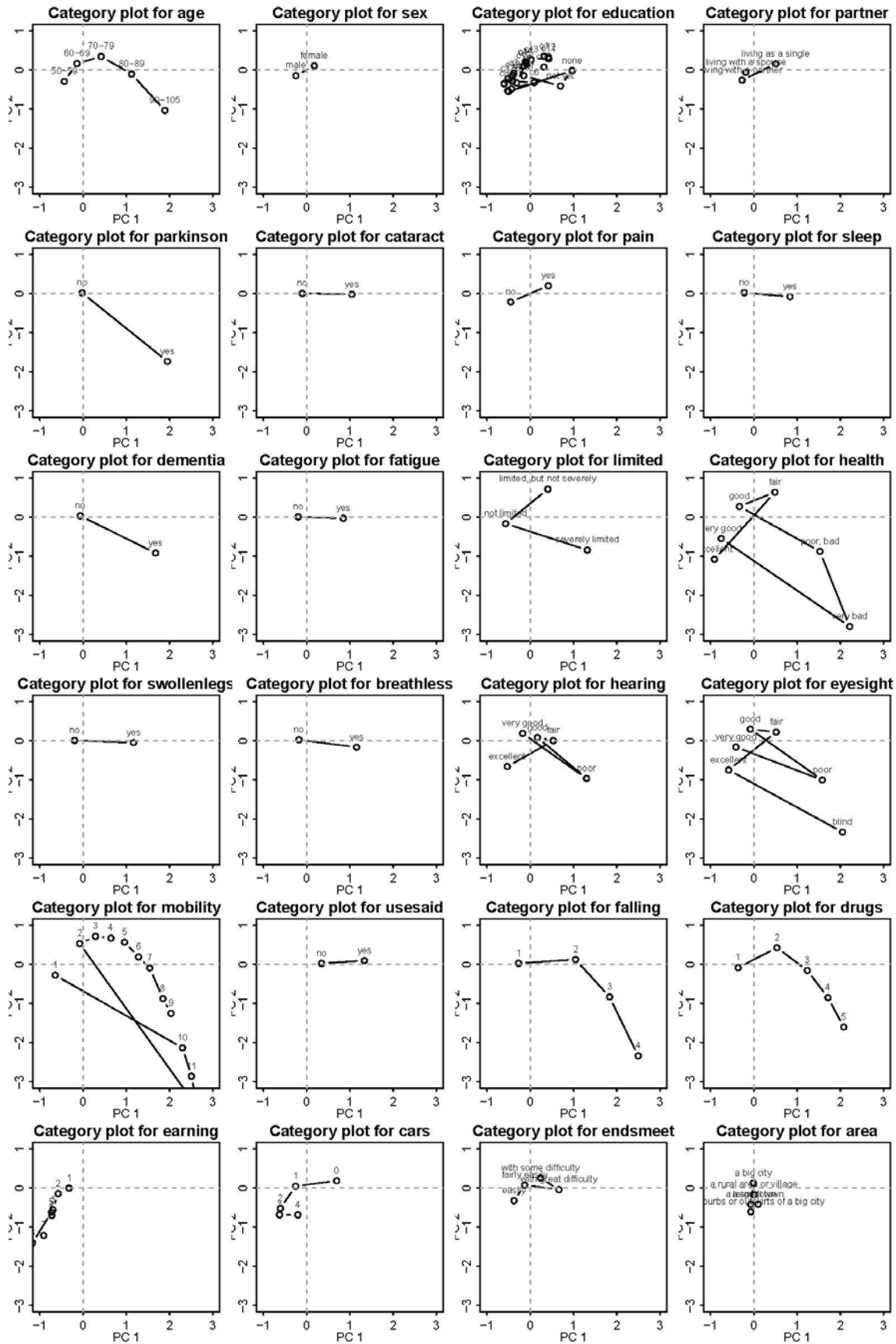


Figure 3-2: Category quantifications of the 3-dimensional HOMALS solution on principal components PC 1 and PC 2

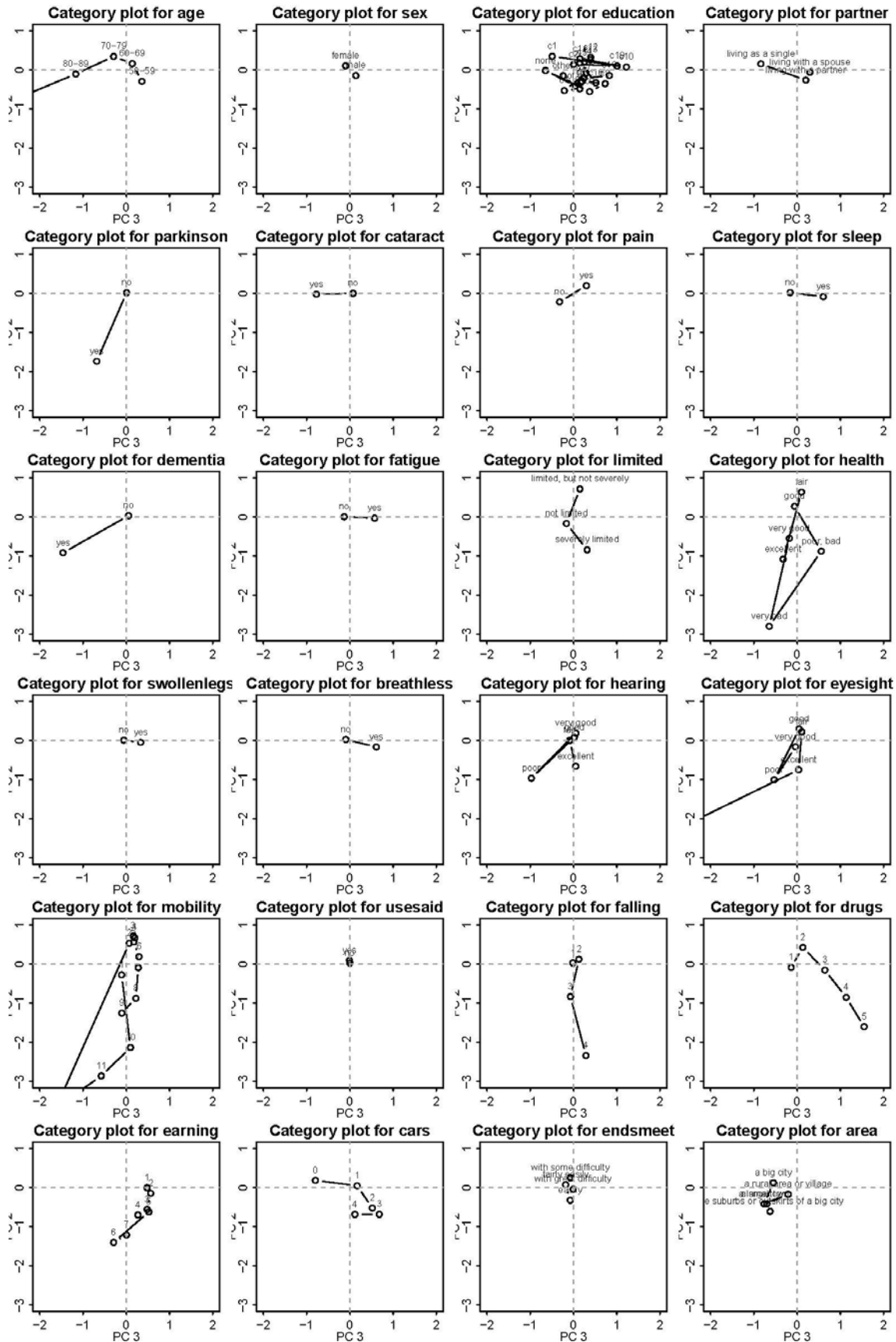


Figure 3-3: Category quantifications of the 3-dimensional HOMALS solution on principal components PC 1 and PC 3.

Persons scoring high on the PC 3

- are generally younger, and live with a partner,
- are bothered by pain and sleeplessness, swollen legs, are easily out-of-breath,
- use many fall-related drugs,
- have relatively low incomes and possess 1 car.

Persons scoring low on PC 3

- are generally older, and live single,
- are at risk for dementia,
- have cataract, poor eyesight, poor hearing,
- have higher incomes.

The interpretation of the three principal components is as follows: PC 1 is mainly driven by age and perceived health, together with the handicaps and disabilities that come with chronic disease and old age. PC 2 is mainly driven by differences in health, almost independent of age, with the high scores in relatively good health given age. PC1 and PC2 share falling, drugs and mobility. PC 3 is more driven by age, distinguishes the type of decline in specific functions (cataract, dementia, vision, hearing) from complaints that impact on daily life (pain, fatigue, sleeping problem, and breathlessness) and presence of cars and a partner characterise this PC.

3.3.2 Profile structure

The person space was clustered into 4 to 6 groups by the *k*-means algorithm. The algorithm is known to be able to produce severe local minima when starting from a random configuration. In order to evade such complexities, we ran the algorithm by specifying a number of smart starting cluster centres, or centroids (see Table 3-4). These centroids were chosen to approximate the fountain structure.







Color	Cluster	PC 1	PC 2	PC 3
	1	-2	-2	0
	2	1	2	0
	3	1	-2	0
	4	4	-4	0
	5	-1	0	0
	6	4	-4	-2

Table 3-4: Smart starting centroids used for the *k*-means algorithm.

3.3.3 Interpretation

It appeared that the 4-profile solution ($n = 18239, 15370, 7926, 2751$) is dominated by age and health (not shown). It essentially cuts down the entire configuration in an ordered, almost 1-dimensional, classification.

Figure 3-4 shows the subjects coloured by the 5-profile solution. This solution ($n = 16371, 5910, 5689, 2249, 14067$ respectively) added an extra cluster starting at ($PC1=-1, PC2=0$) with the hope of breaking up the relatively large red group from the 4-profile solution. This strategy succeeded. The new cyan group is placed between the black group and the pair of red and green groups. The parallel red and green clusters distinguish themselves especially on PC 3 in a higher socio-economic group (red) and a lower socio-economic group (green). The blue group is similar to the one found in the 4-profile solution.

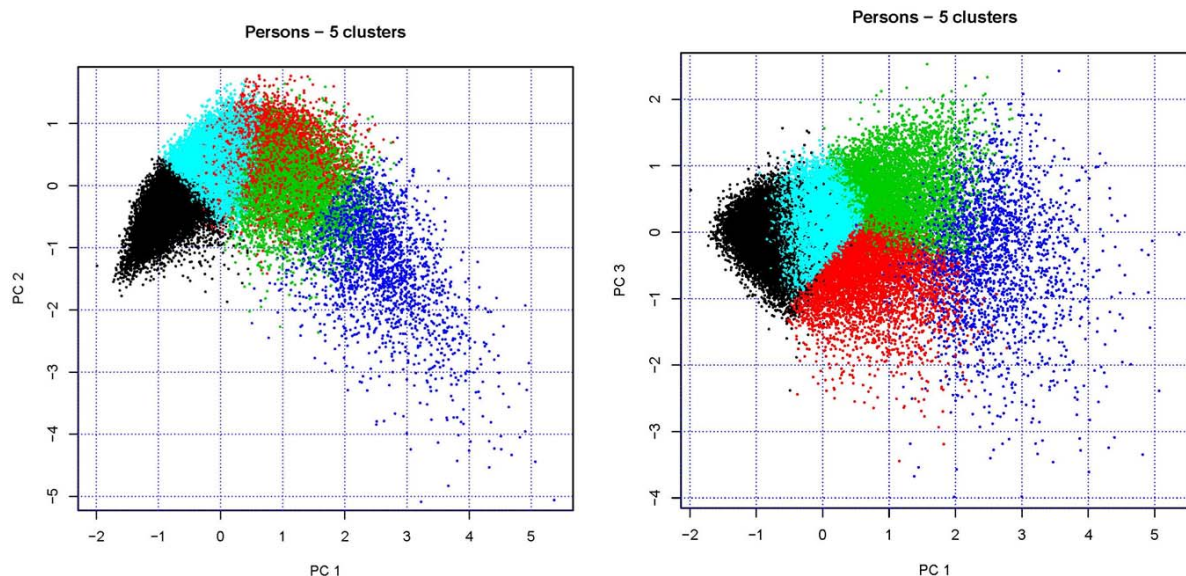


Figure 3-4: Location of respondents on components PC 1, PC 2 and PC 3, coloured by profile.

The 6-profile solution ($n = 12114, 5050, 9121, 4032, 12308, 1661$) added an extra starting point in the hope of breaking the heterogeneous blue group into two more homogeneous groups (not shown). This strategy is only partly successful. The new purple group takes over much of the role of the blue group, and its presence compresses the blue into the green group.

Table 3-5 provides a breakdown of the frequencies per category per cluster for the 5-profile solution. The profiles are ordered according to their place on dimension 1, so profile 5 is placed between profile 1 and 2. There are substantial and easy-to-spot differences between the five profiles. When taken together, the counts observed in the profile provide a sharp and accurate picture of the composition of the profile.



Profile	Number	Profile				
		1	5	2	3	4
Color						
Size		16371	14067	5910	5689	2249
age	50-59	9611	5275	364	1926	179
	60-69	4936	5552	1102	1882	332
	70-79	1568	2962	2463	1544	725
	80-89	246	278	1784	334	800
	90-105	10	0	197	3	213
sex	female	6984	7585	4358	3497	1568
	male	9387	6482	1552	2192	681
education	c1	1823	2877	2450	1119	671
	c2	2630	2830	850	881	271
	c3	2098	1565	207	419	74
	c4	1791	509	159	175	55
	c5	1879	805	149	265	69
	c6	1509	1104	367	669	290
	c7	1352	630	146	212	65
	c8	342	173	7	42	5
	c9	112	36	3	17	3
	c10	94	261	11	230	24
	c11	320	703	357	420	154
	c12	69	217	74	140	30
	c13	344	585	117	243	37
	c14	304	358	90	127	18
	c15	199	226	62	71	19
	c16	260	125	20	66	11
	c17	319	161	21	38	6
	c18	290	195	16	68	2
	c19	72	96	3	45	4
	none	204	390	698	341	397
	not yet	11	6	5	10	7
	other	267	155	80	71	21
partner	living as a single	2272	2398	4128	1135	1257
	living with a spouse	13233	11107	1678	4328	939
	living with a partner	856	548	93	220	50
parkinson	no	16352	14040	5864	5627	2090
	yes	8	21	40	52	153
cataract	no	16032	13559	4601	5169	1548
	yes	328	502	1303	510	695
pain	no	12719	5291	2588	881	502
	yes	3650	8776	3322	4808	1743
sleep	no	15387	11561	4893	2524	1083
	yes	982	2506	1017	3165	1162
dementia	no	12003	11013	3912	4277	1136
	yes	9	7	158	40	200
fatigue	no	11468	9323	3348	2080	619
	yes	544	1704	727	2248	717
limited	not limited	15154	7296	2228	501	46
	limited but not severely	910	5891	2991	2492	411
	severely limited	305	880	691	2696	1791
health	very bad	7	4	11	63	257
	poor, bad	78	361	360	2352	1406
	fair	689	4943	2963	2569	477
	good	6422	7483	2149	648	93
	very good	6498	1147	363	51	11
	excellent	2674	125	61	6	2
Swollen legs	no	16081	12839	4873	3559	1165
	yes	288	1228	1037	2130	1080
breathless	breathless no	16137	12872	5229	3350	1249
	breathless yes	232	1195	681	2339	996

Profile	Number	Profile				
		1	5	2	3	4
Color						
Size		16371	14067	5910	5689	2249
hearing	poor	131	122	266	151	358
	fair	1248	1850	1258	1234	733
	good	2699	3051	1506	1443	557
	very good	7980	7786	2556	2337	518
	excellent	4309	1258	321	522	80
eyesight	blind	1	0	19	0	44
	poor	130	206	472	485	875
	fair	1259	2781	1668	1874	729
	good	5721	7054	2654	2203	424
	very good	5872	3142	897	786	131
	excellent	3384	883	197	339	36
mobility	1	15037	6067	1360	428	26
	2	1026	3939	1081	511	19
	3	218	2307	1055	799	42
	4	60	1073	884	929	75
	5	12	416	672	885	115
	6	2	170	421	788	198
	7	5	73	236	622	274
	8	1	13	117	375	327
	9	1	8	58	201	342
	10	0	1	11	111	338
	11	0	0	6	29	277
	12	2	0	6	4	214
usesaid	no	1539	5949	2241	3015	468
	yes	38	373	1024	924	849
can use a pen	no	16214	13807	4687	5059	763
	yes	150	259	1218	618	1481
falling	1	16097	12927	4334	3252	606
	2	257	1068	1299	1841	764
	3	14	72	257	513	601
	4	1	0	20	83	274
drugs	1	15421	9901	3626	1723	611
	2	861	3514	1872	1936	671
	3	72	599	369	1399	590
	4	10	43	32	503	252
	5	1	1	2	123	110
earning	1	259	247	23	60	9
	2	256	158	0	30	0
	3	224	70	4	11	2
	4	130	34	2	9	2
	5	15	3	0	1	0
	6	5	0	0	0	0
	7	16	1	0	0	0
cars	0	1444	2151	4450	1487	1468
	1	6763	6426	781	1954	191
	2	2742	1072	18	317	12
	3	298	113	0	29	2
	4	78	26	13	20	7
ends near	easily	4176	1895	784	505	154
	fairly easily	4000	3295	1696	845	342
	with some difficulty	1975	3158	1750	1363	519
	with great difficulty	572	1013	762	915	475
area	a big city	108	99	65	19	11
	a large town	84	36	32	12	14
	a small town	92	31	30	14	23
	a rural area or village	124	88	42	28	21
	the suburbs or outskirts	103	34	25	15	18

Table 3-5: frequencies per category per cluster for the 5-profile solution

3.3.4 Conclusion

There is a strong and distinct *fountain-like pattern* in the data that is dominated by age, health, and to some extent socio-economic factors and type of disability. The cluster analysis decomposed the fountain into a small number of discrete groups. We know of no other work that has detected the strong fountain-like shape in health data of the elderly.

The solution with five clusters is a readily interpretable summary of the profiles of European elderly. The 5-profile solution was easy to interpret, therefore the 5-profile solution has been selected for further analysis and typology. As to requirement 3 for profiling, labels connected to the profiles are:

Profile 1: Fit as a fiddle

Profile 2: An oldie but a goodie

Profile 3: Hole in the Heart

Profile 4 Care-full

Profile 5: Happily Connected (initially denoted as “Happy Together”)

Although the results provide a valuable basis for the further elaboration of comprehensive profiles of older people, the resulting clusters still lack of specific important aspects. The SHARE project concentrates on health and contains relatively little geographical information. The urbanisation information was collected for only a subset of respondents. However, the large number of persons involved in the statistical analysis gives a robust configuration of points. Observe also that the health problems represented in the solution are quite broad. Thus, we may hope that the structure, and the 5-profile solution, is generalisable to diseases and handicaps that were not collected by SHARE.

We close by some hints for further work. It could be of interest to exploit the longitudinal character of the data to see how the persons actually move in time through the cloud, i.e. which are the most common paths through the profiles. This would provide important starting points for further investigations of frequent triggers of transitions and how to foster desirable developments and avoid unfavourable “careers”.

3.4 Additional Information from SHARE

To extend the knowledge provided through the determining features of the five clusters we looked into additional variables from SHARE. Descriptive statistical analyses concerning the residential area (area where respondent lives, sufficient supply facilities in the neighbourhood, sufficient public transport in the neighbourhood, neighbourhood suffering from vandalism or crime), mental health (sad or depressed last month, hopes for the future, depression ever), activities (voluntary, charity work, care for sick or disabled, help family, friends or neighbours, gone to sports, social or other kind of club, taken part in religious organisation, taken part in political or community organisations) such as current job situation have been performed in order to describe the characteristics of the profile to a larger extent. Additionally, the results of these continuative analyses offer new points of reference for linking relevant findings from related literature to the profiles.

An overview of the most important characteristics of each profile is given in Chapter 5.

4 Categorisation & Mapping of Information from the Literature

After the clustering and the additional analysis of the data from the SHARE-Database (Chapter 3) information from more the 70 international publications, studies and reports were linked to the clusters based on the results of the previous steps. To facilitate the overview and the allocation of the information and quotes from literature an appropriate categorisation was elaborated. The information from reports and publications was classified into the categories demographics, health, transport, living environment and the category other (social networks, coping strategies / handling of stress, future trends etc.). Table 4-1 gives an overview of the categorisation of information from literature and the topics covered. Information was collected for all five clusters in all categories.

Demographics	Health	Transport	Environment	Other
gender	physical health	usage of transport modes	residential area	lifestyle
age	mental health	driving license, car ownership	quality of infrastructure	social life
income	cognitive skills	usage of bicycle	barriers in public space	life satisfaction
financial resources		mobility indicators	facilities in residential area	coping strategies
education		information and navigation	(perceived) safety	handling of stress
employment			annoyances	future trends
household information				usage of (new) technologies

Table 4-1: Categories focused on in the allocation of the information from literature to the profiles

The information which has been extracted from the different publications has been allocated to the appropriate clusters as follows: in the selected publications reported correlations between features that are also included in the SHARE based clusters and other features that are not covered by SHARE data have been identified and linked to the appropriate clusters. Most of the findings in the regarded publications indicate relations between different features of interest (see categories above) and the features from the SHARE database with highest explanatory power (e.g. age, state of health), therefore it was possible to draw qualitative conclusions concerning probable additional characteristics for each profile. The following lists contain the main statements that have been used for further interpretation of the profiles and the related references.

4.1 Findings from Literature related to Cluster 1 (Fit as a Fiddle)

Demographics
<ul style="list-style-type: none"> • Most the younger, active seniors are still employed (Szenamo 2010). • A sufficient income is the primary factor for facilitating mobility and to reach a high quality of life. The higher the income, the better the (subjective) appraisal of autonomy and life satisfaction. (Size 2006). • Seniors living in two persons or family households evaluate their possibilities to leave their homes significantly better than seniors living alone.



- Seniors in two or more person households use the car more often than seniors living alone (Friedwagner et al. 2010).
- Higher income and education are associated with a larger number of daily car trips by older people (Lord 2011, p. 53)
- Do not consider themselves as “old” people. (Megel & Schlag 2002, p. 69)
- Are described as “Go-Gos”: younger, autonomous, active elderly which are still in the midst of life (Kryspin-Exner o.J.).

Health

- Social as well as physical activity is consistently associated not only with higher life satisfaction but also with better health, longer life (Mollenkopf 1997, p. 296)
- Most of the younger elderly do not suffer from any health problems (Megel & Schlag 2006).

Transport

- The 'younger elderly' have no transport related difficulties and that they are very satisfied with their possibilities for reaching whatever destinations they wish. (Mollenkopf 1997, p. 307, Haustein & Stiewe 2010)
- The car remains the key means of transportation, also for female seniors (Szenamo 2010).
- Driving the own car supports the independence of living, the maintenance of social networks, the arrangement of leisure activities and so on (Size 2006).
- “Younger old (65 to 74)” have a lower risk of accident than young drivers between 18 and 24 (Oswald 1999 in Size 2003).
- Elderly of nowadays prefer driving with their own car, and car drivers use, for instance, public transportation for an extremely little amount of their daily trips only. The own car is easily at hand, quick and comfortable, and it prevents from having to be together with unknown people (Size 2003).
- Nearly 80 % of the households of the seniors from 55 to 64 years of age have a car of their own (single persons in fewer cases than couples or families) Men are better equipped than women; nearly all of the men of the “young old” group can actively participate in motorised traffic. (Size 2003).
- Employed older people use the car more often than retired. They are also more satisfied with their possibilities for leaving their homes (Friedwagner et al. 2010).
- The average number and lengths of trips does from the younger old does not differ from the average population (BMVIT, Walk-space.at 2011).
- The mobile seniors will remain very agile in their leisure and free time and will feature a high number of trips in leisure traffic (Szenamo 2010).
- Younger older people do not tend to make less complex trip chains than younger people (Su 2007, Hensher 2007).
- Since the beginning of the 1980s the amount of mobility increase among people between 50 and 65 (Megel & Schlag 2002, p. 36f, Scheiner 2008, p.6).
- Younger old make the most holiday trips compared to the other groups. Car drivers do more holiday trips and go on holidays more often than non-car-driver (Megel & Schlag 2002, p. 38).

Living Environment

- In terms of travel mode, seniors are more and more relying on automobile than years ago while modes of public transit and walking are not frequently used outside the city (Wei Li 2006, p. 7)
- Participants with high income and high autonomy and satisfaction scores have little problems with



<p>infrastructural conditions (but lack of toilets is a problem for nearly all seniors!) (Size 2006).</p> <ul style="list-style-type: none"> • Car dependency is highest in suburban area. The number of older people in suburban areas will grow because many “babyboomers” live there. New mobility concepts are needed (Fiedler 2007).
Other
<ul style="list-style-type: none"> • More driving licences, and car ownerships of today’s “younger old” than in the past. Now car affiliated peer groups becoming older, who are very depended to cars, also social, cultural, and normative. Driving is an expression of, and means towards, independence, autonomy, spontaneity, control and competence and enhances the wellbeing (Schwanen 2010, p. 539, aeneas 2010). • Giving up driving may lead to strong limitations and negative effects on health (Naujoks & Porzelt, 2008, S. 9). • Persons living in rural areas will be force to use the car more and more because of the decline of public transport. This makes car ownership in future even more important (MOTION n.d., p. 99). • About 90% of this group own a mobile phone, 72% have an internet connection (Haustein & Stiewe 2010). • The younger group has higher education, excellent health and a better understanding for technologies (Kräußlich 2009). • It is assumed that the usage of internet and the acceptance of new technologies will increase among older people, because they are familiar with these technologies since their younger ages. The relevance of Information and Communication Technologies among the elderly will increase in future. The “digital divide“ will be closed (MOTION n.d., p. 100, Gehrke, 2008).

4.2 Findings from Literature related to Cluster 2 (an Oldie but a Goodie)

Demographics
<ul style="list-style-type: none"> • Age is not a significant factor associated with transport deficiency (Hjorthol 2010). • Higher age groups of seniors belong to the economically poorest groups in society. (Size 2003). • There are more older people (80+) are living alone. While the men have enough retirement pay on their own, older women depend on others. In general the household income of older people is well below average (Fiedler 2007). • Research examining gender differences show that women have greater mobility limitation than men, and may be more likely to experience mobility disability later in life compared with men (Yeom et al. 2008). • While the majority of women aged 80 or older are widows or live alone, the majority of men live with a partner. Women lose not only their spouse, but very often also their car and chauffeur, and experience a loss in welfare and well-being along several dimensions. The welfare difference between men and women is considerable (Hjorthol 2010). • In using cars and public transport there are stereotypical gender roles: women use the public transport more often, men are the principal drivers and women their passengers (BMASK 2009). • The advantage of living alone is to be forced to manage daily living without support by others and to be forced to leave the house or flat (Size 2006). • Older people who live alone or have low household income have been shown to make fewer trips (Tacken 1998 in Kim 2011).



- As their degree of disability increases, those over 85, and women in particular, will face several serious constraints with little family assistance. The majority of older women will live alone, some because they have never married, some because they have been widowed or divorced (Rosenbloom 2003, p. 3).
- There is a clear pattern of declining participation rates and exposures to all benefits of transport mobility (psychological benefits, exercise benefits, community help, community socializing) with increasing age (Spinney 2009).

Health

- Physical activity, dietary habits, smoking cessation, and midday naps, might depict the “secrets” of the long livers (Panagiotakos 2010).
- Self-efficacy, an extrinsic motivational component defined as a person’s belief about his or her ability to engage in a health behavior, has a positive impact on mobility functions such as walking and climbing stairs and is affected by both social context and social belief (Yeom et al 2008).
- Regular physical activity substantially delays the onset of functional limitations and loss of independence such as reduces pain and improves the function of joints (U.S. Department of Health and Human Services 1996).
- Physical activity often reduces symptoms of depression. (U.S. Department of Health and Human Services 1996).
- Although disability rates increase with age, two-thirds of those over age 85 reported being in good to excellent health. (Rosenbloom 2003, p. 2)
- People over 85 need more time for relaxing and taking rests (25% of the day). Persons in the group of 70 to 84 only need half of this amount (12%) (Megel & Schlag 2002, p. 54).

Transport

- Walking becomes more important among the older and very old (80+) (Fiedler 2007, O’Fallon & Sullivan 2009a, p. 13)
- People older than 80 prefer buses and trams over underground. The most used mode is walking (Käser 2003).
- With 74 years and older, the number of people feeling unsafe walking, decreases.
- Regarding seniors of 80 years or older, 20 % of them have access to an own car anyhow (Size 2003).
- Despite the popularity of the car, there is a role for public transport, with use increasing as individuals pass 75 years of age (Alsnih, 2003).
- The oldest group had the most problems with public transport: its overcrowded, technically maladapted and maladapted to routes and frequencies (Käser 2003).
- Taxi usage among all older population groups is low, but highest among the older old (Su et al 2009).
- Many individuals entering their 80s experience vision and hearing impairment, along with higher incidence of dementia, Alzheimer’s and other aging related diseases. For these seniors, driving no longer remains a safe or feasible transportation option. (Wei Li 2006, p. 7)
- Many older people who no longer drive depend on family and friends to provide transportation. Although accepting rides as a passenger has benefits such as personal contact to combat loneliness (Kostyniuk 2003).
- Women often adapt better to the life after the car than men and explain this through men’s more extensive driving history and cultural norms that associated – and perhaps still associate – men

and masculinity with being the primary driver (Bauer et al. 2003; Hakamies-Blomqvist, 2003 in Schwanen 2010, p. 593).

- Outdoor mobility decreases in old age, because the general activity level of the elderly decreases, especially occupational activities (Wohlfahrt, 1983; Backes & Clemens, 1998 in Size 2003).
- Trip making declines significantly after age 75. Older people also travel considerably less distance than those in younger age groups (Su 2007, BMVIT Walk-space.at 2011, Wei Li 2006, Lord 2010, p. 52). Two thirds of the trips of older people are less than five kilometer, one third less than one kilometer (Mollenkopf 1996, p.16).
- Mobility reductions become more evident as people reach 80 years of age (Alsnih, 2003)
- People of 75 years and older do not leave their flat at 60 % of the days of a year; for older women it is up to 70% (Size 2003), but people without severe physical limitations do leave their homes daily (Friedwagner et al. 2010).
- The level of mobility, measured by non-home activity time, travel time, and travel distance, declines as older people age (Su 2007).
- In the group of seniors who are “slightly limited in their mobility”, leisure trips are extremely important (Szenamo 2010).
- A large share of seniors’ trips occurs in the time periods between the two rush-hour peaks. (Wei Li 2006, p. 7)
- The older old are adapting strategies to reorganize daily trips in relation to more accessible locations, often within shorter distances, as well as relying on others to facilitate travel (Lord 2010, p. 57).
- When well known transport routines could not be done any more, actors have to change transportation behaviour. Finding new possibilities within the transportation system is a difficult task for older people.(Alsnih, 2003).
- Among the very old shopping is the most important, often only purpose for trip making. (Fiedler, 2007).

Living Environment

- Older elderly people (those over 75) are more likely to be transit users when transit stops are close to home and when local access to goods and services is high (Su 2007).
- The elderly respondents find it especially convenient when the sidewalks are broad and comfortable, when there is little traffic, when they can use a traffic-free zone, or when the goal is nearby. (Mollenkopf 1997, p. 308).
- People over 85 years of age are often affected by problems in the area of walking (like vehicles on footpaths, lack of ramps, loose animals). The same group has most problems with public transport (overcrowded, technically maladapted, maladapted in route and frequencies)
- Senior citizens criticise a bad infrastructure for cycling, a lack of financial resources for mobility aids and a lack of toilets in public spaces. Conditions that facilitate the mobility of seniors are of higher quality in urban areas than in suburban areas (Size 2006).
- The dependency on their living environment is very high for older people because of their shorter activity radius (Mollenkopf 1996, p.16).
- Finlayson and Kaufert (2002 in Lord 2010) have noted a tendency among older adults to avoid certain extreme temperatures, confrontations with social groups or crowds, waiting times, as well as certain transportation modes. Their relationship to the environment adjusts according to individual and collective experience (Lord 2010, p. 53).



<ul style="list-style-type: none"> • Public transport facilities can cause trouble for people who suffer from impairments of mobility or the senses, and many old people perceive the traffic conditions as difficult or even threatening (Mollenkopf 1997, p. 296). • Seating possibilities and shelter from rain, snow, wind is important for the use of the public transport (BMASK, 2009). • Circumstances that go together with a high score of fears are: living in a nursery home, having a low income, being impaired and dependent on a mobility aid (Size 2006). • People living in suburban or urban areas have more problems with social behaviour on the streets than those from rural areas; seniors living alone (autonomous seniors) have, in contrast, few problems with the social behaviour of their fellow citizens (Size 2006). • Mobility conditions for older adults are considered good in urban areas but they seem to be very poor in rural areas. Nevertheless living in a rural area, despite of a poorer infrastructure, may offer to senior citizens the possibility of a better social control in the positive sense. (Size 2003).
Other
<ul style="list-style-type: none"> • Social as well as physical activity is consistently associated not only with higher life satisfaction but also with better health, longer life (Mollenkopf 1997, p. 296). • Taking a couple steps on one's property, supervising maintenance work, conversing with neighbors or going out for fresh air and sun are considered valuable micro-mobilities, providing ways to stay in touch with the vitality of the neighborhood (Lord 2010, p. 58). • Public transport training, which involves safety and trip planning and ticket purchasing training appeals most to those aged 75 and over. (Fiedler & Fenton, 2011). • In the future (2040) 25 % of the car drivers will be 65 years and older. To a great extent this development is due to the fact that older women are the most rapidly increasing group among the owners of driver's licences (Size 2003). • The rate of internet usage is low among people 75+. They get information from newspapers, TV or via phone (MOTION, n.d.). • Two thirds of people 70+ have problems using ticket machines, the technical demands overburden them (IFES 2003).

4.3 Findings from Literature related to Cluster 3 (Hole in the Heart)

Demographics
<ul style="list-style-type: none"> • Older adults with mobility limitation include those who have an annual income under \$25,000 and those who have less than a high school education (Yeom et al. 2008). • The departure from the system of gainful employment is not only connected with a marked reduction in income, but also with a loss of social contacts (Mollenkopf 1997, p. 296).
Health
<ul style="list-style-type: none"> • Increased mobility limitation is also associated with other chronic conditions such as metabolic syndrome and fatigue in daily living among older adults, suggesting that effective management of chronic diseases in older adults may be crucial to reduce the development of mobility limitation in later life (Yeom et al 2008). • There are links between mental and physical declines and reductions in performance, especially as a car driver (Alsnih 2003, Megel & Schlag 2002, p.68).

- Between 30 and 40% of drivers with dementia or Alzheimer's Disease are likely to be involved in a motor crash. 50% of all old drivers killed in road crashes suffering from Alzheimer (Johnansson et al 1997 in Whelan et al 2006).
- A lack of exercise causes physical and mental problems: older people who do not leave their homes regularly, suffer from a lack of exercise which leads to degradation of muscles and bone and the risk of falling and fractures increases. Because of their bad health and their staying at home they lose social contact, what makes their situation even worse and leads to a high risk of depression (Megel & Schlag 2002, p. 118).
- Personal health condition rather than chronological age matters in mobility of the older population. Good health and well-being decrease the chance of having lack of transportation compared to fair or poor health and well-being (Kim 2011).
- Negative emotions ("fears") which influence mobility decisions may be the fear of falling, of victimisation and of the behaviour of vehicle drivers (Size 2006).
- There is a group of elders avoiding any sort of activity: This might have psychological reasons such as depression, lack of motivation, fears, and loneliness (Size 2003).
- Activities which are less connected with physical effort, like going for walks for example, or those which do not require any mobility outside the home at all like receiving visitors, making oneself comfortable at home, or reading are carried out more frequently by elderly persons whose physical mobility is limited (Mollenkopf 1997, p. 306).
- Self-efficacy has a positive impact on mobility functions such as walking and climbing stairs and is affected by both social context and social belief (Yeom et al 2008).
- Being unable to drive is one of the strongest predictors of increased symptoms of depression among older people (Hjorthol et al. 2010).

Transport

- Older people who have never driven are aware of their physical limitations and have adapted their lifestyle to accommodate this. However, older ex-drivers are not as aware of their physical limitations, adding to the feeling of lost independence (Alsnih, 2003).
- In general, older drivers with vision problems and self-reported poor health status were more likely to report problems driving on unfamiliar roads and driving at night or in poor weather conditions (Oxley & Charlton 2010, p. 517).
- The possibility of no longer being able to drive is traumatizing for older adults and reduces wellbeing (Whelan et al. 2006, Davey 2007, Schwanen 2010), particularly for those living in suburbs (Lord 2011, p. 53).
- Loss of transport mobility, as occurs when older people no longer have access to a car or cannot drive, may therefore result in a reduction of wellbeing (Davey 2007).
- Many older people who no longer drive depend on family and friends to provide transportation. Although accepting rides as a passenger has benefits such as personal contact to combat loneliness, this option can exact a psychological price on the older passenger. But there are also negative aspects of accepting rides: feelings of indebtedness that became burdensome and demeaning when reciprocation was impossible; schedules or routes of drivers that did not meet their needs as passengers; and nervousness about the driving skills of the people who gave them rides (Kostyniuk 2003).
- Often well known transport routines could not be done any more, so actors have to change transportation behavior. Finding new possibilities within the transportation system is a difficult task for older people (Alsnih, 2003).



- In terms of travel mode, seniors are more and more relying on automobile than years ago while modes of public transit and walking are not frequently used outside the city (Wei Li 2006, p. 7).
- Public transport facilities can cause trouble for people who suffer from impairments of mobility or the senses, and many old people perceive the traffic conditions as difficult or even threatening (Mollenkopf 1997, p. 296).
- Driving is often the easiest physical task for older people. Long before they lose the ability to drive, older people may be unable to board or ride public transit, or to walk to a bus stop or train station. Even though many may still be able to use special transit services, the overwhelming majority of older people, regardless of their stage of disability, are able to ride in a car and choose to do so first. (Rosenbloom 2003, p.11)
- The three greatest barriers to bus travel are getting to the bus stop; waiting at the bus stop; and getting on or off the bus (Lavery 1996).
- The elderly who are constantly impaired in their mobility report on significantly fewer composite trips than elderly who are less or not at all impaired. (Mollenkopf 1997, p. 305)
- Senior citizens with bad health must make a significant number of trips for visits to hospitals and other medical facilities. (Wei Li 2006, p. 7, Friedwagner et al. 2010)

Environment

- The equipment and the facilities in the living environment are very important for older people, especially when they suffer from bad health and impairments (Mollenkopf 1996, p. 16).
- Seating possibilities and shelter from rain, snow, wind is important for the use of the public transport (BMASK, 2009).
- Conditions that facilitate the mobility of seniors are of higher quality in urban areas than in suburban areas. (Size 2006).
- Senior citizens have relatively little trust that speed limits will be respected by drivers. They also criticize a bad infrastructure for cycling, a lack of financial resources for mobility aids and a lack of toilets in public spaces. (Size 2006).
- People in rural areas may suffer poorer health (e.g. outcomes for diseases such as cancer and diabetes can be less favorable in rural areas than in more urban settings) because they are seeking diagnosis later in their illnesses. Limited mobility has been identified as a possible contributory factor to this fact (Deaville 2001 in Parkhurst & Shergold 2009, S. 336).

Other

- New intelligent transportation system (ITS) technologies in the areas of vision enhancement, collision avoidance, and way finding such as education, training and intervention programmes may help to improve the safety of older drivers (Kostyniuk 2003).
- The need for physical assistance in order to get around is becoming a reality which highly depends on the care-giving relationship the person has with their closest relations (spouse, children and friends) (Lord 2011, p. 56).
- When certain activities restricted completely due transport, the consequence can be social exclusion, exclusion of participation in social life (Kryspin-Exner o.J.).
- To feel worthless, worn out or exhausted for the elderly individuals is thought to be a significant obstacle in achieving a proper life satisfaction (Mollaoglu 2010, p. 115)
- In rural areas social contacts are more stable. In general men living alone have less social contacts than alone standing women (Käser 2003).
- Little open mindedness towards new technologies (Kräußlich 2009).

- There are gender differences in the usage of technologies: older men use them more than women (Käser 2003); women have a negative attitude on technologies (Gehrke 2008).

4.4 Findings from Literature related to Cluster 4 (The Care-Full)

Demographics
<ul style="list-style-type: none"> • The group of the oldest participants with the lowest income has the lowest values in autonomy and life satisfaction. For facilitating mobility and, subsequently, quality of life a sufficient income is the primary factor (Size 2006, Size 2003). • Outdoor mobility such as walking decrease in old age, because the general activity level of the elderly decreases (Size 2003, Panagiotakos 2010). • Age is not a significant factor associated with transport deficiency, physical and mental health plays a more important role (Kim 2010).
Health
<ul style="list-style-type: none"> • Activities which are less connected with physical effort, like going for walks for example, or those which do not require any mobility outside the home at all like receiving visitors, making oneself comfortable at home, or reading are, understandably, carried out more frequently by elderly persons whose physical mobility is limited (Mollenkopf 1997, p. 306). • The prevalence of health injuries and chronic illnesses increases with advancing years. These impairments affect sensory perception and flexibility and therefore make mobility and the maintenance of an autonomous life considerably more difficult (Mollenkopf 1997, p. 296). • When frail elderly receive extensive assistance from the caregiver (i.e., spouse, family members, home care aid) with activities of daily living, the elder may be discouraged from engaging in activity, such as walking, which may increase the risk of falling. This “overprotection” may actually contribute to developing, rather than preventing, mobility limitation (Yeom et al 2008). • There are strong links between mental and physical declines and reductions in performance (Alsnih, 2003). In addition to physical illness, older adults are at risk for psychological disorders such as depression, schizophrenia, anxiety states, or substance abuse, which, can be functionally disabling with respect to the performance of necessary activities of daily living (Clark et. al. 1995). • 50% of people above 85 are suffering from locomotive disabilities (Fielder, 2007).
Transport
<ul style="list-style-type: none"> • Outdoor mobility and traffic participation are highly problematic for the “old old” and for handicapped people. (Size 2006). • Public transport facilities can cause trouble for people who suffer from impairments of mobility or the senses, and many old people perceive the traffic conditions as difficult or even threatening (Mollenkopf 1997, p. 296). • Walking becomes more important among the older and very old (80+) (Fiedler, 2007). • The use of special transport services is comparatively high in the group of the oldest and impaired seniors (Szenamo 2010, Friedwagner et al. 2010). • Catering and shopping trips for seniors severely limited in their mobility will have to be taken over by others. The demand for transport and delivery services will increase, especially in rural areas (Szenamo 2010).



- Trip making declines significantly after age 75 and older people also travel considerably less distance than those in younger age groups (Su 2007, Mollenkopf 1997, Alsnih 2003).
- The number and distance of trips declines (BMVIT Walkspace.at 2011, Wei Li 2006, p. 7) due to significant limitations in autonomy (Lord 2010, p. 52).
- Some members of this group must make a significant number of trips for visits to hospitals and other medical facilities, therefore they often need special mobility services (Wei Li 2006, Kräußlich 2009).
- The oldest old avoid certain extreme temperatures, confrontations with social groups or crowds, waiting times, as well as certain transportation modes (Lord 2010, p. 53).
- No longer able to move in the city reveals one's incapacities, accepting to be homebound becomes then inevitable (Lord 2010, p. 58)
- Among the very old shopping is the most important, often only purpose for trip making (Fiedler, 2007).

Environment

- Moving to a retirement-home breaks the affective relationship to the "home"; our study suggests that reduced mobility is largely responsible for this (Lord 2011, p. 58)
- For the oldest it is best when the sidewalks are broad and comfortable, when there is little traffic, when they can use a traffic-free zone, or when the goal is nearby (Mollenkopf 1997).
- People over 85 years of age with a higher risk of need of care are often affected by problems in the area of walking (like vehicles on footpaths, lack of ramps, loose animals). The same group has most problems with public transport (overcrowded, technically maladapted, maladapted in route and frequencies) (Size 2006).
- More passive activities within one's home are predominantly important for elderly people who are limited in their mobility for health reasons. They are, at the same time, those who are most dissatisfied with the possibilities of getting where they would like to go (Mollenkopf 1997, p. 302).

Other

- Taking a couple steps on one's property, supervising maintenance work, conversing with neighbours or going out for fresh air and sun are considered valuable micro-mobilities, providing ways to stay in touch with the vitality of the neighbourhood. These short but regular experiences of public places confirm elders' presence and status in their neighbourhood (Lord 2010, p. 58).
- The ratio of seniors who are severely restricted in their mobility will progressively grow. Catering and shopping trips for seniors severely limited in their mobility will have to be taken over by others. The demand for transport and delivery services will increase, especially in rural areas (Szenamo 2010).
- Meeting the mobility needs of the 'oldest old' living in rural areas in a truly sustainable way emerges as a particular significant and increasing policy challenge. (Parkhurst G., Shergold I. 2009, p. 339)
- Seniors severely limited in their mobility will spend leisure time mostly locally, not far from home. Assisted mobility (leisure trips) will become very important (Szenamo 2010).
- Life satisfaction levels of nursing home residents are lower compared to individuals living at home (Mollaoglu 2010, p.117).
- With increasing age, some changes have occurred in the life of the subjects; losses emerged in physical, social and emotional fields, and as a consequence, life satisfaction was negatively affected. (Mollaoglu 2010, p. 117).

- New technologies cause problems and too excessive demand for the oldest. Displays, keyboards, ticket machines etc. may not meet their needs (Gehrke 2008).

4.5 Findings from Literature related to Cluster 5 (Happily Connected)

Demographics
<ul style="list-style-type: none"> • The higher the income, the better the (subjective) appraisal of autonomy and life satisfaction such as mobility (Size 2006). • Higher income and education are associated with a larger number of daily car trips by older people (Lord 2011, p. 53). • In two- or more-person-households cars are available and used more often, (Megel & Schlag 2002, p. 138). • Seniors in partnerships leave their homes more often and are more active (Friedwagner et al. 2010). • Mainly the men are the drivers. Many older women do not have driving licenses or less driving practise (Hensher 2007).
Health
<ul style="list-style-type: none"> • Staying mobile and fit is one of the most important goals of active elderly. Walking and cycling are the preferred modes for exercise (Megel & Schlag 2002, p. 118). • Social as well as physical activity is consistently associated not only with higher life satisfaction but also with better health, longer life (Mollenkopf 1997, p. 296) • A growing number of older people stay healthy and active doing sports and taking part in cultural activities (Fiedler 2007).
Transport
<ul style="list-style-type: none"> • Driving the own car supports the independence of living, the maintenance of social networks, the arrangement of leisure activities and so on (Size 2006). • We could find a positive correlation between driving a car and membership in a seniors' organisation. We suppose that membership in an organisation and driving a car both depend on a good income, a good health status and on a high general activity (Size 2006). • Because of the loss of occupational obligations older drivers drive less than younger ones, only about 50 to 70 % of the kilometres that younger drivers drive (Size 2003). The trips are shorter, but the slightly limited elderly use their car for almost as many trips as their working counterparts (Szenamo 2010, Newbold et al. 2005, p. 347). • Personal travel, travel associated with visiting friends and relatives, and travel for religious and volunteer organizations all ranked highly in each period as well, while travel to- and from work or work for pay ranked low, and decreases when people getting older. (Newbold et al. 2005, p. 349) • In the group of seniors who are "slightly limited in their mobility", leisure trips are extremely important (Szenamo 2010). • For seniors who are between 65 and 75, who are mostly still able to drive safely and independently, their transportation needs could be served well with a car and a driver license. (Wei Li 2006, p. 7) • The worst five barriers for older people in public transport: overcrowded vehicles, ruthless drivers, insufficient routes, lack of punctuality, bad infrastructure access (SIZE 2006 in Fielder 2007).



- Pre-trip and on-trip information have to be adopted to the need of older people (Fielder 2007).
- A large share of seniors' trips occurs in the time periods between the two rush-hour peaks. (Wei Li 2006, p. 7)
- Itineraries are selected based on traffic density (basically the streets speed or traffic is reduced), and on familiarity with their urban, architectural and social characteristics (Lord 2010, p. 58).
- Women who are married or living with a partner, are not the principal driver. Among today's older couples, the male partner is generally the principal driver when couples drive together. In Genral women tend to drive fewer kilometres than men (Oxley et al. 2010, p. 520).
- Women use public transport more often than men (Friedwagner et al. 2010).

Environment

- Circumstances which correlate with a low score of fears: living together with a partner, having a high income, being active in a seniors' association (Size 2006)
- Active older people criticise bad infrastructure for cycling, a lack of financial resources for mobility aids and a lack of toilets in public spaces. (Size 2006).
- Participants with high income and high autonomy and satisfaction scores have little problems with infrastructural conditions (but lack of toilets is a problem for nearly all seniors!) (Size 2006).
- The perception of social attitudes as mobility problems is dependent on pension income and health status and is interlinked with the autonomy and satisfaction score. People living in suburban or urban areas have more problems with social behaviour on the streets than those from rural areas; seniors living alone (autonomous seniors) have, in contrast, few problems with the social behaviour of their fellow citizens (Size 2006, Summary Results).

Other

- This group is characterized by a high life satisfaction and a strong connection with their family. Taking care for grandchildren or other family members plays an important role and has a positive impact of physical and mental health the elderly (Kryspin-Exner o.J.).
- In rural area older people are "forced" to use the private car, because of the decline of public transport, there will also be a increasing number of older female drivers (MOTION n.d.).
- Bicycle training and Informations for people who are still physicaly and mental fit, want tob e active, but have safety concerns and never got used to ride a bike (Fiedler & Fenton 2011).
- Members of a seniors' organisation seem to be a privileged group. They are more autonomous; more satisfied with their life, they have a higher income and are better equipped with respect to mobility means (Size 2006).
- In the group of the active elderly the internet usage will increase (Silver surfers). The number of internet user between 60 and 70 is increasing 4% per year (Gehrke 2008).
- The usage of technologies is more likely in urban areas. Persons who used technologies in their professional lives will also do so in older ages (Käser 2003).

The additional information summarized above which has been extracted from the literature and allocated to the appropriate cluster information add to the cluster details as a basis for sketching the first draft of the GOAL profiles. The following chapter provides the consolidated description of all relevant characteristics of older people in the respective profiles.

5 Draft Profiles

Based on the clustering of the SHARE-Database, the additional information from SHARE and the information added from literature five draft profiles have been developed. Figure 5-1 depicts the profiles in relation to two substantial characteristics: predominant range of age and level of activity.

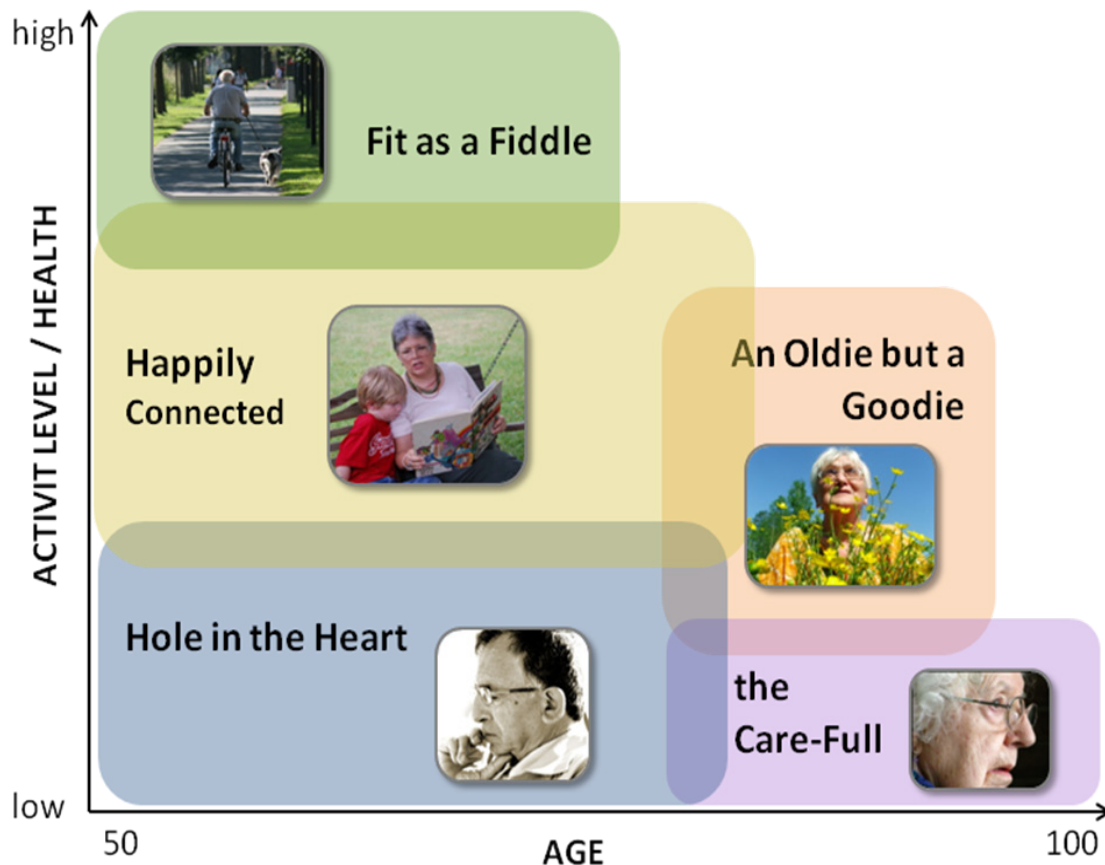


Figure 5-1: age and activity level of the profiles of older people

The profiles cover the whole range of age of older people included in the respective database (from 50 up to 100) and activity (from very high to very low activity). The first group *Fit as a Fiddle* can be described as the youngest and the most active group, while the group on the opposite side of the graph is called *the Care-Full*. In *the Care-Full* group are the frail, limited and immobile very old ones. The members of the group *an Oldie but a Goodie* are quite mobile and independent despite their old age, and the members of *Happily Connected* are still fit and active due to their high life satisfaction and their excellent social networks (spending time with grandchildren, being members of senior's clubs, doing volunteer work etc.). The last group is called *Hole in the Heart*, because members of this profile have severe mental (depression, no hopes for the future, loneliness) such as physical problems (cardiovascular disease, diabetes, fatigue, pain, etc.).

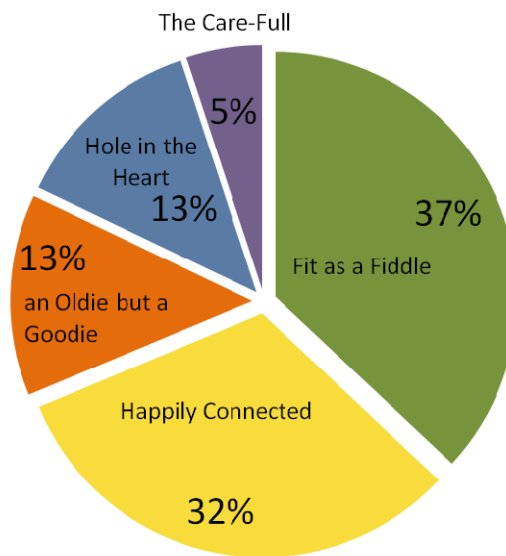


Figure 5-2: Size of the clusters within the SHARE database

Figure 5-2 shows the size of the clusters within the SHARE database. The largest shares are related to *Fit as a Fiddle* and *Happily Connected* (both more than one third of the participants of the survey), while only 5% belong to *The Care-Full*. The percentages do not necessarily represent actual shares in the European population (members of *the Care-Full* or the *Hole in the Heart* might be more reluctant or not able to respond to questionnaires and may therefore be underrepresented), but due to more than 55 000 datasets in the SHARE database the profiles provide sufficient information for a comprehensive insight into older people's different living situations and mobility-related characteristics.

5.1 Comparison of the Draft Profiles

The following Table 4-1 provides a comparison of the characteristics of each of the five draft profiles. For more detailed information concerning all profile-related features and the respective source of information (SHARE clustering features, SHARE added features, literature) see the extensive description of the draft profiles in the appendix (11.1).

The table shows a qualitative estimation of feature-related tendencies in the clusters in relation to the average older person and allows a general comparison of important factors determining the mobility of older people belonging to the profiles. The underlying information is based on both concrete data (giving detailed percentages of e.g. physical limitation within a profile from the descriptive analysis of the profile-related SHARE data) as well as qualitative assessments of related findings which can be linked to the SHARE features. Hence, the quality offered by the profiles lies not only in the amount of distinct information about specific health-related limitations and related results from large scale data analysis, but also in their comprehensiveness and the holistic picture they draw of older people's lives and realities.



		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
		Fit as a Fiddle	an Oldie but a Goodie	Hole in the Heart	The Care-Full	Happily Connected
Demographics	main age group	50-59	80-90	50-75	85-100	60-75
	gender	more male	more female	o	more female	o
	financial resources	+++	+	---	--	++
	still employed	+++	--	--	-	+
	household information	married or in partnership	single	O	single	married or in partnership
Health	general health	+++	+	--	---	++
	eyesight and hearing	+++	--	O	---	++
	limitation in activities	---	+	++	+++	-
	suffer from pain	---	-	++	+++	--
	Dementia / Alzheimer's	---	+	--	+++	--
	drugs needed	---	+	+++	+++	-
	aid needed	---	+++	O	+++	-
Transport	importance of driving	+++	---	+++	-	++
	importance of public transport	--	+++	--	-	+
	importance of walking	-	+++	O	+	++
	assistance needed	---	+	++	+++	--
	number and length of trips	+++	--	--	---	+
	purpose of trips	work, leisure, socializing	socializing, religious services shopping	medical facilities	medical facilities, religious services	recreation, sport, family, socializing
Environment	problems with infrastructure barriers	---	++	++	+++	-
	afraid of crime	---	+	++	++	-
Life Satisfaction	satisfaction and mental health	+++	++	---	---	+++
	social networks	++	++	-(family only)	--(family only)	+++
	activities	+++	+	--	---	++
	Technology usage	+	--	-	---	+

Figure 5-3: Draft Profiles comparison
 +++ above average; --- below average; o not clear

5.2 Review of the draft profiles with interviews in the Netherlands

As part of the work within this task TNO performed four interviews with different stakeholders in the Netherlands. The stakeholders interviewed were: Frank van Dam from the PBL Netherlands Environmental Assessment Agency (PBL); Mark van Hagen from the NS Dutch Railways; Peter Jorritsma⁵ from the Netherlands Institute for Transport Policy Analysis (KiM); and Jan Brinkers from the senior organization UniekBO.

The interviews were performed to assess how the draft profiles were aligned with the views of these stakeholders. Additionally these interviews gave insight in the policy implications of ageing society and mobility. In general all the respondents found that the draft profiles gave a good reflection of the older people in The Netherlands. Below are some specific findings from the interviews.

5.2.1 PBL Netherlands Environmental Assessment Agency

PBL Netherlands Environmental Assessment Agency (PBL) is the national institute for strategic policy analysis in the fields of environment, nature and spatial planning. We spoke with Dr. Frank van Dam who is program leader Housing Market and Living Environment. He is working a/o on a project regarding “Ageing Society and Migration”.

In general the decreasing mobility patterns of older people, also found within the GOAL research, are confirmed with the work done by the PBL. One of the main conclusions regarding spatial planning for older people is that retirement migration seems to decrease. This also has implications in developing mobility services for specific regions. For example in ageing regions in The Netherlands this would mean more transport services dedicated for older people. Additionally the traffic infrastructure should be modified to accommodate a growing segment of older people in specific regions.

5.2.2 NS Dutch Railways

The NS provides train services in The Netherlands with roughly one million passengers per day. We spoke with Dr. Mark van Hagen who is a senior project leader at the strategy and research department Market Research and Consultancy of the NS.

In general Mark confirmed the completeness of the draft profiles. He also mentioned that for older people the focus on life styles is becoming more important in making strategy and policy decision. Therefore he welcomed the work done in the project GOAL. With respect to the train services and train stations of the NS, Mark mentioned that they use weakest link approach in their designs, which therefore inhibits specific desires of older people such as signage or accessibility.

⁵ Peter Jorritsma also attended the first GOAL workshop at AIT in Vienna (AUT) on February 27 and 28, 2012

5.2.3 Netherlands Institute for Transport Policy Analysis (KiM)

The Netherlands Institute for Transport Policy Analysis (KiM) performs research and policy analyses in the area of mobility. With their studies the institute lays the basis for the mobility policy. We spoke with Peter Jorritsma who is a senior scientific researcher at the KiM. Peter authored the Dutch report 'Elderly on Travel' (In Dutch: Grijs op Reis) and coordinated the ENT14: Keep Moving project regarding mobility of older people.

The KiM is also involved in the GOAL project since it provided the database which is used for analysis of the mobility styles and patterns of the draft profiles in section 6. In general the draft profiles from GOAL were very recognizable. Peter also mentioned that the GOAL profiles could well be used in developing better target group policy (advice). Especially Peter was very interested in the results of the GOAL project regarding the development of scenario's and segmentation studies. This information would be very useful in providing policy advice regarding the ageing society and mobility.

5.2.4 UnieKBO

UnieKBO is the largest seniors' organization in the Netherlands and provides advocacy at various levels of the government as well as training and leisure activities for seniors. We spoke with Jan Brinkers who is a senior policy advisor working a/o on mobility issues for seniors.

With regards to the profiles Jan mentioned that seniors are always depicted as a happy, homogenous group. However older people are a rather heterogeneous group and he therefore welcomed the approach used for the draft GOAL profiles.

One specific remark on the Happily Connected group was that this group could be less healthy than depicted in the description. Within this group hidden Alzheimer could be present Mark mentioned. Also the driving ability of women seems to decrease in this group, making the women in this group more reliant on other people and transport services.

5.3 Workshop 1: Discussion of the Draft Profiles

The Workshop 1 took place in Vienna at the Austrian Institute of Technology on the 27th and 28th of February 2012. Details concerning the agenda and a list of participants can be found in the appendix ().

The main objectives of the Workshop 1 were the presentation and discussion as well as the definition of next steps concerning the further elaboration of the draft profiles of older people. Together with stakeholders (e.g. representatives of the target groups), experts and project members, aspects concerning the plausibility of the profiles, remaining knowledge gaps and potential future trends of the draft profiles were discussed. With focus on the following work packages (driving, walking and cycling, public transport and information & guidance) important input and suggestions for the further elaboration of the profiles was collected.

In the workshop the main knowledge gaps were identified. More information about living conditions and social networks, mental characteristics and mental limitations, residential area, mobility behaviour, technology usage and information as well as the transition points needed. The findings from the workshops were used as the basis for conducting two small surveys.

5.3.1 Group Discussion 1 – Plausibility, Gaps and Future Trends of the Profiles

In the first group discussion the plausibility, knowledge gaps and future trends of the five profiles were discussed. To achieve structured results four groups were built, where each group had a specific focus (socio-demographics, physical characteristics, mental characteristics and regional differences). In the following the main content of the discussions among the respective groups members are summarised.

5.3.1.1 Socio-Demographics

Plausibility

Do the profiles represent realistic segments of older people? Is there a specific and important type that is missing?

According to the socio-demographic characteristics the profiles were considered as plausible. There was a discussion about the starting age: on the one hand the starting age of 50 years may be too young, because this group has very similar characteristics (employment, travel behaviour, etc.) to the average population. But on the other hand for this group prevention, information, education and training (staying mentally and physically fit, usage of new technologies, alternatives to driving, etc.) become very important.

During the discussion it was proposed to change the label of one of the groups: Cluster 5, which has initially been called *Happy Together* was re-named to **Happily Connected** as it also includes older people living happily connected to others but alone in a single household (without partner or family). Those people have a very good network of friends and neighbours and are very active in organisations, volunteering, etc.

Additions / Knowledge Gaps

Which aspects are missing; is there additional literature? Which issues should be particularly considered in the further development of the profiles?

The largest knowledge gaps concerning the socio-demographic characteristics are the living conditions. The profiles contain only little information about how people live. There are big differences between living alone, with a partner, with a family, in a well connected neighbourhood, in senior's residents or in a nursing home. Support and care depends a lot on the living conditions. Another very important fact combined with the living conditions is the number of connections: having friends, family and being active improves quality of life such as the health status.

Future Trends

How will the profiles change in the future? Which profiles may possibly change /merge /vanish / emerge?

There will be a shift to higher age, because people will work longer and get older, etc. This means that age gets less important while the importance of health increases. It is also expected that the group of *The Care-Full* will grow, because the older the population gets, the more the number of sick and immobile people will increase. This means that more specific services (support or nursing care for older people, more specific and special transport services, etc.) will be needed.

5.3.1.2 Physical characteristics

General remarks

Do the profiles represent realistic segments of older people? Is there a specific and important type that is missing?

Looking at the profiles, there are two possibilities of reaching very old age. On the one hand, there is the “desirable” way, where the person starts as *Fit as a Fiddle* and is getting older through the stages of *Happy Together* and *An Oldie but a Goodie*. On the other hand there is the “undesirable” way, where people get problems early and belong to the *Hole in the Heart* group and may be reaching *the Care-Full* group after. To prevent this way, fitness, information campaigns and education and training are very important and should start at younger ages, at least if people reach the *Fit as a Fiddle* group.

Future Trends

How will the profiles change in the future? Which profiles may possibly change /merge /vanish / emerge?

In future the size of all groups will change. Especially the group of *the Care-Full* will grow. There are also increasing disparities in physical and mental health expected, especially between the groups *An Oldie but a Goodie* and *Hole in the Heart*. In general better strategies and policies are needed, especial to improve the health, fitness and possibilities to make sport for older people. Therefore, the raising of awareness for the ageing society is necessary for policy makers as well as for older people.

5.3.1.3 Mental characteristics

General Remarks

Do the profiles represent realistic segments of older people? Is there a specific and important type that is missing?

For older people it is important that their brain stays fit through stimulation by new information and input. If people are not mobile anymore the input decreases and the risk of cognitive decline increases due insufficient stimulation.

Additions / Knowledge Gaps:

Which aspects are missing; is there additional literature? Which issues should be particularly considered in the further development of the profiles?

Mental characteristics and cognitive skills are not covered well in the SHARE-Database. The variables dementia and Alzheimer’s reflects severe mental health decline, but there are

many other limitations affecting people. The following list of mental characteristics should also be included in the further elaboration of the profiles:

- Memory
- Attention
- Complexity of information
- Speed of information processing and decision making
- Reduced Situational Awareness
- Fatigue (this one is covered by SHARE)
- Ability to learn
- Confidence and trust

Future Trends

How will the profiles change in the future? Which profiles may possibly change /merge /vanish / emerge?

The future trend of working longer will be positive for cognitive health.

5.3.1.4 Regional / Spatial Differences

Plausibility

Do the profiles represent realistic segments of older people? Is there a specific and important type that is missing?

The *Care-Full* group should be divided into two sub-groups. One subgroup with severe mental and physical limitations and the other with reduced mental abilities. The first group, which can't leave the home alone, was considered as not useful for the analysis of mobility behaviours. The other subgroup with reduced mental abilities may benefit from ITS.

Additions / Knowledge Gaps

Which aspects are missing; is there additional literature? Which issues should be particularly considered in the further development of the profiles?

The residential area is missing in the profiles, but it plays an important role, especially for transport and the analysis of mobility behaviour.

There is also a demand for a group covering different family structures and attitudes (e.g. social changes from immigration, etc.)

Future Trends

How will the profiles change in the future? Which profiles may possibly change /merge /vanish / emerge?

In future the economic conditions will be very different for the elderly. For most of them the financial abilities will be better than it was in the past, which gives them the possibility to move to other and more suitable locations (e.g. from the suburbs to the city because of better alternatives to the private car, better health care, etc.).

On the other hand reductions in infrastructure especially concerning facilities in public transport, security, rest rooms, etc will have a negative impact on the opportunities of older people.

5.3.2 Group Discussion 2 – Further elaboration of the profiles

In the second round of group discussions main findings in relation to older people and the further work packages (driving, public transport, walking & cycling, information and guidance) were discussed. Missing information regarding older people and driving / public transport / walking & cycling and information & guidance was identified especially for the conception of the planned survey contributing to the further elaboration of the profiles. Furthermore, the technological progress and its influence on the mobility of the people in the profiles were discussed.

5.3.2.1 Driving

Main findings

What are the most important findings in relation to older people and driving? How can these findings be related to the profiles? Is there particular information about mobility styles and patterns?

As drivers become older, they may start feeling unsafe in certain traffic situations. Compensation appears, i.e. avoiding driving at certain hours (e.g. rush hour), at night or in bad weather conditions.

As for fitness to drive, it was discussed how this issue could be communicated to an older person, i.e. that he/she may not be able to drive anymore. It is a very delicate issue and attention needs to be paid on the transition from driving to using other transport options. For instance, the *Hole in the Heart* profile is very relevant for the issue of fitness to drive since they are suffering from diseases and limitations that would not allow them to keep on driving safely but at the same time they are very dependent on driving. Monitoring driver health status during driving could be used to ensure a safe driving and possibly to support decisions on fitness to drive. The question of responsibility is very relevant, when an elderly driver needs to stop driving because he/she is not able to drive anymore.

Since currently many elderly drivers are not familiar with new technologies, specific training on how to use those is strongly suggested. This way, users' acceptance and reliability on the systems could be improved and real benefits from using such systems could be achieved. (Education & Training and Awareness)

The whole cockpit should be adapted to elderly people's needs, both physically and cognitively. For them, certain functions may be totally unknown (activation procedure, icons meaning, etc.) and also physical accessibility could be compromised. Also the change of focus becomes problematic in terms of visual capacities and this should also be considered.

Missing information

Regarding older people and driving, which information is missing and should be included in the survey?

There was an agreement that younger people should be investigated, thus profiles should cover drivers of younger ages. This way, options such as training or other initiatives to stay active and able to drive could be taken into account.

Also, regional and spatial characteristics are interesting, i.e. the areas where elderly people live. The reason for this is that driving needs and mobility options are different depending on the area of living.

Information on travel purposes and other aspects related to travel (mobility patterns and styles), specifically covering driving, would be very useful.

Safety data would be interesting as well, i.e. the involvement in accidents in the past, which kind of accidents, in which circumstances, which injuries, etc.

Impact of future progress

How will technological progress influence the mobility of the people in the profiles? Which one will benefit, which will not? What needs to be done to aid people of all profiles?

Automatic systems (such as cruise control), systems to safely cross an intersection or to safely change lanes seem to be the ones that elderly people would benefit more. However, training on how to use these systems is absolutely necessary. Safer cars are necessary but jointly with training efforts. Regarding training of new technologies, the concept of “learn by playing” appeared: in the same way that children learn how to become adults by playing, adults could learn how to become elderly by playing too.

Technological efforts may provide benefits to all users, not just to elderly drivers, e.g. an intersection support system could be useful to all drivers.

Infrastructure barriers are also to be avoided, mainly when thinking of elderly people as pedestrians.

Also, a positive view of the ageing process needs to be promoted. The message underlying these efforts and strategies needs to be positive and based on facilitating their lives and improving their quality of living. A comparison was made with Apple (e.g. iPhone) and how the ideal car could be conceived and presented to elderly drivers.

Information and guidance

It was highlighted that information on weather, traffic and route could be very helpful for elderly drivers so that they can adapt their driving to these circumstances and safely reach their destinations.

5.3.2.2 Public Transport

Main findings

What are the most important findings in relation to older people and public transport? How can these findings be related to the profiles? Is there particular information about mobility styles and patterns?

Behaviour and attitudes towards public transport use have to change. Instead of the private car the public transport has to become more attractive. From public transport there is also a strong link to walking. Barrier-free and handicapped accessible infrastructure is needed in public spaces and in the mobility system.

Other important topics are actual and perceived safety and security. Older people have to feel safe using public transport. The equipment of the vehicles and the public transport stations is very important (barrier-free, nice and friendly and well-lit surroundings, resting possibilities like benches, public toilets, etc.).

Furthermore, the transition process from car to public transport has to be understood. It is very important to know on which point people stop driving the own cars. For some profiles this process may be easier, but members of the *Hole in the Heart* group often cannot cope with this situation. It is important to motivate people in younger age to be flexible and to use other modes than driving, so they get used to the public transport system.

Missing information

Regarding older people walking and cycling, which information is missing and should be included in the survey?

Information about the transformation process from the private car to public transport is missing (when?, why?).

Additionally, the role and usage of technologies such as the access to information regarding the profiles has to be investigated. Information about training, learning and behaviour in difficult situations within the public transport system (delays, cancelled trains and busses, complex trip chaining, etc.) has to be taken into account.

Impact of future progress

How will technological progress influence the mobility of the people in the profiles? Which one will benefit, which will not? What needs to be done to aid people of all profiles?

In future new transport services for the frail elderly will needed (special taxis, individual mobility services, etc.)

Caused by financial issues there is a reduction of public transport, which leads to severe problems for people relying on public transport e.g. *an Oldie but a Goodie* group. How can people cope, if there is no public transport system? This is even more problematic for people with little income?

It has also to be investigated if the new technologies and the vehicle design make driving for older people really safer or if it is only a marketing trick of the automobile industry.

Information and Guidance

For guidance and information databases for elderly travellers, which provide transport and trip chaining information are necessary. This database needs easy access and the design has to be adapted to the needs of the elderly users. Besides the advantages for the users the database also provides information about the travel behaviour of older people for the public transport providers.

5.3.2.3 Walking and Cycling

Main Findings

What are the most important findings in relation to older people walking and cycling? How can these findings be related to the profiles? Is there particular information about mobility styles and patterns?

Walking

Walking is the human core competence for all activities and for staying mobile, fit and autonomous. Therefore, it is important to strengthen this competence and to provide information and special offers for older people, like e.g. Nordic walking courses, organized walks, walking campaigns, physical or ergo-therapy and etc. Especially the group *an Oldie but a Goodie* is interested in offers like gymnastic, dancing, etc and in this group are also many self-organised walking groups. This also has positive social aspects (going out and being active with friends). Furthermore, it is necessary to give walking a positive image and to change the behaviour and the attitude towards walking, to encourage older people walk more and stay active.

- The quality of the waling environment is one of the key factors which make people walk. For a nice walking environment the following preconditions have to be realised:
- Barrier-free and handicap accessible environment (especially to reach public transport, shops, restaurants,...)
- Nice and pedestrian public spaces and streets (green, little traffic, shops,...)
- Resting places (park benches)
- Public toilets
- Good footpath networks (also in rural areas)
- Longer green light periods
- Measures to improve road safety (speed limits, pedestrian crossings, broad sidewalks,...)
- Crime prevention and security (lightening, etc.)

For people with physical impairments (*Hole in the Heart, the Care-Full*) mobility aids like mobility scooters are available. To make their usage possible, barrier-free environment and especially broad sidewalks, barrier-free shops, handicapped accessible public transport have to be established. Since some of these mobility scooters are driving on footpaths (they can reach speed up to 20 km/h) safety matters and insurance for the users and for other people have to be discussed.

Cycling

There is a big difference between walking and cycling. While walking is a human core competence, not all groups can use bikes. The highest rates of bike usage are expected in the *Fit as a Fiddle* and the *Happy Together* groups.

There are different reasons for cycling. On the one hand cycling is a sport and people do it for recreation and to stay fit, but on the other hand it is also a mode of transport for daily trips (going to work, shopping, visiting friends, etc.).

There is a different image of cycling in different countries. While cycling in the Netherlands for example is a way of life and the cycling infrastructure is very good, in other countries many people are not used to cycling. This may have different reasons: missing bike lanes and cycling infrastructure, mountainous areas, never learned how to ride a bike, etc. Older people who had never been cycling before are not likely to start with higher ages.

A very important issue which older people hinder cycling is safety. Especially in cities an excellent and safe cycling infrastructure is needed to make older people cycle. Besides safe bike lanes, crossings, etc. information (where are bike lanes, are there hills, how long will it take to get somewhere,...) is very important. In general the bike usage is higher in rural areas, because there is less traffic, the distances are longer (walking takes too much time), the public transport is worse. In rural area the bike is also use more often for non-sport trips.

Missing information

Regarding older people walking and cycling, which information is missing and should be included in the survey?

Information about the modal split of the different groups is missing. It is also not clear for which purpose older people use bikes. Because of image, landscape and cycling infrastructure the number of bike users varies in the different regions and the different countries. There is also missing information about the barriers which hinder older people from using bikes. There is also serious concern about the relatively high (one-sided) accident rate among older bikers. It is not exactly known why this happens. In the Netherlands a research programme is undertaken to investigate this and what can be done about it.

Impact of future progress

How will technological progress influence the mobility of the people in the profiles? Which one will benefit, which will not? What needs to be done to aid people of all profiles?

In future the mobility system will get more complex, thinking about multimodal transport etc. Therefore, an information system designed for the needs of older people is necessary.

Sensors, ambient assistant living tools and inventions like air-bags for people at high risk of falling down may improve walking possibilities for fail elderly.

In the field of biking E-bikes, Tricycles and assistive bikes may make biking more interesting for older people. E-biking is getting popular among members of the *Fit as a Fiddle* and *Happy Together/Happily Connected* groups, particularly for recreation. Tricycles such assistive bike systems may improve the mobility and fitness of the groups *Hole in the Heart* and *an Oldie but a Goodie*.

Information and Guidance

For walking and particularly cycling information about foot paths or the bike lanes is very important. Many older people do not leave their houses if they cannot be sure if the foot paths are safe in winter (ice and snow on the paths). For the cyclists the bike lanes are very important for actual and perceived safety. Many older cyclists avoid cycling in unknown areas due to lack of guidance and information (are there bike lanes, slopes, safe crossings,...?). Therefore, better information and navigation systems using real-time information are needed. On the other hand it was also mentioned that using maps is training for the brains and the cognitive system of elderly. A better information system, like auto tracking systems, is required for blind or visually impaired people.

6 Mobility Styles and Patterns

6.1 The Identification of Significant Mobility Styles and Patterns and their Influence Factors

As the draft profiles do not yet include results concerning specific mobility behaviour patterns within the profiles, additional data sources and relevant findings from related studies have been regarded. Influence factors on the mobility behaviour of older people are shown in the following Table 6-1. The selection is mainly based on the result of the literature review (Chapter 2).

	Influenced by ...	Note
Demographic characteristics		
Age		
Gender		
Household		Marriage, living alone (today especially widowed females) EU: every third pensioner is living alone
Living environment		“With increasing age more persons are willing to move out of the city into the greener suburbs.” “The portion of older persons in German suburban regions is about 20%.”
Income		
Education		
Mobility Options		
owning a driver’s license	Gender, age	More males, but it is becoming equal
Owning a Car	Gender, income, household, fitness/health	Freedom, Independence, self-reliance „Widowed female elderly living in suburban regions never or only very seldom drive a car (little to no driving experience)” “With increasing age the „portion of households with vehicles which were bought as new cars increases”
Public transport	Gender, living environment, owning a car, income, fitness/health	Females are more depended from public transport because they own less often a car. Bad connection of public transport in suburban regions, physical mobility is necessary „Public transport is most commonly used by the oldest (over 75 years) age groups and by women.”
Bicycle	Fitness/health, living environment	High physical mobility is necessary “Land-use provisions and proper facilities can make cycling a feasible transport mode for older people in some countries (it currently is in such countries as Denmark and the Netherlands).”
By Feet	Fitness/health, living environment	physical mobility is necessary EU: 30-50% of older peoples trips are made walking

Attitudes		
Fitness/health	Age	Changes due to the age are inescapable. EU: home trainer for fitness (avoid fitness center, club)
Motive	Income, living environment	Shopping, visits and leisure, culture, sport
Stress factor	Fitness/health, living environment	“At night, during rush hours and when the weather is inconvenient. They avoid unknown streets, highways and turns across traffic.”
Types of travelling	Income, fitness/health	full accessibility, travel experience, city trips, hiking and health orientation Holiday in 2009 (Germany): 40% in Germany, 55% to foreign countries
Use of Internet	(age, education, income)	The use of the Internet is increasing Travel planning, tickets, information (health), communication (E-Mail), shopping (medicament)
Distance per day	Owning a driver's license, income, gender, fitness/health, motive, living environment, owning a car	„Elderly with a low income or without a driving license are more likely to stay home and have shorter travel distances.” On average males cover a larger distance, because of the better access to an own car.

Table 6-1: Influence factors on the mobility behavior of older people.

6.1.1 Database “MiD” (Germany)

In 2002 and 2008 50 000 households were questioned within the nationwide study “Mobility in Germany” (Mobilität in Deutschland - MiD) with regard to their mobility behaviour. The data collection was made on behalf of the federal ministry of traffic, construction and street development (Bundesministeriums für Verkehr, Bau- und Straßenentwicklung –BMVBS). “The central aim of this study was to collect representative and reliable information on socio-demography of persons and households as well as their everyday mobility (e.g. routes differentiated between aims and means of traffic) for an entire year” (MiD 2008).

The results of “MiD 2008” were published in August 2009. „In the nationwide basis data collection information of 25 922 households and 60 713 persons for 193 290 routes, 34 601 vehicles and 36 182 trips were registered. Thus it is possible to differentiate between federal states and regions. In addition to the basis sample, ten regional samples were realized to increase the number of interviews to 24 021 households” (Follmer, et al. 2010, p.1).

6.1.1.1 Description of database and work

Data of MiD (2008) allow various ways of analysis:

- Individual mobility behaviour: the detailed description of person characteristics allows analyses of certain groups of persons. The additional description of characteristics of routes, households, vehicles and environment enables a differentiated consideration of mobility.

- Mobility and households: here mobility behaviour can be analysed in relation to certain individual household characteristics.
- Mobility behaviour distinguished by the structure of urban development. This context was developed by Federal Department of Construction and Spatial Development (Bundesamt für Bauwesen und Raumordnung – BBR)
- Behaviour with regard to travel and economy: the due date data collection allows an analysis of daily mobility needs.
- User segmentation and target groups: statements of individual frequencies of use of different means of transportation.
- Mobility and environment: implementation of several variables to calculate CO2 emissions in traffic.
- Chains of routes: the collection allows considering certain routes and returning ways with certain stop-overs.
- Modelling of traffic: A number of variables offer a basis to create different traffic models.

6.1.1.2 Relevant results

For data analysis of MiD (2008) corresponding statements from literature can be presented. The most important results concern the distribution of usage of modes of transportation for specific age groups (Figure 6-1).

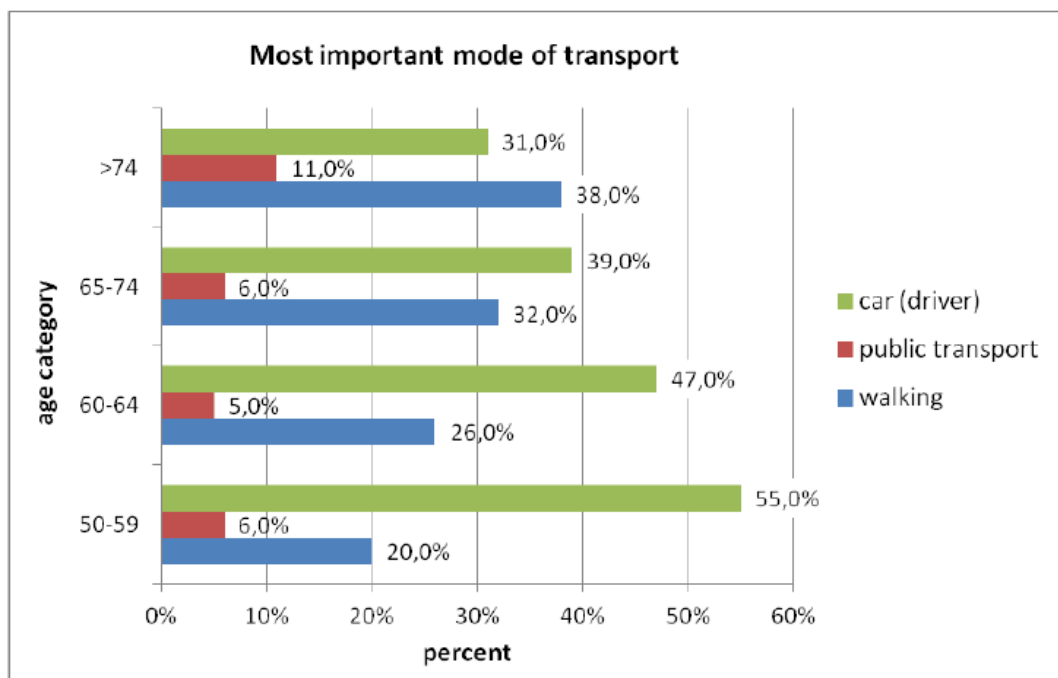


Figure 6-1: Most important mode of transport (MiD 2008, Germany)

The next graph (Figure 6-2) illustrates the exact point at which the change from predominant vehicle usage to walking occurs. At this point also a change from using the bike to using

regional public transport takes place. The mobility of being a passenger in a car remains the same for considered age groups.

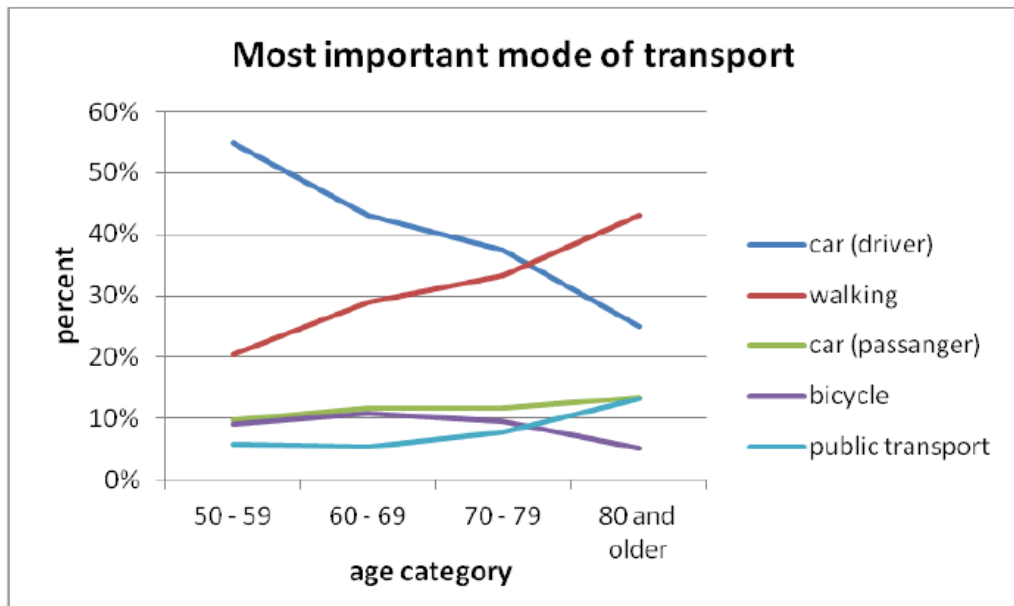


Figure 6-2: The Change of most important mode of transport (MiD 2008)

Also the direct comparison of mode of transportation usage of the age groups 50-59 and the group of those aged 75 or older corresponds to statements from literature. As presented in the following graphs (Figure 6-3; Figure 6-4), car usage decreases with increasing age. However, the frequency of using a bike remains the same. The frequency of using public transportation stays the same on a low level.

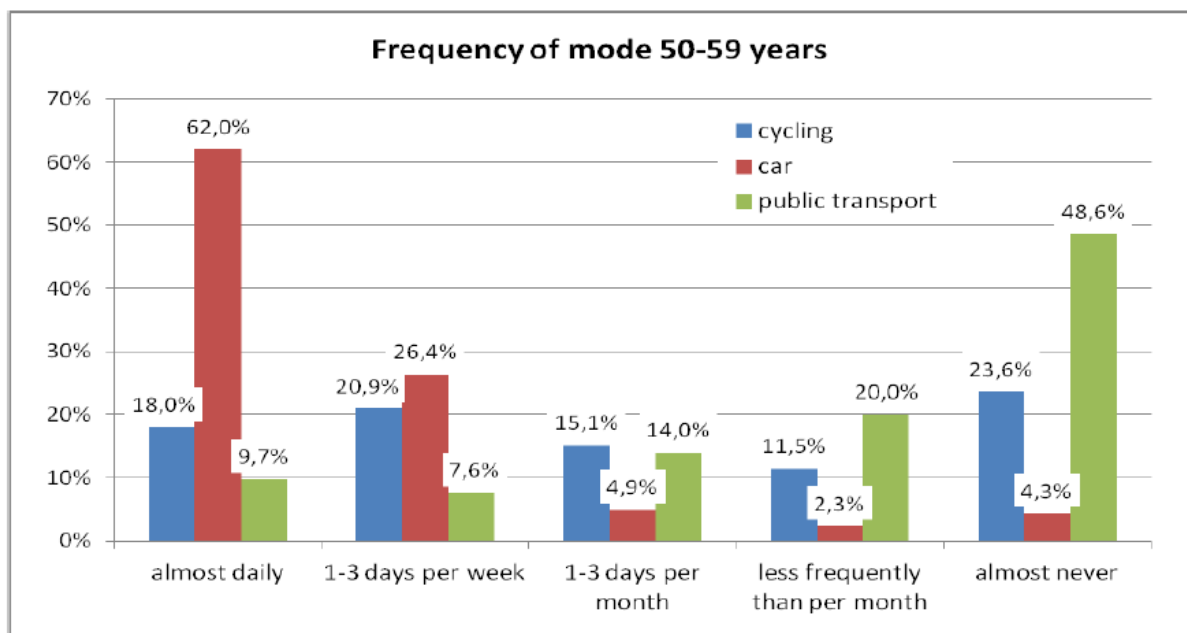


Figure 6-3: Frequency of mode for persons 50-59 years old (MiD 2008)

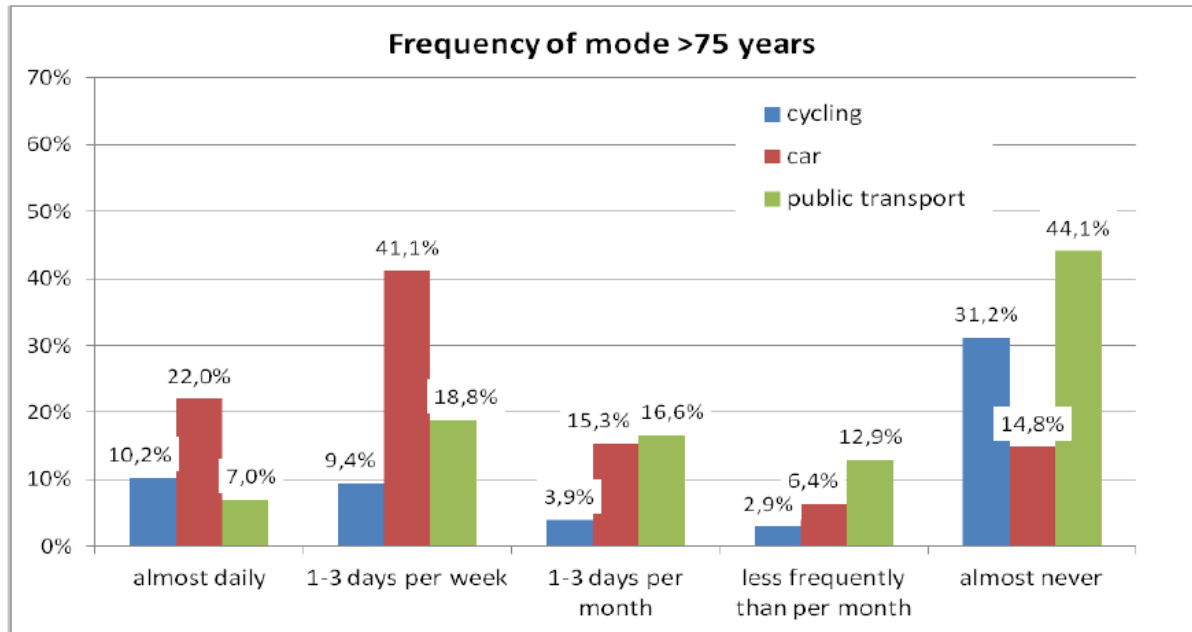


Figure 6-4: Frequency of mode for persons 75 years and older (MiD 2008)

6.1.2 Database “ISTAT” (Italy)

6.1.2.1 Description of Database and work

The Italian National Institute for Statistics (ISTAT) released a report depicting the Italians’ life style and habits. The study performed involved 41 000 persons directly interviewed, who were asked to describe daily activities. The results collected in the public report were split in three categories: students (age 15 - 25 years old), employed (age 25 – 60 years old) and finally retired (age more than 60 years old). The annual report refers to the Italian situation for the years 2008 – 2009 and it makes some comparison with the Italian situation within the years 1988 – 1989 (ISTAT 2011).

6.1.2.2 Relevant results

Figure 6-5 shows how the activity distribution changes in a day for the three categories considered. Elderly people have a greater portion of the day available for the spare time and for all the activities aiming to the person health and living (sleeping, eating, taking care of themselves and so forth) gathered under the name of “physiological time”. Moreover, comparing the data gathered in Figure 2-4, it shows that elderly people spend less time for travelling in comparison to the other two categories.

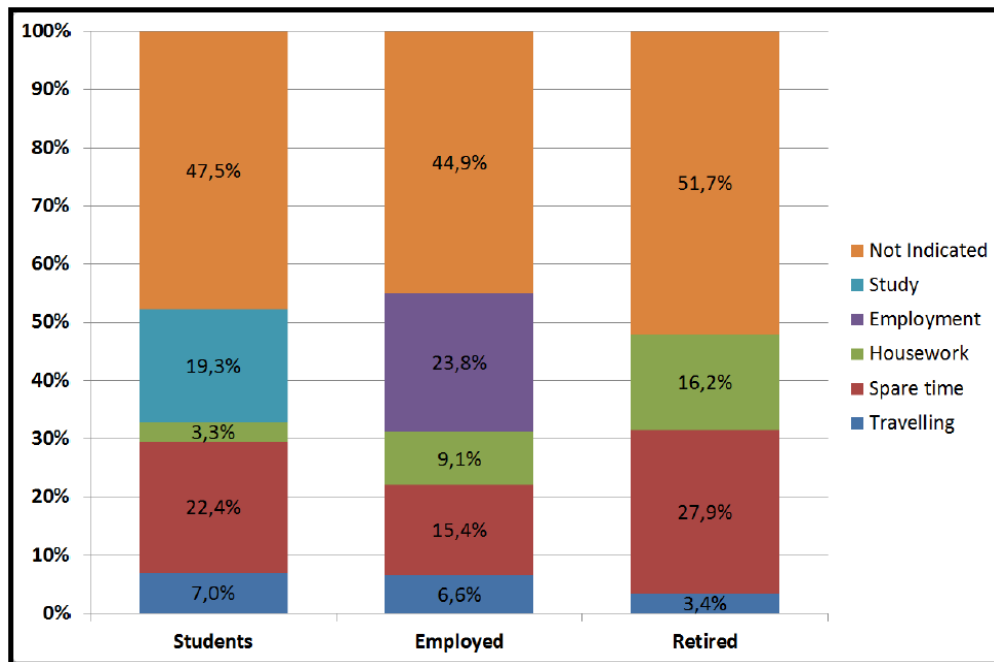


Figure 6-5: Activities percentage composition of a mean day of the week (2008-2009)

Additional considerations can be made comparing the activity distribution within a mean day of a week for elderly people in the years 1988-1989 and 2008-2009.

ISTAT database describes Italian lifestyle and habits using three parameters:

- generic mean duration (M.g.), which considers the average time taken to perform the listed activities by the observed population, considering both the persons who performed the activity and the persons who did not;
- frequency of participation, which indicates the percentage of the population who perform within the generic mean day a specific activity
- specific mean duration (M.s.), which indicates the average time needed to perform a specific activity taking into consideration only the portion of population who performed that activity.

Table 6-2 collects the information concerning retired population and the data split by gender for the years 1988-1989, 2002-2003 and 2008-2009. The values of *generic mean duration* (M.g.) and *specific mean duration* (M.s.) are indicated in hours.

Retired population									
	Female			Male			Total		
	1988-1989	2002-2003	2008-2009	1988-1989	2002-2003	2008-2009	1988-1989	2002-2003	2008-2009
Physiological Time									
M.g.	12.54	12.27	12.20	13.26	12.40	12.31	13.08	12.32	12.25

%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
M.s.	12.54	12.27	12.20	13.26	12.40	12.31	13.08	12.32	12.25
Education and Training									
M.g.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.3	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0
M.s.	0.41	1.02	-	2.15	1.52	-	0.52	1.32	-
Work									
M.g.	0.06	0.04	0.04	0.41	0.25	0.21	0.20	0.12	0.11
%	2.3	1.1	1.0	12.3	6.3	5.1	6.4	3.2	2.7
M.s.	4.24	5.26	6.05	5.29	6.35	6.46	5.15	6.22	6.37
Housework									
M.g.	5.13	4.45	4.52	2.14	2.23	2.32	3.59	3.46	3.53
%	94.7	91.6	92.4	80.1	82.6	84.1	88.7	87.8	88.9
M.s.	5.30	5.11	5.16	2.47	2.53	3.01	4.30	4.17	4.22
Spare Time									
M.g.	5.26	6.05	6.06	6.54	7.27	7.31	6.02	6.39	6.42
%	99.4	99.4	99.2	99.0	99.5	99.6	99.2	99.5	99.4
M.s.	5.28	6.07	6.09	6.58	7.29	7.33	6.05	6.41	6.45
Travelling									
M.g.	0.20	0.39	0.38	0.44	1.03	1.04	0.30	0.49	0.49
%	43.3	66.2	67.5	65.4	83.3	81.5	52.4	73.3	73.4
M.s.	0.47	0.58	0.56	1.07	1.16	1.18	0.57	1.07	1.07
Not Indicated									
M.g.	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01
%	1.6	2.2	2.3	1.7	3.6	2.5	1.6	2.8	2.3
M.s.	0.45	0.55	0.45	0.43	0.59	0.46	0.44	0.57	0.45

6-2: Activities distribution within a mean day of a week for elderly people in the years 1988-1989, 2000-2003 and 2008-2009.

Comparing the results of the interviews 2008-2009 and 1988-1989, the retired population spend less time for “physiological time”, namely the time reserved to sleep, to eat and for the personal care, i.e. 43 minutes less. Moreover the percentage of persons within the retiring age who still work decreased: 6.4% in 1988-1989 against 2.7% in 2008-2009, leading to a reduction of the time spent for working in the general average day, 20 minutes in 1988-1989 vs. 11 minutes in 2008-2009. On the other hand the time saved with the aforementioned activities was distributed on spare time and travelling. The interviewed population within the retiring age in 2008-2009 use 49 minutes within the mean day for travelling, 19 minutes more than the same population in the years 1988-1989. Moreover the time spent as spare time increased considerably: 40 minutes more than in the years 1988-1989.



Comparing the data from females and males shows that the reduction of time addressed for physiological needs is higher for men than for women, respectively 55 minutes and 34 minutes less than 1988-1989. At the same time a higher reduction of the working time is registered for men: 20 minutes less than 1988-1989 against 2 minutes less for women.

Additional information comes from the comparison of the time spent by women and by men for housework. In addition to a reduction of the time addressed for housework, there is a reduction of the percentage of women in the retiring age who perform this activity: 94.7% of the interviewed women did housework, occupying 5 hours and 13 minutes of the mean day in the 1988-1989, while in 2008-2009 92.4% of the interviewed women did housework, spending 4 hours and 52 minutes of the mean day. On the other hand the percentage of men who perform housework increased in 2008-2009, 84.1% against 80.1% in 1988-1989, and the mean time spent for this activity within the mean day of the week raised from 2 hours and 14 minutes in 1988-1989 to 2 hours and 32 minutes in 2008-2009.

Finally, concerning the time spent by the interviewed population in the retiring age, both the percentage of the population and the time spent within the generic mean day of the week increased.

The percentage of women travelling on an average day rose from 43.3% in 1988-1989 to 67.5% in 2008-2009 and respectively the time spent for this activity increased from 20 minutes to 38 minutes. In the same way, the percentage of men travelling on an average day changed from 65.4% in 1988-1989 to 81.5% in 2008-2009 and the time spent within the generic mean day of the week respectively raised from 44 minutes to 1 hour and 4 minutes.

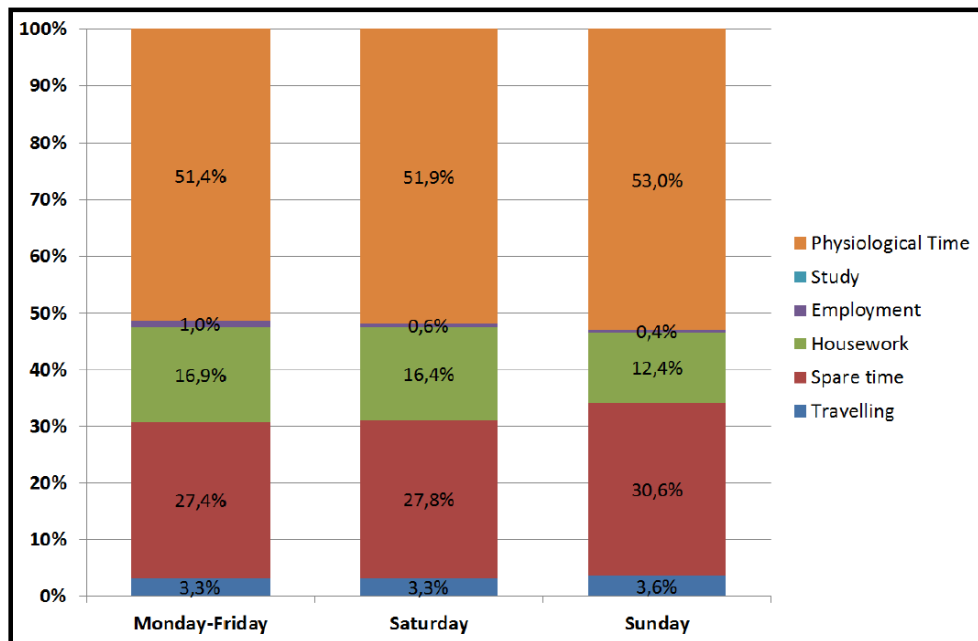


Figure 6-6: Activities percentage composition of an average week (2008-2009)

Analysing the data by day shows that the distribution of the activities for the population in the retiring age does not have significant variations (Figure 6-6), while during Sundays the

retiring age population reduces the time spent for housework and they slightly increase the time addressed for physiological time, spare time and travelling.

Finally ISTAT completed the analysis of the data gathered investigating the activities performed by the interviewed population within the spare time. Table 6-3 gathers the information on the activities that the interviewed population (retiring age) use to perform on their spare time.

Retired population									
	Female			Male			Total		
	1988-1989	2002-2003	2008-2009	1988-1989	2002-2003	2008-2009	1988-1989	2002-2003	2008-2009
Television									
M.g.	2.20	2.24	2.28	2.47	2.52	3.05	2.31	2.35	2.44
%	86	86.8	88.8	92.4	91.3	93.2	88.6	88.7	90.7
M.s.	2.42	2.46	2.47	3.01	3.08	3.18	2.50	2.55	3.01
Social relations									
M.g.	0.58	0.55	0.56	1.01	1.03	1.04	0.59	0.59	0.59
%	56.8	58.6	58.9	50.7	59.3	61.6	54.3	58.9	60.1
M.s.	1.43	1.34	1.34	2.00	1.47	1.43	1.49	1.40	1.38
Rest									
M.g.	0.29	1.01	1.04	0.30	1.01	1.01	0.29	1.01	1.03
%	29.3	56.8	60.4	29.7	56.7	57.4	29.5	56.8	59.2
M.s.	1.39	1.47	1.46	1.41	1.47	1.46	1.40	1.47	1.46
Outdoors activities									
M.g.	0.18	0.19	0.22	1.08	0.56	0.51	0.39	0.34	0.35
%	20.1	21.5	24.9	50.2	44.6	44.6	32.5	31.1	33.3
M.s.	1.30	1.27	1.30	2.16	2.05	1.55	1.59	1.50	1.44
Hobbies									
M.g.	0.35	0.25	0.22	0.22	0.27	0.23	0.30	0.26	0.22
%	26.2	23.7	22.1	16.7	23.5	22.8	22.3	23.6	22.4
M.s.	2.15	1.45	1.39	2.13	1.57	1.41	2.15	1.50	1.40
Internet									
M.g.	-	0.00	0.00	-	0.02	0.04	-	0.01	0.02
%	-	0.4	0.4	-	1.9	3.2	-	1.00	1.50
M.s.	-	2.01	1.00	-	1.41	1.51	-	1.45	1.44
Reading									
M.g.	0.20	0.21	0.19	0.44	0.38	0.38	0.30	0.28	0.27
%	26.6	27.7	27.4	49.5	44.1	44.2	36	34.5	34.5
M.s.	1.16	1.16	1.10	1.28	1.25	1.26	1.23	1.21	1.19
Charity work									
M.g.	0.03	0.16	0.13	0.06	0.13	0.13	0.04	0.15	0.13
%	2.8	12.9	11.1	2.6	11.4	9.7	2.7	12.3	10.5
M.s.	1.49	2.02	2.00	3.38	1.59	2.13	2.31	2.01	2.05
Social involvement									
M.g.	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00
%	0.4	0.2	0.3	0.6	0.7	0.3	0.5	0.4	0.3
M.s.	2.30	0.58	0.57	2.46	1.50	1.06	2.38	1.38	1.02
Religious activities involvement									
M.g.	0.17	0.19	0.17	0.07	0.07	0.06	0.13	0.14	0.12
%	25.8	26.8	23.6	10.8	11.1	9.8	19.6	20.3	17.7
M.s.	1.05	1.09	1.10	1.01	1.00	1.02	1.04	1.07	1.08
Cultural activities									
M.g.	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
%	1.1	1.1	1.2	1.9	2.2	2.00	1.4	1.6	1.5
M.s.	2.00	2.06	1.56	2.06	1.53	1.37	2.03	1.58	1.46

Music and radio listening									
M.g.	0.03	0.04	0.03	0.07	0.04	0.04	0.05	0.04	0.03
%	5.5	7.1	5.4	11.4	8.1	5.8	7.9	7.6	5.6
M.s.	0.59	0.57	0.49	1.02	0.54	1.03	0.01	0.56	0.55

Table 6-3: Activities performed by the interviewed persons in retiring age during their spare time in the years 1988-1989, 2000-2003 and 2008-2009.

Comparing the habits of the sample in 1988-1989 and 2008-2009 shows that the higher variations detected concern the time spent for rest, raising from 29 minutes in the 1988-1989 up to 1 hour and 3 minutes in 2008-2009. The portion of spare time used to watch television is still high: 2 hours and 44 minutes in 2008-2009 against 2 hours and 31 minutes in 1988-1989. The time addressed for outdoor activities decreased from 39 minutes in 1988-1989 to 35 minutes in 2008-2009. Finally the data related to the use of computers and Internet reveal a still lacking usage of these technological means of information by the retiring-age population, in fact, in 1988-1989 data on the usage of these systems were not available and in 2008-2009 only 1.50% of the sample surfs internet and uses computers.

6.1.3 Database “Keep Moving” (Netherlands)

In this section further elaboration on the mobility styles and patterns of older people is described by an analysis of additional data-sources. In particular the database of the ENT14: Keep Moving project (Wallgren & Jorritsma 2007) was identified as additional data-source to provide background to the mobility preferences of older people.

6.1.3.1 Description of Database and Work

The data from the Keep Moving database was collected within the ENT14: Keep Moving project in three different countries: Austria, Sweden and The Netherlands. This database has been used in various different studies and publications (van Beek et al. 2010; van Beek et al. 2011, Factum 2010, Hof 2009). The questionnaire focuses especially on the effect of transition points on the mobility styles and preferences of older people. The two transition points identified were the transition to retirement and the transition to one-person household due to the loss of the partner. Insight in variables such as frequency of leaving home for an activity, most important travel mode and perceived opportunities and quality of transportation modes were gained.

The survey included the same set of questions for the three different countries. The survey was conducted in The Netherlands by web panel questionnaire (CASI, Computer Assisted Self Interview); in Sweden by e-mail questionnaire; and in Austria by a telephone assisted questionnaire (CATI: Computer Assisted Telephone Interview) (Factum 2010). The total sample consists of 5.716 respondents spread reasonably equal over the three countries. The age of the respondents ranged between 62 and 105 years at the time of the interview.



6.1.3.2 Relevant Results

With the analysis of the Keep Moving database several findings from the literature review are confirmed. For example the frequency of leaving home for an activity decreases when growing older (Figure 6-7). Due to decreased physical ability and social network older people tend to perform less activities than younger people. This is also confirmed within the Keep Moving database as shown in the figure below.

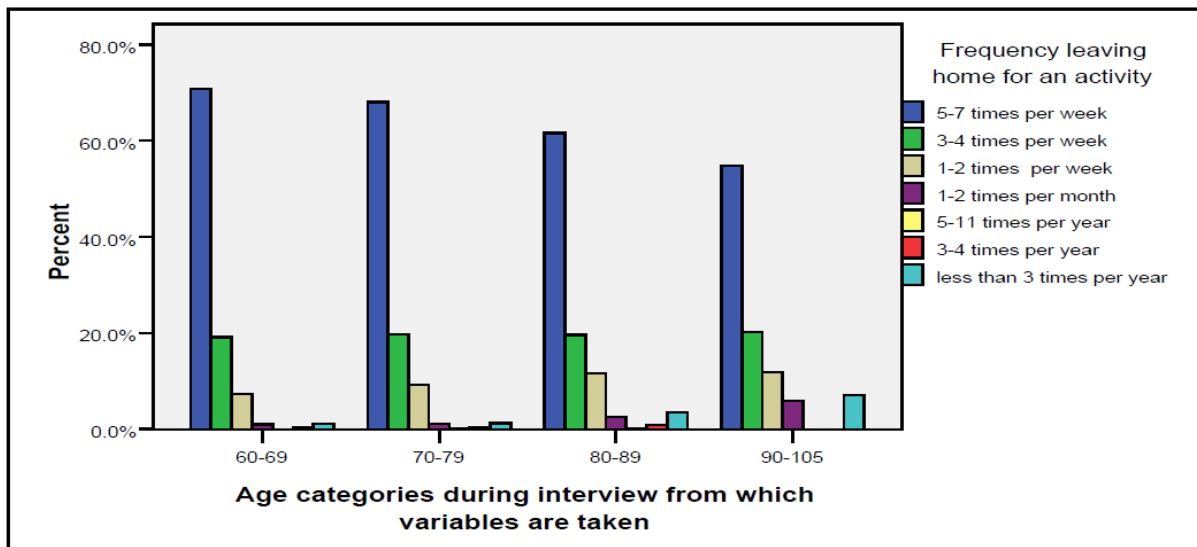


Figure 6-7: Frequency of leaving home for an activity (KiM 2008)

When looking at the most important travel mode (Figure 6-8), for all age categories the car is seen as the most important travel mode. When growing older, people tend to perceive walking as more important and cycling and car use as less important. Also the use of public transport and special transport services increases with age. These results are confirming the findings in the literature review in section 2.3.

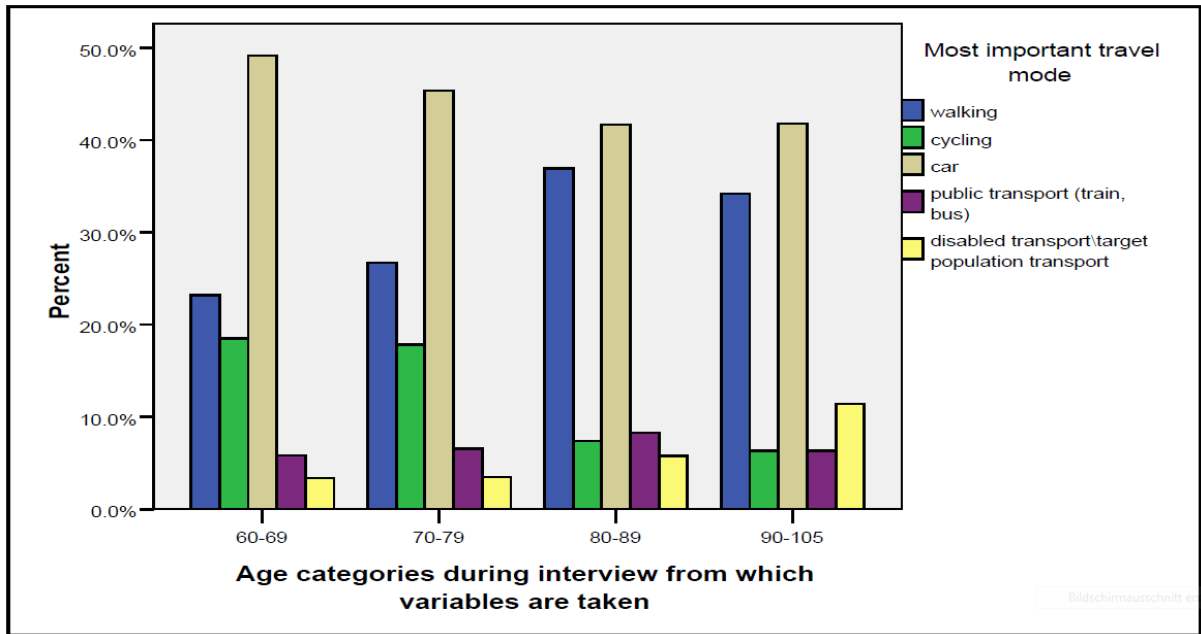


Figure 6-8: Most important travel mode (KiM 2008)

Since trip lengths of older people are significantly smaller (section 2.4) travel modes such as walking or cycling is preferred in most cases (Figure 6-9). When analyzing the trip frequencies per travel mode, walking is by far the most used travel option. Driving and being a passenger in a car is the second and third most used travel options.

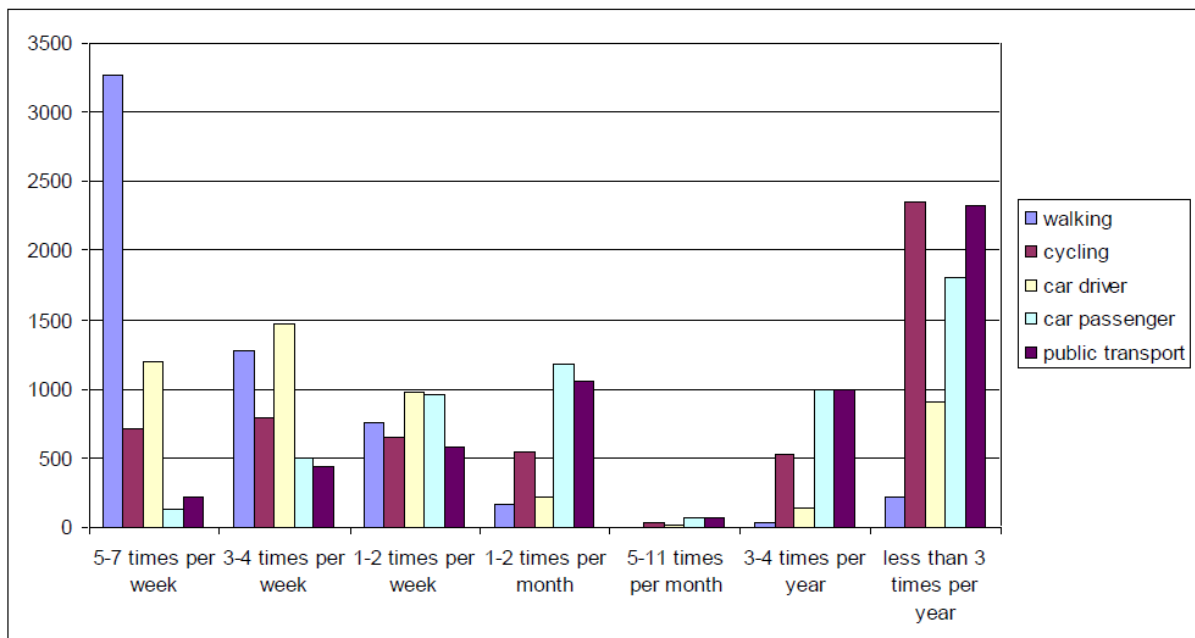


Figure 6-9: Trip frequencies per travel mode (KiM 2008)

The Keep Moving survey also focused on perceptions towards travel options. The graph below (Figure 6-10) shows an overview of the respondents' reactions to the question: "How do you value your transport option with each mode?" Overall the car as a driver is seen as

the best travel option followed by car passenger and walking. Cycling and public transport is seen as the worst travel option. Reasons for this are the physical disabilities emerging and older ages limiting active mobility options. The low evaluation of public transport can also be caused by poor services as found in the literature review in section 2.3).

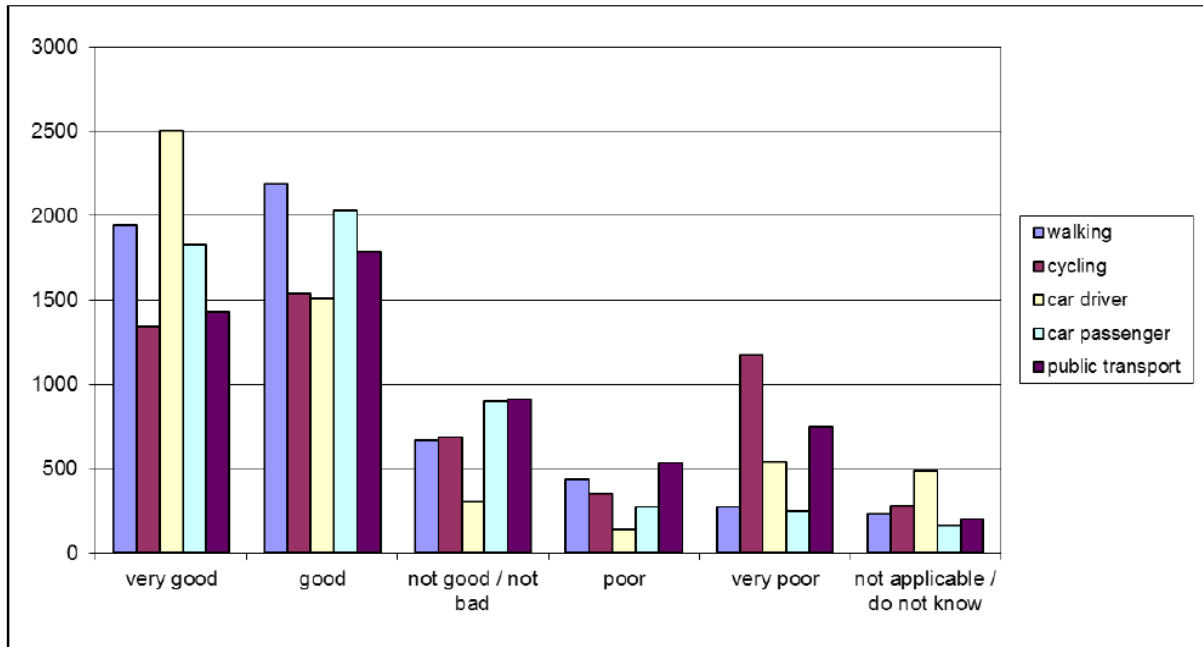


Figure 6-10: Reaction to "How do you value your transport option with each mode?" (KiM 2008)

The low evaluation of public transport is an interesting observation. Especially when combined with the fact that the older people get, the more dependent people will become on public transport to transport themselves. The Figure 6-11 shows the valuation of travel options with public transport differentiated to age classes:

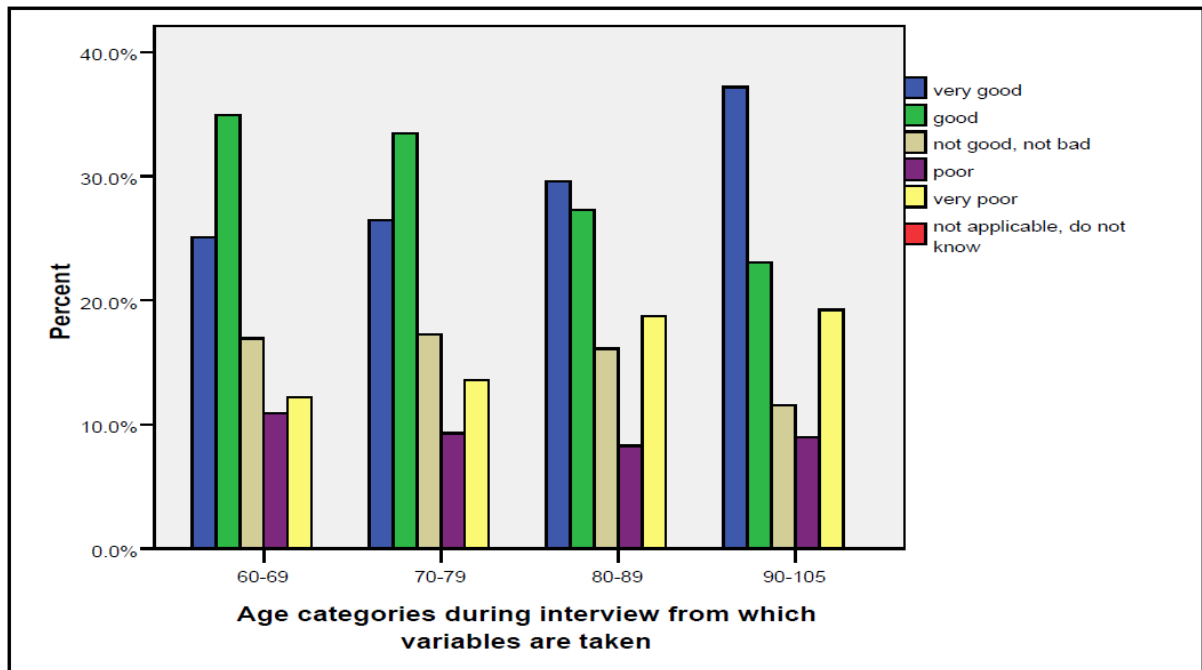


Figure 6-11: Valuation of travel options with transportation mode 'public transport' (KiM 2008)

The graph shows that although in general people perceive travel options with public transport as very poor, the older age classes feel that travel options with public transport become better. Because the older age groups (80+) are much less populated in the sample the differences in valuation between both approaches can be become evident. In the next section (6.2) the Keep Moving database is further analysed with respect to the five profiles developed from the SHARE database.

6.2 The Definition of Significant Mobility Styles and Patterns for each Profile of Older People

Based on the analysis of the large pan-European databases from the SHARE project five draft profiles of older people were identified (Chapter 5).

- **Fit as a Fiddle:** 50 to 60 yrs; excellent physical/mental health; still employed; mobile with private transport.
- **Hole in the Heart:** 50 to 75 yrs; suffer from physical/mental health limitations; limited in activities; prefer private transport.
- **Happily Connected / Happy Together:** 60 to 75 yrs; good physical/mental health; mostly retired; active social life; mobile with private transport.
- **An Oldie but a Goodie:** 80 to 90 yrs; still in good health; mostly widowed; mobile by walking and public transport.

- **The Care-Full:** 85 yrs and older; suffer from severe health limitations; widowed; severe mobility limitations; mobile only with special transport.

The SHARE database provides recent longitudinal data on personal characteristics, such as health status, disabilities, health care and medication usage, economic position and housing for over 45 000 respondents aged 50+ but gives limited information regarding mobility styles and patterns. Additional literature regarding socio-economic and socio-demographic factors already enhanced the description of these profiles. In order to further develop the mobility aspects of the profiles additional databases are used for analysis. In this section we further elaborated on the specific mobility styles and patterns of the profiles based on the analysis of mobility databases.

The database of the ENT14: KEEP MOVING project has been identified as a specific data source next to the SHARE database to provide background to the mobility preferences of older people connected to the profiles. In section 6.1.3 the KEEP MOVING database is described in general terms. By connecting the SHARE database with the KEEP MOVING database more insight in mobility aspects, such as most important travel mode, frequency of leaving home and use of different travel modes as well as several perception variables regarding the use of different transport modes is expected. The secluding sections will present the connection of the KEEP MOVING and SHARE database and the analysis of significant mobility styles and patterns in direct correlation with the draft profiles as described above.

6.2.1 Connecting the KEEP MOVING Database with the SHARE Database

The KEEP MOVING database was used to provide a basis for extra analysis of the mobility styles and patterns of the older people in the different profiles. In order to perform this analysis the profiles developed from the SHARE database were to be allocated to the KEEP MOVING database as well. To achieve this a statistical connection between both databases has been made. For connecting the profiles developed from the cluster analysis of the SHARE database to the KEEP MOVING database three steps were undertaken.

1. Identification of corresponding variables in the KEEP MOVING and SHARE database on which the statistical connection between both databases is made. These variables were: age (with selection of ≥ 60); gender; perception of health status (most important variable in the SHARE database in terms of explaining variability in the data); perceptions of hearing status, eyesight, and physical mobility .
2. Estimation of a statistical model with the SHARE database that predicts the profile of each respondent based on the selection of variables from step 1, using a technique called Multilayer Perceptron (MLP). The MLP splits the original SHARE data file in two data sets, a training and testing sample. The MLP uses the training sample to estimate the model and the testing sample to validate the results. Overall, around 64% of the cases were allocated to the correct profile cluster in the testing sample.

3. Use of the statistical model developed in step 2 for predicting the profiles in the KEEP MOVING database. The distribution of the predicted profile clusters across the KEEP MOVING database was somewhat different from that in the SHARE database (see Figure 6-12): less people in the clusters Care-full and Hole in the Heart, while more people were in the clusters Fit as a Fiddle and Oldie but Goodie.

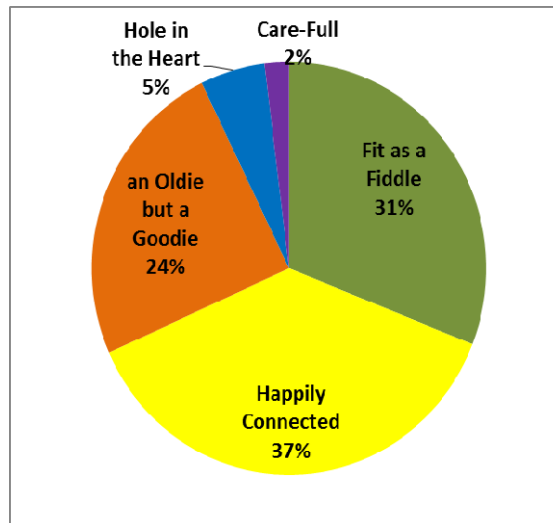


Figure 6-12: Distribution of the profiles in the KEEP MOVING database

6.2.2 Data Analysis of the KEEP MOVING Dataset for Mobility Styles and Patterns

In this section the mobility styles and patterns for the different profiles are further developed by analysis of the KEEP MOVING database. From the KEEP MOVING database the following variables are further analysed in relation to the draft profiles: most important travel mode; frequency of leaving home for an activity; frequency of use of travel mode; valuation of opportunities for travelling; valuation of each travel mode separately.

6.2.2.1 Most Important Travel Mode

Figure 6-13 shows the results for the question: What is your most important travel mode? In general the KEEP MOVING database shows that for all the profiles the most important travel mode is the car followed by walking and cycling. Public transport and disabled transport is not perceived as an important travel mode by the respondents.

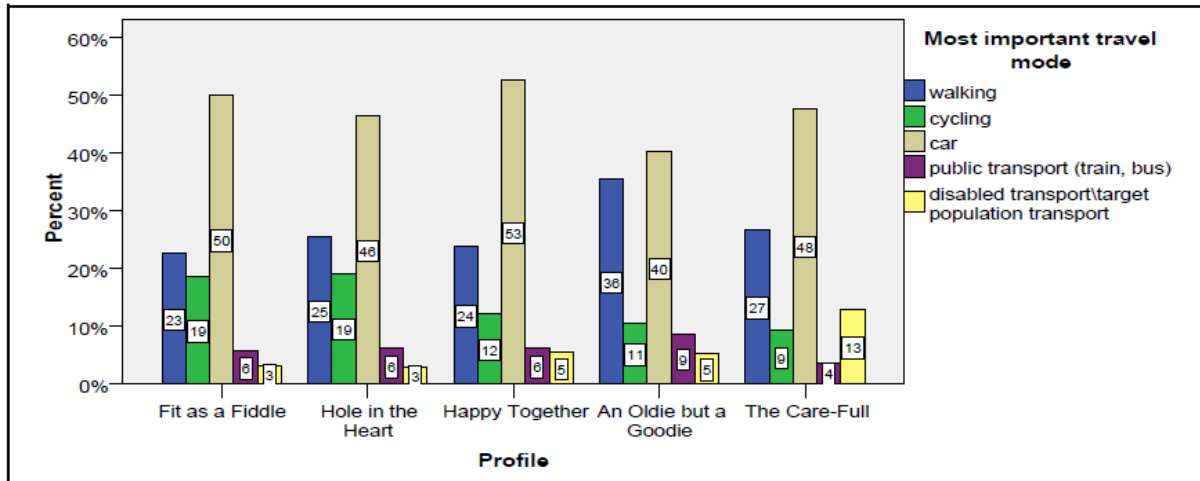


Figure 6-13: Most important travel mode for each profile

When analysing the respondents within each profile the following findings are made:

- **Fit as a Fiddle:** compared to the average respondent in the KEEP MOVING database this group has comparable preferences for the most important travel mode (most important travel mode is the car followed by walking and cycling).
- **Hole in the Heart:** compared to the average respondent in the KEEP MOVING database this group has comparable preferences for the most important travel mode (most important travel mode is the car followed by walking and cycling)
- **Happily Connected / Happy Together:** compared to the average respondent in the KEEP MOVING database this group has comparable preferences for the most important travel mode (most important travel mode is the car followed by walking and cycling).
- **An Oldie but a Goodie:** compared to the average respondent in the KEEP MOVING database this group has more focus on walking and less on car driving and cycling. This group also shows the highest proportion of public transport as most import mode.
- **The Care-Full:** compared to the average respondent in the KEEP MOVING database this group has less focus on cycling and more focus on disabled transport

6.2.2.2 Frequency of leaving home for an activity

Figure 6-15 gives an overview of the frequency people leave their home for doing an activity, such as shopping, visiting relatives or going to a doctor or other service. The oldest people from the database are in the profiles The Care-Full and An Oldie but a Goodie. The frequency of leaving home for an activity significantly decreases significantly for these profiles, which is in line with the findings from literature. Older people tend to have less physical abilities and a decreasing social life.

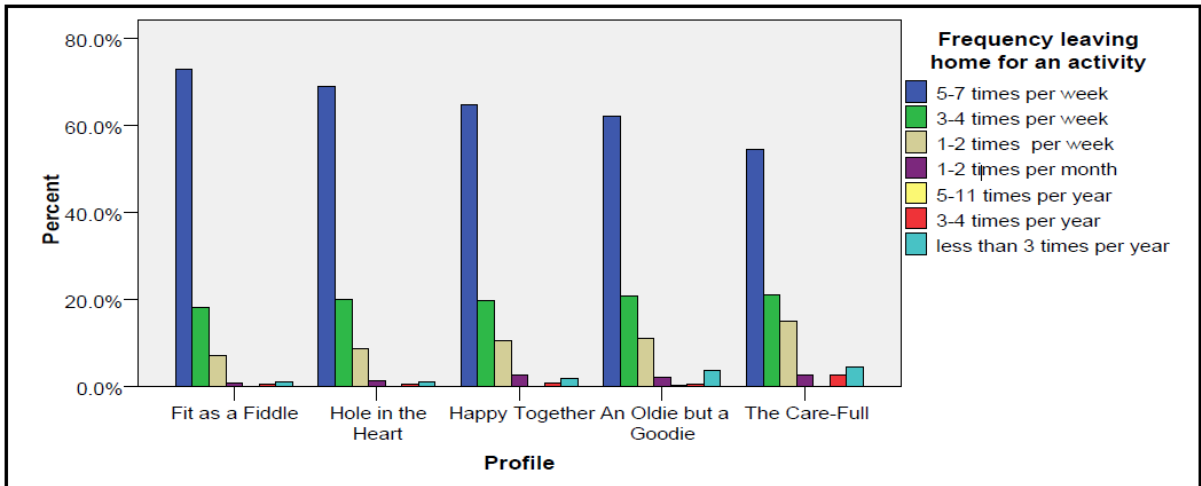


Figure 6-14: Frequency of leaving home for an activity for each profile

6.2.2.3 Modal Split

Based on the respondents' reaction to the question on the frequency of use of each travel mode information on the distribution of trips across the modes of transport (i.e., modal split) was obtained for each profile. Figure 6-15 shows the total number of trips per day per travel mode for each profile and Figure 6-16 shows the relative distribution of trips over the different travel modes for each profile.

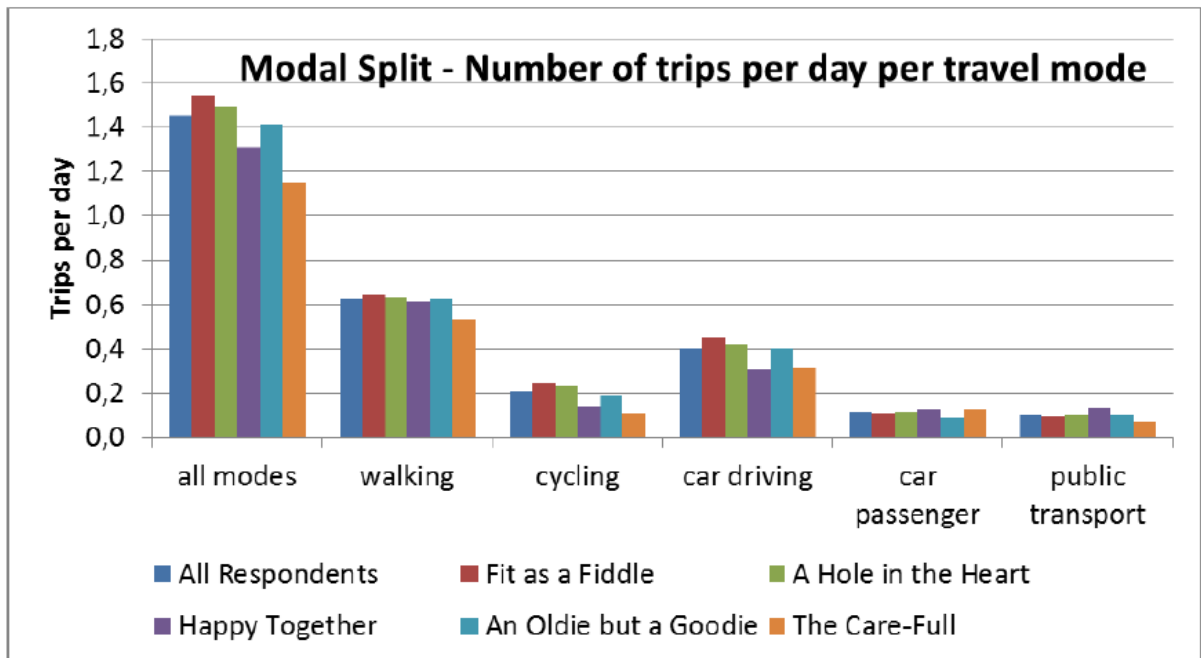


Figure 6-15: Modal Split – Number of trips per day per travel mode per profile

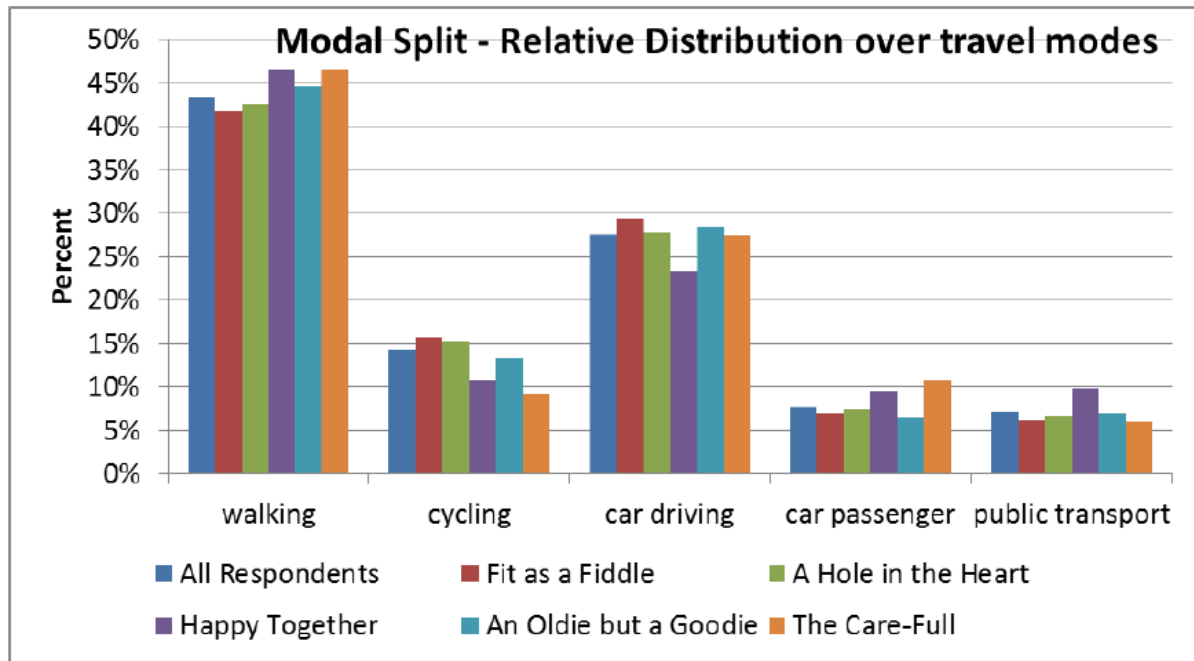


Figure 6-16: Modal Split – Relative distribution over travel modes per profile

Based on these figures the following observations are made for each profile groups:

- **Fit as a Fiddle:** compared to the average respondent in the KEEP MOVING database this group makes more trips per day and especially with the car as a driver or the bicycle
- **A Hole in the Heart:** compared to the average respondent in the KEEP MOVING database this group makes a little bit more trips per day and especially with the car as a driver or the bicycle.
- **Happily Connected / Happy Together:** compared to the average respondent in the KEEP MOVING database this group makes less trips per day. This group especially uses less bicycle, car as a driver but uses more car as a passenger and public transport.
- **An Oldie but a Goodie:** compared to the average respondent in the KEEP MOVING database this group makes a little less trips per day. This group especially uses less cycling and car as a passenger but more walking.
- **The Care-Full:** compared to the average respondent in the KEEP MOVING database this group makes much less trips per day. This group especially uses less bicycle, car as a driver but uses more walking and car as a passenger.

In general these observations show that as older people get, the less trips they make (comparable with the result found in the frequency of leaving home for an activity). Also there is a small shift towards walking, car as a passenger and public transport when reaching the older age profiles.

6.2.2.4 Valuation of Opportunities for Travelling

In the survey the respondents were asked to give a valuation of their opportunities to travel. Although this variable comprises several different aspects of the respondent, such as financial, household situation, having a driving license or not or the structure of people's social lives, it does give insight in how the respondents from different profiles value their travelling options. This variable can therefore provide feedback in the further development of specific mobility services for each group. Figure 6-17 gives the results of this variable. Using a rating of '5' for very good and '1' for very poor, the average rating of all respondents in the KEEP MOVING database is 4.04.

- **Fit as a Fiddle:** average rating of 4.19. Compared to the average respondent in the KEEP MOVING database this group has better valuation of their travelling opportunities with 'very good' being the dominant answer.
- **A Hole in the Heart:** average rating of 4.15. Compared to the average respondent in the KEEP MOVING database this group has a better valuation of their travelling opportunities. However this group scores less 'very good' and more 'good' compared to the total of respondents.
- **Happily Connected / Happy Together:** average rating of 4.00. Compared to the average respondent in the KEEP MOVING database this group values their travelling opportunities less good. There is a small preference to judge as 'good' instead of 'very good'.
- **An Oldie but a Goodie:** average rating of 4.04. Compared to the average respondent in the KEEP MOVING database this group has comparable valuation of their travelling opportunities with 'very good' being the dominant answer.
- **The Care-Full:** average rating of 3.82. Compared to the average respondent in the KEEP MOVING database this group has the lowest valuation of their travelling opportunities. Compared to the total, within this group there is a large portion that values their travelling opportunities as poor/very poor.

When reviewing the results from the different profiles it seems that the valuation of their travelling opportunities decreases when growing older. This can be related to the decreased physical ability of the older people.

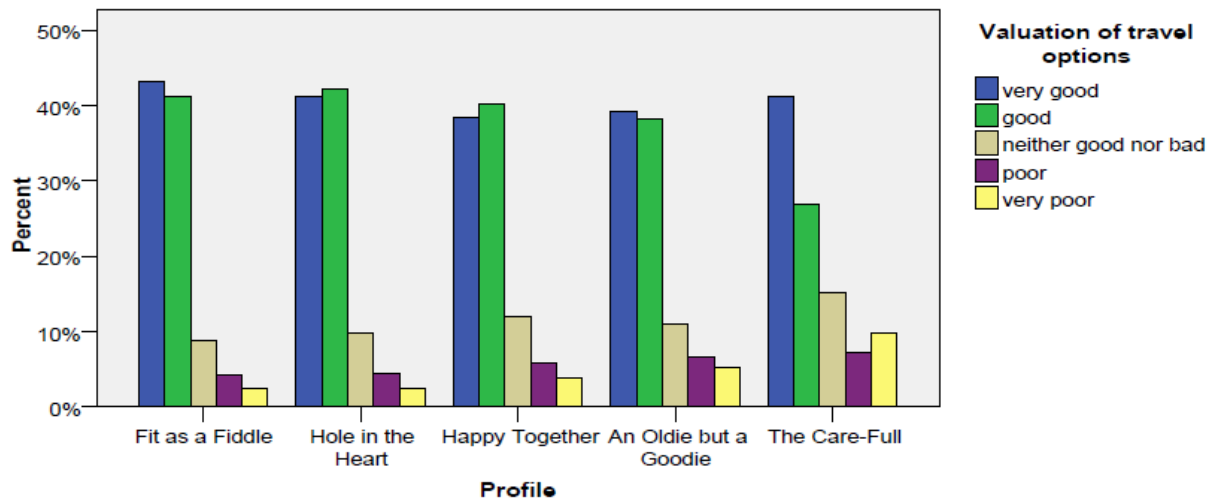


Figure 6-17: Valuation of opportunities for travelling

6.2.2.5 Valuation of each travel mode separately

In addition to the valuation of travelling options this variable gives insight in the value respondents give to the opportunities of using the different travel modes. In general car driving, car passenger and walking are perceived to have (very) good opportunities while cycling has significantly lower quality, being related to the decreased physical ability of older people (Figure 6-18).

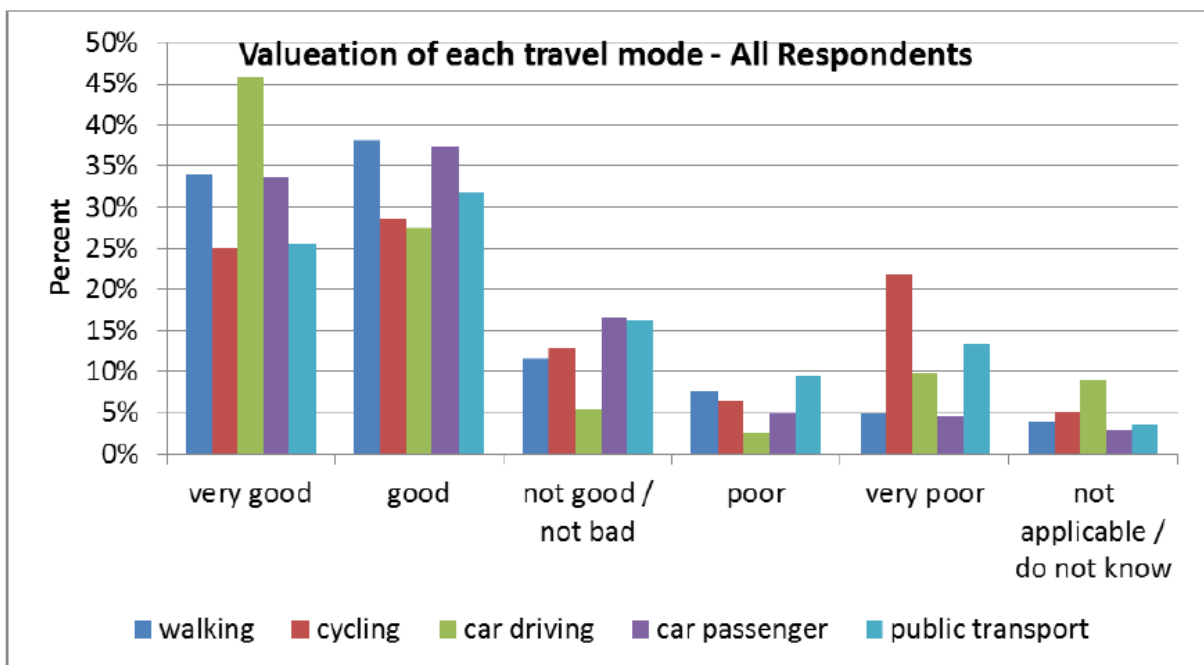


Figure 6-18: Valuation of travel mode for all respondents

Differentiated to the different profiles the following observations can be made:

- **Fit as a Fiddle:** compared to the average respondent in the KEEP MOVING database this group has a comparable valuation of their travelling opportunities with the different travel modes (car driving, car passenger and walking are perceived to have (very) good opportunities while cycling has significantly lower quality).
- **A Hole in the Heart:** compared to the average respondent in the KEEP MOVING database this group has a comparable valuation of their travelling opportunities with the different travel modes (car driving, car passenger and walking are perceived to have (very) good opportunities while cycling has significantly lower quality).
- **Happily Connected / Happy Together:** compared to the average respondent in the KEEP MOVING database this group rates cycling and to a lesser extent car driving and public transport poorer than the average respondent.
- **An Oldie but a Goodie:** compared to the average respondent in the KEEP MOVING database this group rates cycling, car driving and public transport poorer than the average respondent.
- **The Care-Full:** compared to the average respondent in the KEEP MOVING database this group rates cycling, car driving and public transport much poorer than the average respondent.

6.2.3 Overview of the results and definition of significant mobility styles and patterns for the profiles from the KEEP MOVING database

Based on the findings in the previous section the following conclusions are drawn on the significant mobility styles and patterns of each profile based on the KEEP MOVING database (Table 6-4):

	Fit as a Fiddle	A Hole in the Heart	Happy Together	An Oldie but a Goodie	The Care-Full
Most Important travel mode	Car > walking > cycling Comparable with the average respondent;	Car > walking > cycling Comparable with the average respondent;	Car > walking > cycling Comparable with the average respondent;	Car > walking > cycling But focus on walking; less car driving and cycling; highest proportion of public transport,	Car > walking > cycling But cycling below average; much more disabled transport
Frequency of leaving home	Leaves home more than average respondent.	Leaves home more than average respondent.	Comparable with the average respondent	Leaves home less than average respondent.	Leaves home less than average respondent.
Modal split of trips	Walking: 42% Cycling: 16% Car drive: 29% Car pass: 8% Public T: 6%	Walking: 43% Cycling: 15% Car drive: 28% Car pass: 7% Public T: 7%	Walking: 47% Cycling: 10% Car drive: 23% Car pass: 10% Public T: 10%	Walking: 45% Cycling: 13% Car drive: 28% Car pass: 7% Public T: 7%	Walking: 47% Cycling: 9% Car drive: 27% Car pass: 11% Public T: 6%
Valuation of all traveling opportunities	Valuates their opportunities better than the average respondent.	Valuates their opportunities better than the average respondent.	Valuates their opportunities equal to the average respondent.	Valuates their opportunities less good than the average respondent.	Valuates their opportunities less good than the average respondent.
Valuation per travel mode	Comparable with the average respondent	Comparable with the average respondent	Cycling, car driving and public transport is valued a little lower than the average respondent	Cycling, car driving and public transport is valued lower than the average respondent	Cycling, car driving and public transport is valued much lower than the average respondent

Table 6-4: Overview of KEEP MOVING results for GOAL profiles

6.2.4 Supplementary results of MiD 2008

The following paragraphs will add topic-specific results from MiD 2008 database to the profiles.

The general question of the main mode of transport led to the following results for the specific age groups (Figure 6-19), which do not contradict KEEP MOVING database. Taking the car and walking were most often chosen answers. Only for age group 80+ car usage decreases. Public transport is used less frequently than bicycles, which are also used less by the group of persons over 80 years of age for health reasons.

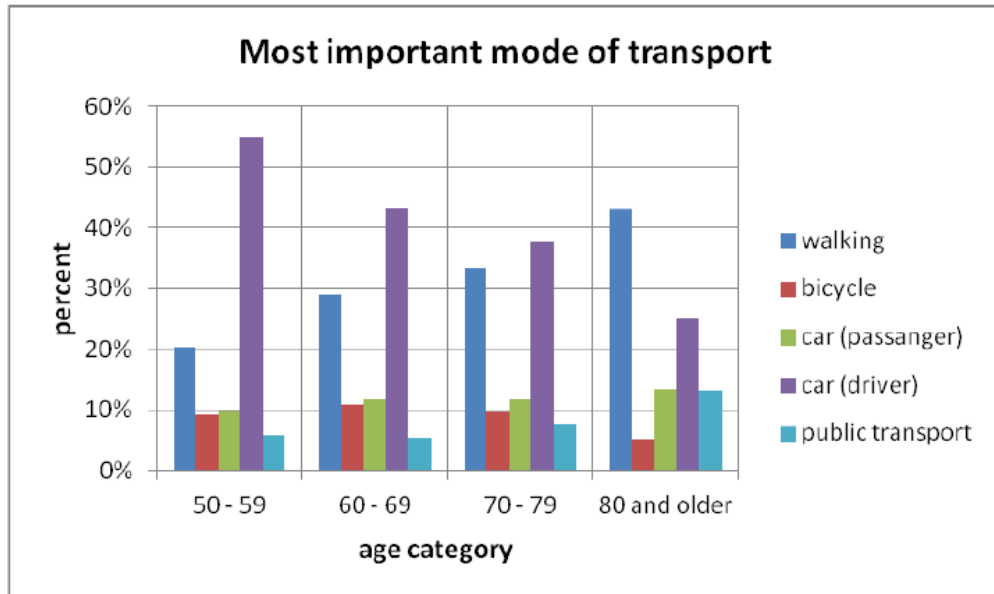


Figure 6-19: Most important mode of transport (MiD 2008)

In addition to the question of the main mode of transport, MiD 2008 asked for the availability of specific modes of transportation. Both car and bicycle are available for all age groups most of the time. By controlling these variables the frequency of usage of the main mode of transportation can be interpreted more exactly.

Furthermore MiD 2008 asks participants whether they own a driving license (Figure 6-21) or a car (Figure 6-21) and what kind of ticket they use for public transport (Figure 6-22). This may explain the lack of using specific modes of transport.

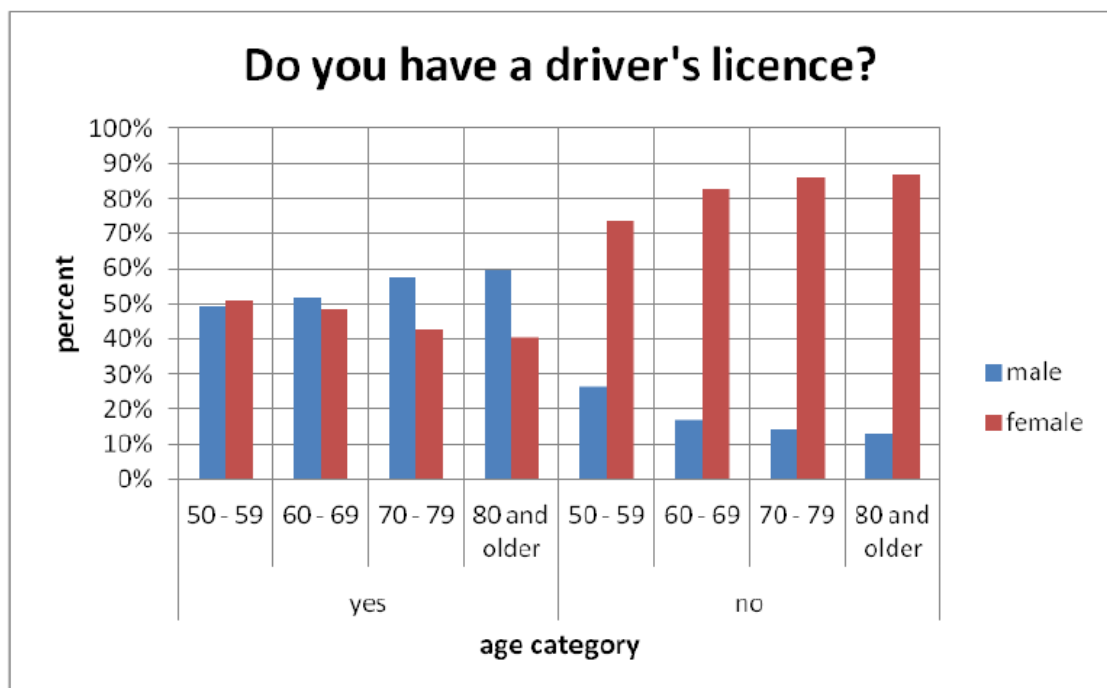


Figure 6-20: Driver's licence by gender and age group (MiD 2008)

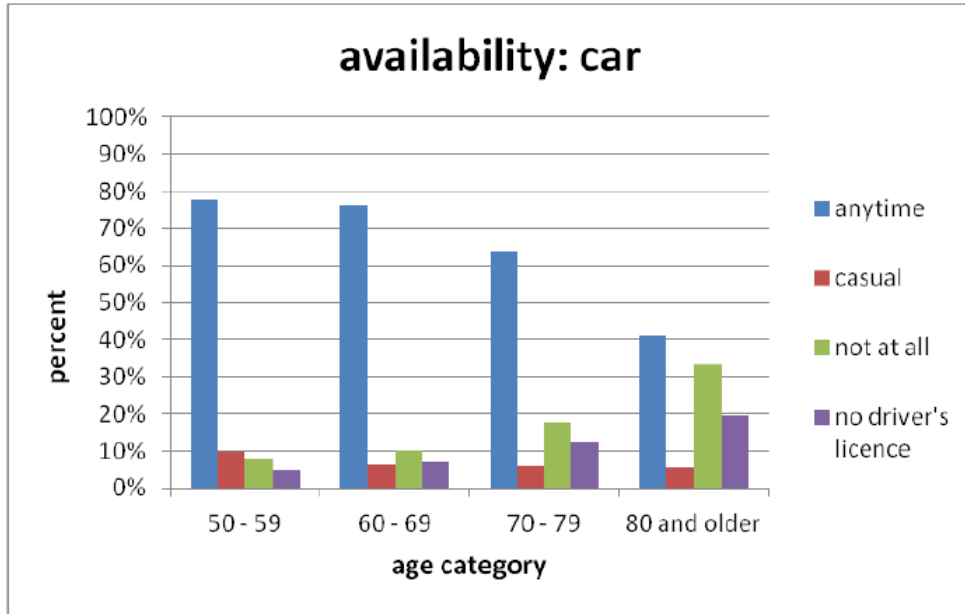


Figure 6-21: The availability of car (MiD 2008)

The analysis of owning a driving license reflects previous statements. In all age groups more men than women own a license. Although the number of bicycles for the group >80 years old decreases, most persons do own a bike.

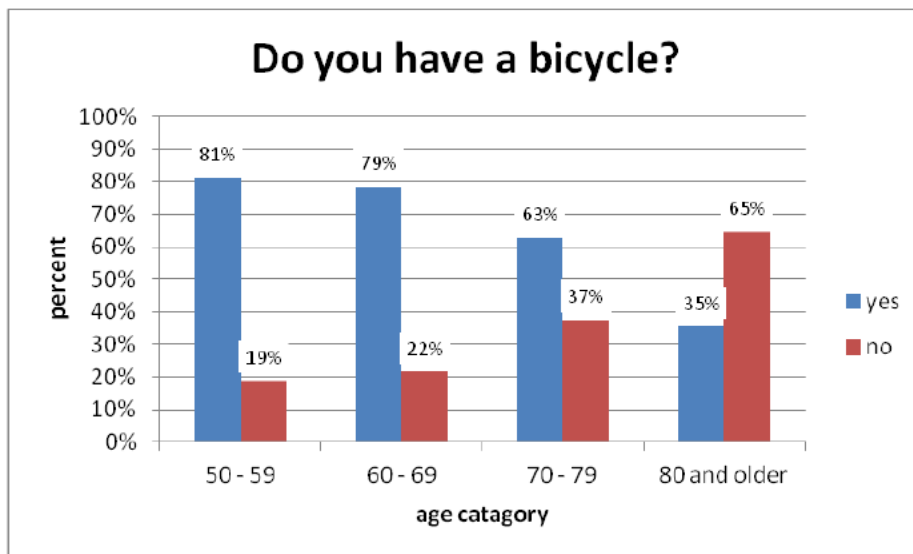


Figure 6-22: Possession of a bicycle by age group (MiD 2008)

Analysis of purchased tickets for public transport shows that most people use single tickets. The number of tickets valid for a month is significantly lower. This can either be explained by the low frequency of use or with ticket prices.

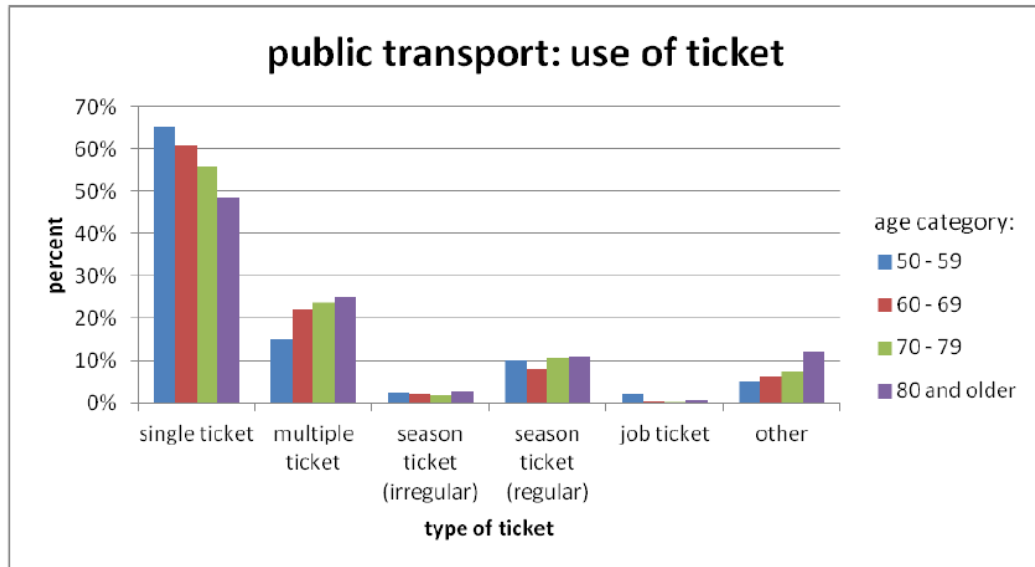


Figure 6-23: Use of tickets on public transport (MiD 2008)

Considering the times at which persons leave their home, the interval between 11am and 5pm can be called a rush-hour of mobility for all older age groups (Figure 6-24).

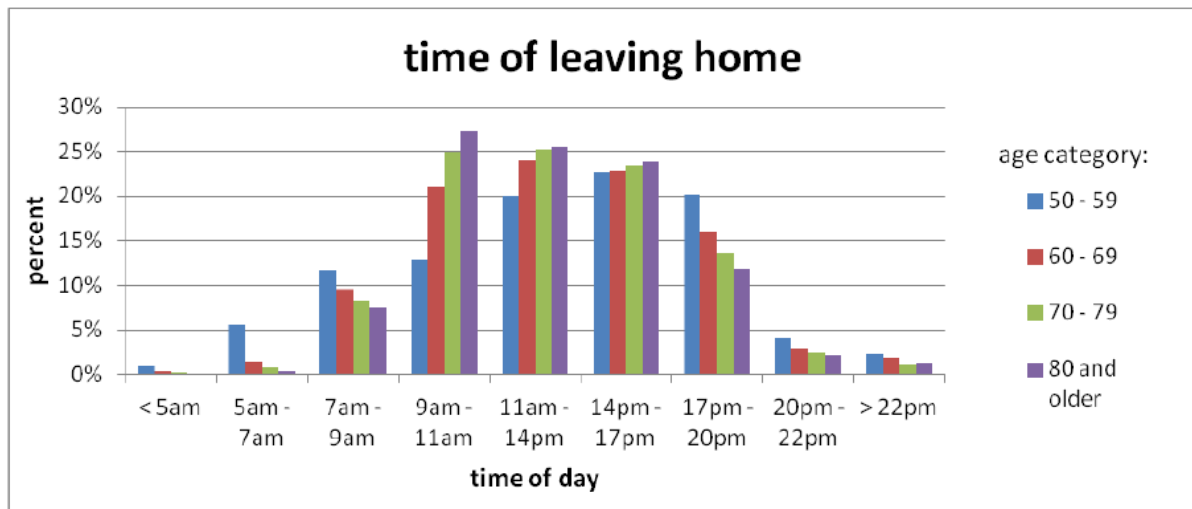


Figure 6-24: Time of leaving home by age group (MiD 2008)

Considering the goals of mobility, shopping and leisure time are mentioned most often. Occupational reasons for leaving the home decrease with age (Figure 6-25).

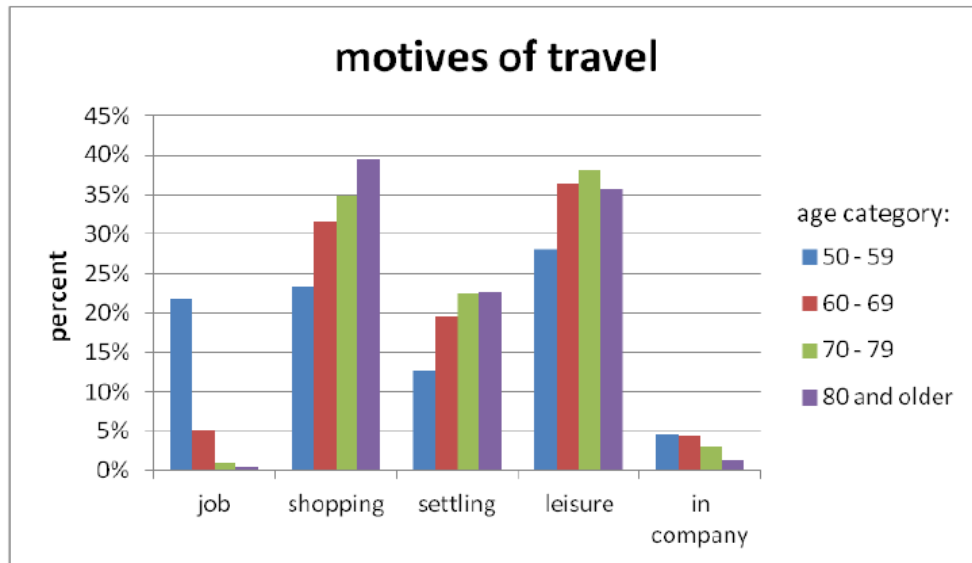


Figure 6-25: Motives of travel by age group (MiD 2008)

Considering the motives of trips in regard to day of week, significant but explainable difference emerges (Figure 6-6). The motive “leisure time” explains about 30% of trips from Monday to Friday; however this increases to 75% on Sundays. “Shopping” is more relevant from Monday to Saturday (30-40%) but decreases to 4.5% on Sundays in favour of leisure time. While undertakings in company remain the same at about 3%, the goals of “errands” and “work” decrease in significance towards the weekend.

In MiD 2008 study also the variable “distance to bus stop” can be analysed. This allows us to interpret the usage of public transport more detailed. On average a distance of 400m to 1km is reported. The differences depend on the region of residence. In a similar vein usage of public transport is dependent from region of residence (Figure 6-26). Considering the usage of public transport in reference to the number of inhabitants of the city, it becomes evident that public transport is hardly used in cities with less than 2000 inhabitants. In metropolises such as places with more than 500 000 inhabitants and more, also older people use public transport several times a week.

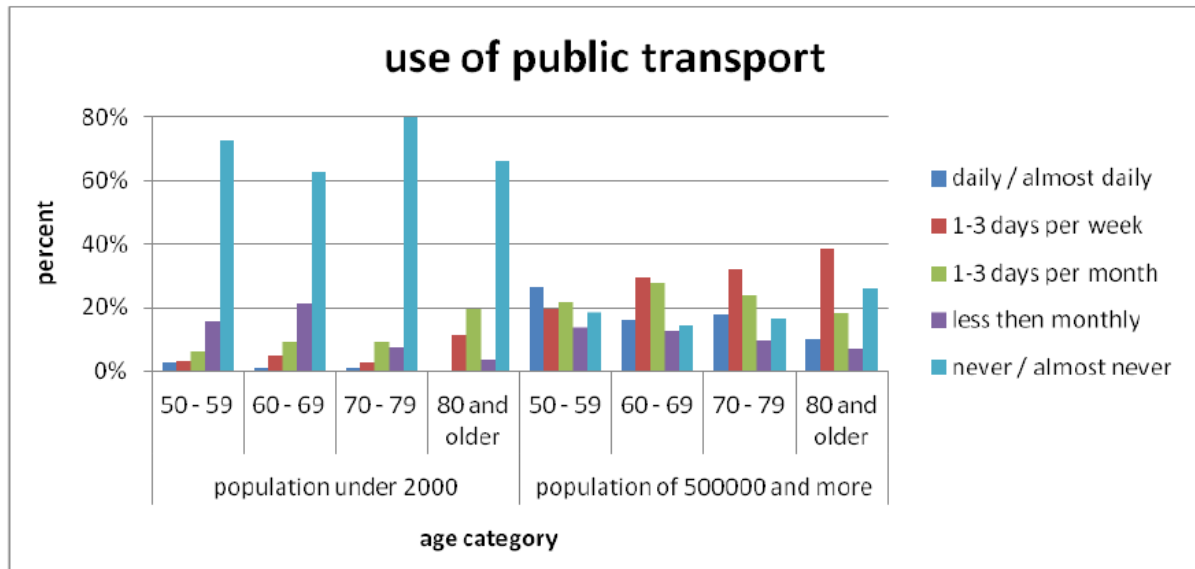


Figure 6-26: Use of public transport by age group and population (MiD 2008)

The following overview (Table 6-5) summarizes the main statements within the age groups which may add to the profiles:

variable	age categories			
	50 – 59	60 – 69	70 – 79	80 and older
mode of transport	car (driver) > bicycling > walking	walking > bicycling > car (driver)	walking > bicycle > public transport	walking > public transport > car (passenger)
motives of travel	work > in company > shopping	settling > shopping > leisure	settling > shopping > leisure	settling > shopping > leisure
frequency				
car	almost daily	1-3 days per week	almost never	almost never
bicycle	less frequently than per month	almost never	no estate	no estate
public transport	almost never	1-3 per week	1-3 per week	1-3 per week

Table 6-5: Overview of important mobility styles and patterns of MiD 2008

7 Surveys

To increase the knowledge about the profiles and see differences and trends among the profiles two surveys have been carried out. The main starting points for preparing the surveys were the following knowledge gaps, which were identified during the first workshop as not yet sufficiently covered by the considered information sources (Chapter 6):

- **Living conditions and social networks:** Social networks and living conditions are important to describe the social networks of older people.
- **Mental characteristics / mental limitations** influence autonomy, mobility behaviour, self-confidence.
- **Residential area:** There are differences in the availability of transport possibilities, services for older people, barrier-free access, and accessibility of facilities according to residential areas.
- **Mobility behaviour / travel styles and patterns:** There are differences within the group of older people concerning mobility behaviour e.g. the usage of transport modes, the frequencies of leaving the home. Mobility behaviour often depends on experiences, personal preferences and attitudes such as availability.
- **Technology usage and information:** There are different usage patterns of technologies among older people. To develop future mobility services, assistive systems, etc. the needs and experiences of older people have to be evaluated.
- **Transition Points:** There are different reasons / live-changing events when older people get from one profile into another and change their behaviour (e.g. stop driving or using the public transport)

To include the point of view from older people as well as experts and intermediaries working with older people, two surveys have been carried out. The first (Survey 1) is an (almost entirely) standardized questionnaire for older people (50+), which was available as paper version and as web panel questionnaire (CASI, Computer Assisted Self Interview). The second survey (Survey 2) was prepared as CASI in-dept-interview with mainly open-ended questions addressing intermediaries and experts working with older people.

7.1 Collected Data

7.1.1 Survey 1 – Mobility behaviour of older people

Survey 1 mainly addressed the topics social networks and activities, residential area and availability of facilities, mobility behaviour including usage of transport modes, frequencies leaving homes, using technologies to improve mobility, transition points and life changing events such as travel information.



The database of Survey 1 (questionnaire for older people) consists of 439 complete datasets with participants from mainly Austria (65%), Spain (20%) and Germany (10%) as well as some responses from the United Kingdom and Poland. From the 439 participants 415 can be allocated to one of the five draft profiles in an iterative process using thresholds. Figure 7-1 shows the allocation process, which was carried out including the variables age, general state of health, physical fitness, need of mobility aids, hearing, eyesight and social activities. During each step, the thresholds defining profile membership have been refined for allocating remaining cases; 24 cases had to be excluded as their characteristics were not distinctive enough for allocation.

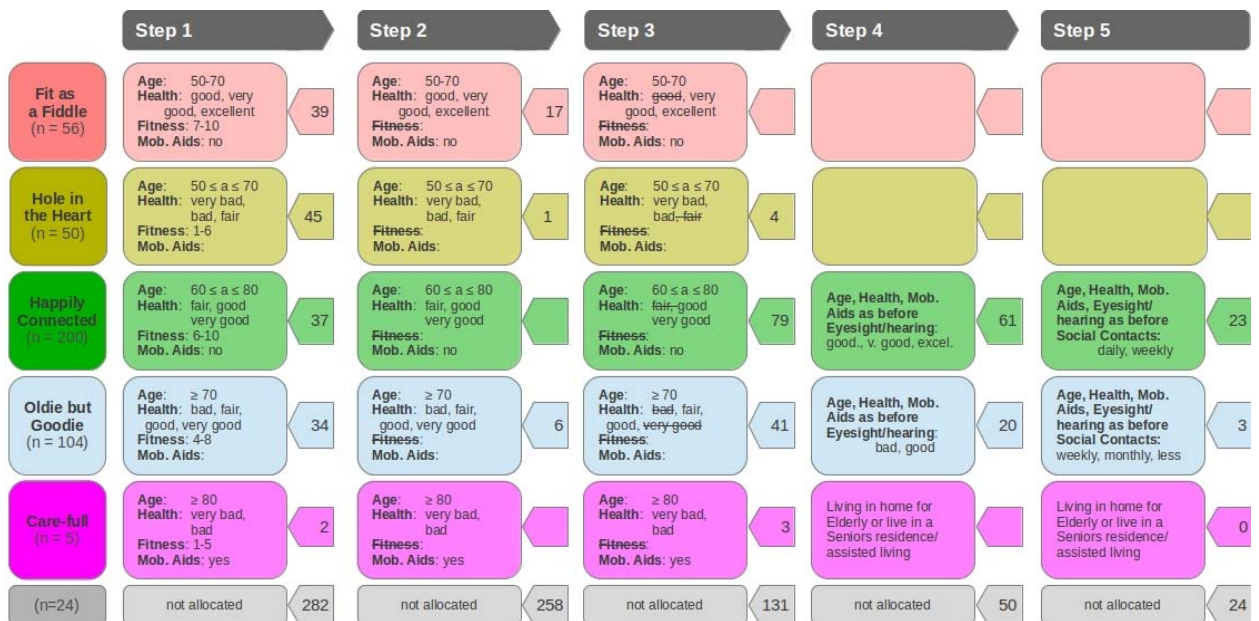


Figure 7-1: Iterative allocation process of the dataset to the five draft profiles.

Figure 7-2 shows the result of the allocation of the datasets. The largest group with almost 50% of the participants is allocated to the Happily Connected profile; second largest with 25% is allocated to an Oldie but a Goodie, and to the Fit as a Fiddle as well as Hole in the Heart profiles about 50 persons could be allocated. Furthermore the Figure 7-2 shows the difficulties reaching members of the Care-Full profile. In absolute numbers only 5 persons of this profile could be identified in the survey sample, therefore no conclusion about this group can be made from the statistical analysis of the survey data.

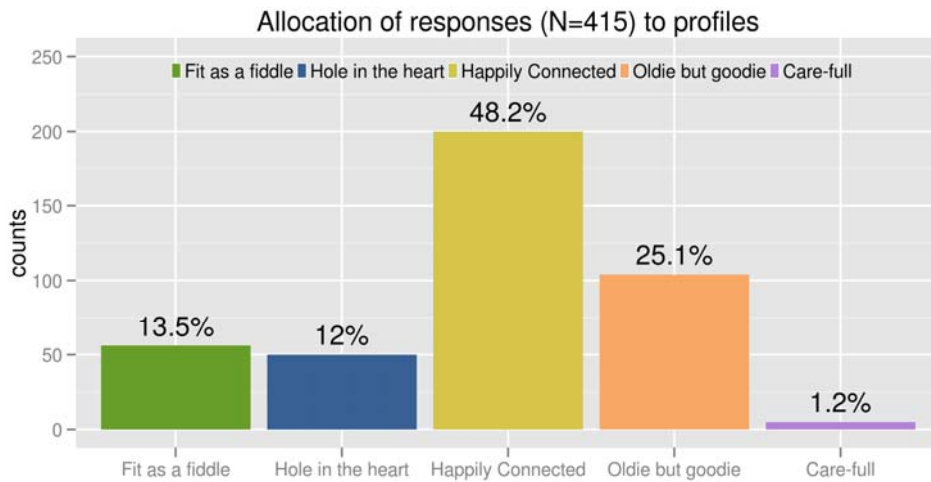


Figure 7-2: Allocated responses to the five profiles (cluster sizes).

Figure 7-3 shows the distribution of the age classes of the participants allocated with respect to the five profiles. Most of the participants are between 60 and 79 years old. The general health of most of the participants is rated from very good to fair (Figure 7-4).

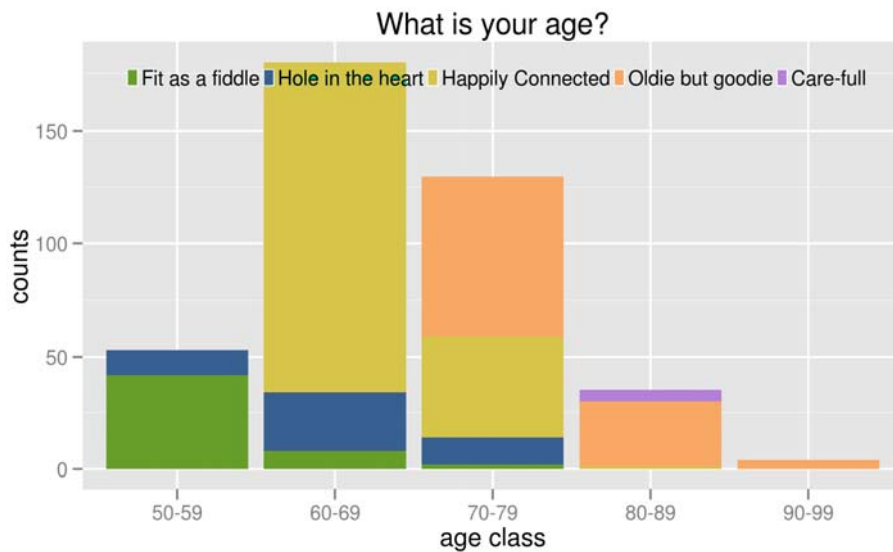


Figure 7-3: Age classes of the participants (allocated to the five profiles).

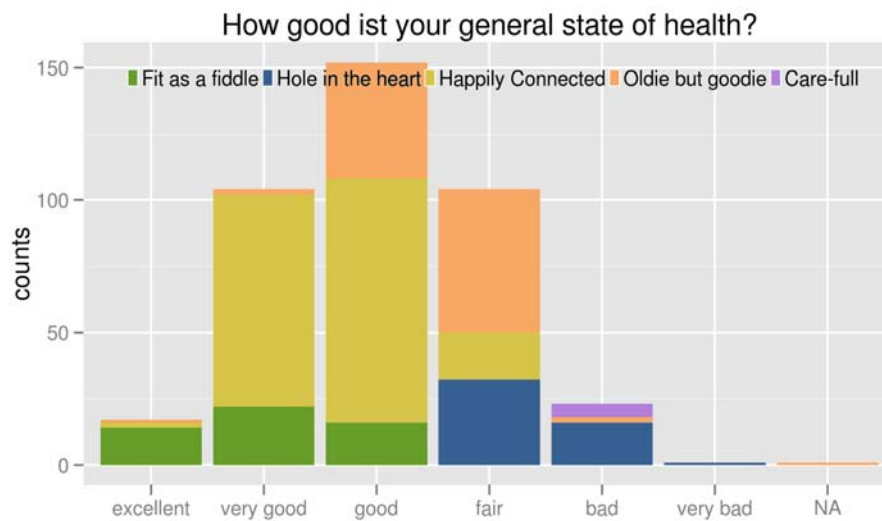


Figure 7-4: Subjective assessment of the participants general states of health (allocated to the five profiles).

Figure 7-2, Figure 7-3 and Figure 7-4 show some of the specific characteristics which have to be taken into account working with the data:

- Even though the Happily Connected group in general is a comparably large group among older people it might be overrepresented within the sample, while the Fit as a Fiddle profile and in particular the hard to reach group of the Care-Full profile are underrepresented. To reach the Care-Full profile other survey and distribution methods would have to be used.
- The age class between 60 and 79 was easier to reach than younger or older people. Particularly more information about persons aged 80 to 100 (including the Care-Full) would be useful.
- All information concerning health and physical fitness is based on self-assessments and might differ from “objective” levels of health and fitness.
- Another obvious fact is that relatively healthy and fit older people and people who are connected in senior citizens organisations or other clubs are overrepresented. This might be caused by the fact that the survey was distributed with the help of senior citizens associations and that these groups are generally more likely to take part in surveys.
- Bias may also occur within the data concerning technology usage, because the survey was not just based on paper but also provided a web-based version of the questionnaire, which was installed on request of the Austrian Senior Citizens Associations. According to them many older people use the internet and are more willing to fill in the form online; still the easier distribution and collection in comparison

to the paper-based questionnaire is likely to lead to an overrepresentation of older people showing over-average usage of technology (i.e. computers).

7.1.2 Survey 2 - Problems and Transition points in Older People's Lives

In Survey 2 (web based in-depth-interviews) 51 experts and intermediaries from countries of all project partners took part. The main focuses of Survey 2 were the physical and mental (mobility) problems and limitations as well as the transition points which are responsible for older people changing from belonging to one profile to another. The experts and intermediaries were asked to select two of the draft profiles (those they assume to have most experiences with) and to provide information about physical and mental health problems, coping strategies, strategies to stay autonomous and fit, technology use as well as information about getting into and leaving a profile again. Additionally, there were general questions addressing the transitions points and life-changing events of older people.

7.2 Main Results of Survey 1: Mobility Behaviour of Older People

7.2.1 Living Conditions and Social Networks

Most of the participants live with their partners or spouses, less than 20% are living alone. The number of older people living in senior residences or homes for elderly is low. For including data from this hard to reach group other survey methods would be necessary.

There are some differences between the profiles. While members of the Fit as a Fiddle group live with their families more often (children may still live at home), the highest proportion living alone can be found within the Oldie but a Goodie profile (Figure 7-5).

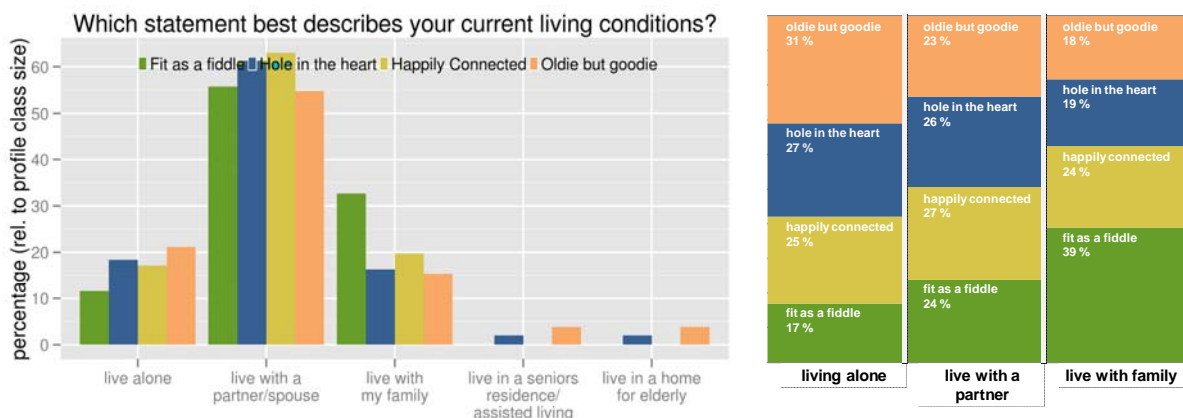


Figure 7-5: Living conditions (allocated to the five profiles).

The rate of memberships and the frequency of participation in clubs, senior citizens associations, religious communities etc. are high among the survey participants (probably due to recruiting of participants via senior citizens associations). Figure 7-6 shows the



differences in participation rates. While the Happily Connected and the Oldie but a Goodie are very active, less activities can be observed within the Fit as a Fiddle group (lack of time; many still employed) and the Hole in the Heart group.

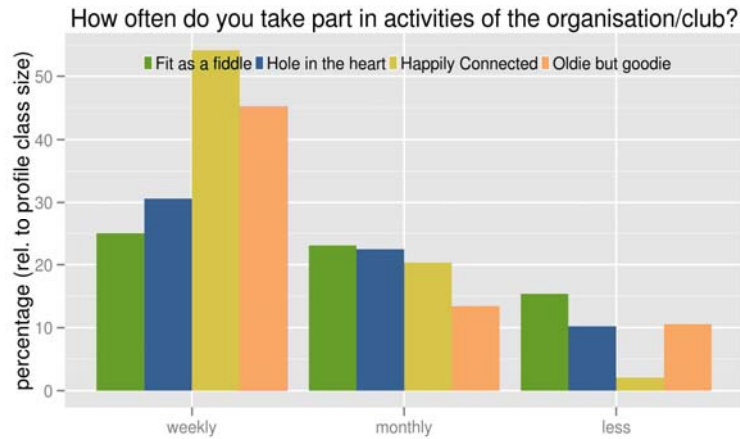


Figure 7-6: Frequency of participation in organisation and clubs (allocated to the five profiles).

7.2.2 Residential Area and Mobility behaviour

Most people reached in the survey live in (big) cities, villages and rural areas; older people from small cities or suburban areas are less represented in the sample. As shown in Figure 7-7, there are some differences concerning the residential areas within the profiles: the Fit as a Fiddle group is comparably more often living in rural areas, suburbs or small villages, while the reverse is true for the Hole in the Heart group. The Happily Connected group seems to hold an equal share in inhabiting all different forms of settlement in comparison to the other profiles. The Oldie but a Goodie can predominantly be found in cities.

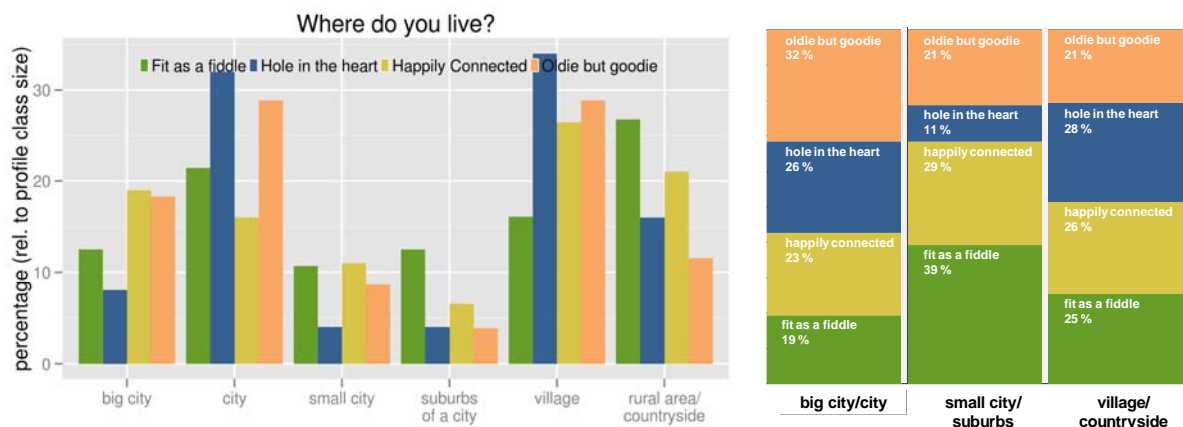


Figure 7-7: Residential area (allocated to the five profiles).

Generally, the participants of the survey are quite active. More than 50% reported to leave their home several times per day. Members of the Fit as a Fiddle group leave their home most often followed by the Happily Connected group. Lowest numbers of people leaving

home several times per day or daily can be observed in the Hole in the Heart group (Figure 7-8).

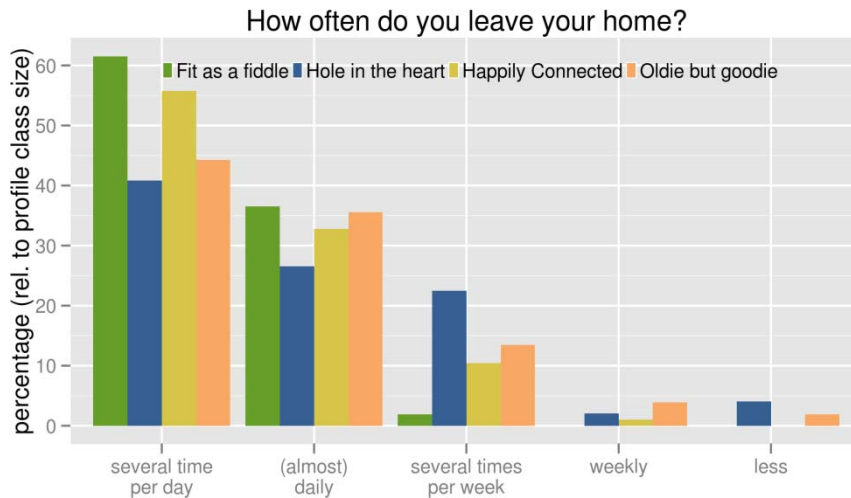


Figure 7-8: Frequencies of leaving homes (allocated to the five profiles).

The transport connections are mainly rated as good for most of the residential areas (except rural areas), but still the usage of public transport is low (Figure 7-9). The highest number of public transport usage can be observed within the Oldie but a Goodie profile.

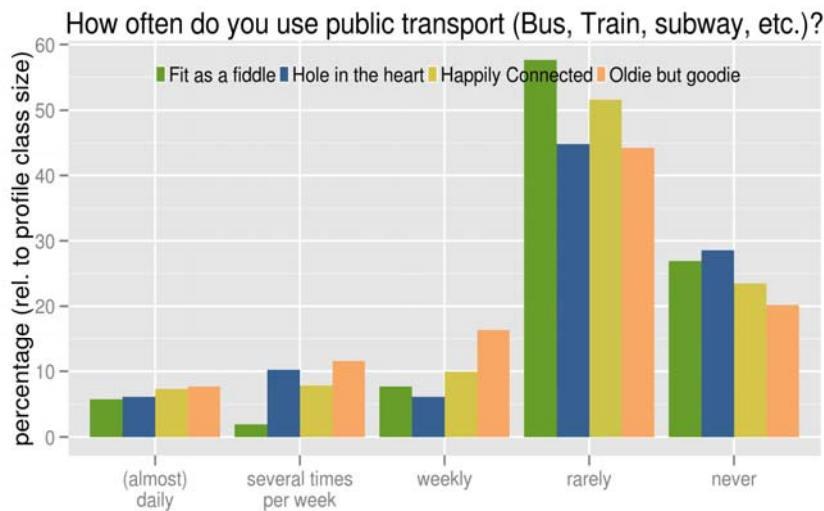


Figure 7-9: Frequencies of the usage of public transport (allocated to profiles).

Usage of public transport strongly depends on the area where people live. The boxplots shown in Figure 7-10 describe the distances (in minutes) people have to walk until they reach a public transport station. Especially in the rural areas and villages the connections to public transport are rated poor to very poor and the distances people have to walk to the next public transport stops are comparably long (average of ten minutes and longer).

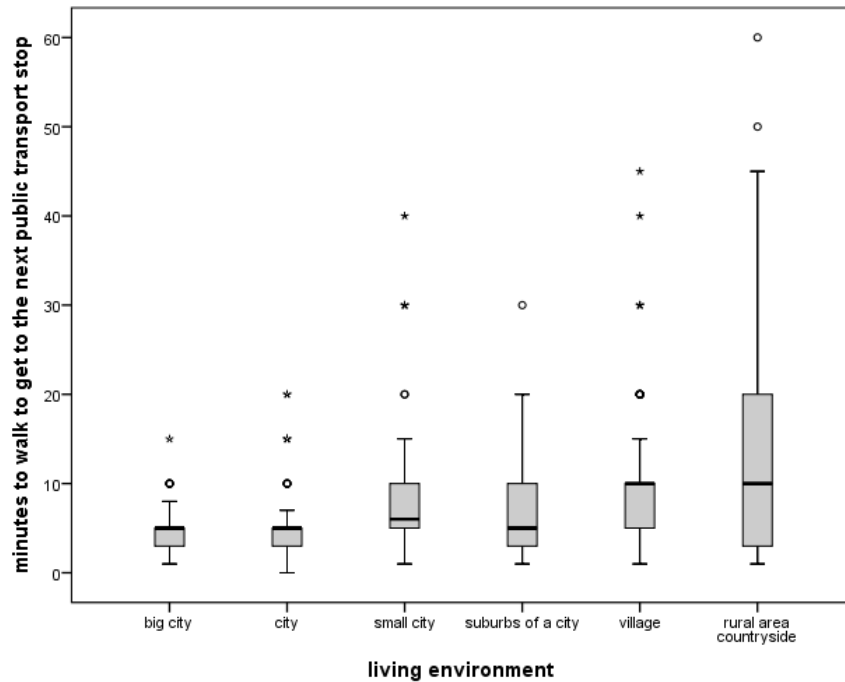


Figure 7-10: Boxplots of the distances (in minutes) people have to walk to the next public transport stop of all residential areas.

People living on the countryside therefore use public transport significantly less often than persons living in cities or big cities (Figure 7-11). Looking into the profiles there are only a few differences. Public transport in rural areas or villages is used regularly (daily to weekly) only by members of the Hole in the Heart (20%) and an Oldie but a Goodie (15%) group, while it is used regularly by more than 70% of all profiles in cities or cities (big city and city).

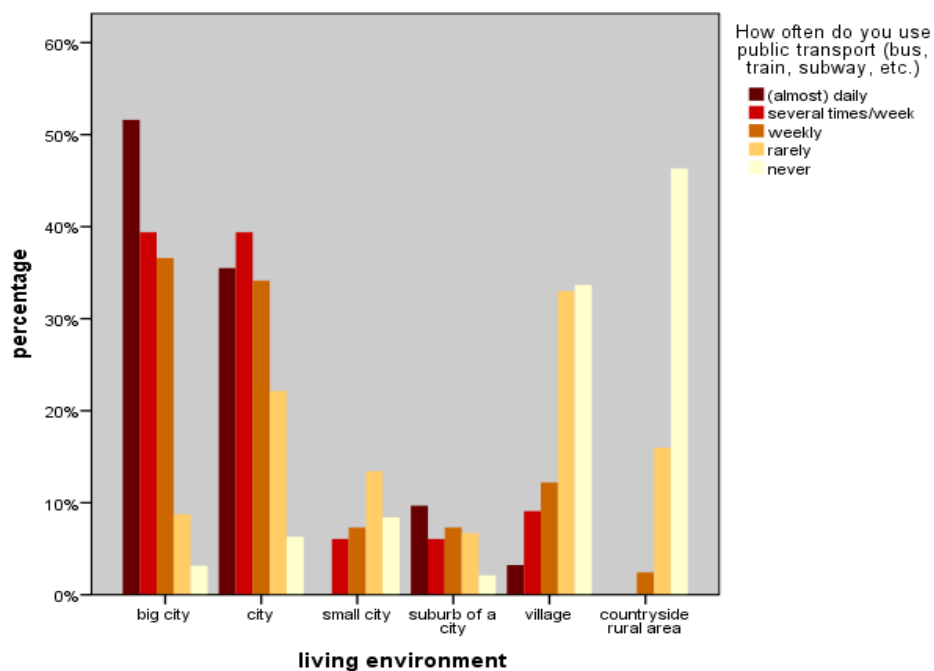


Figure 7-11: Frequencies of the public transport usage in all residential areas.

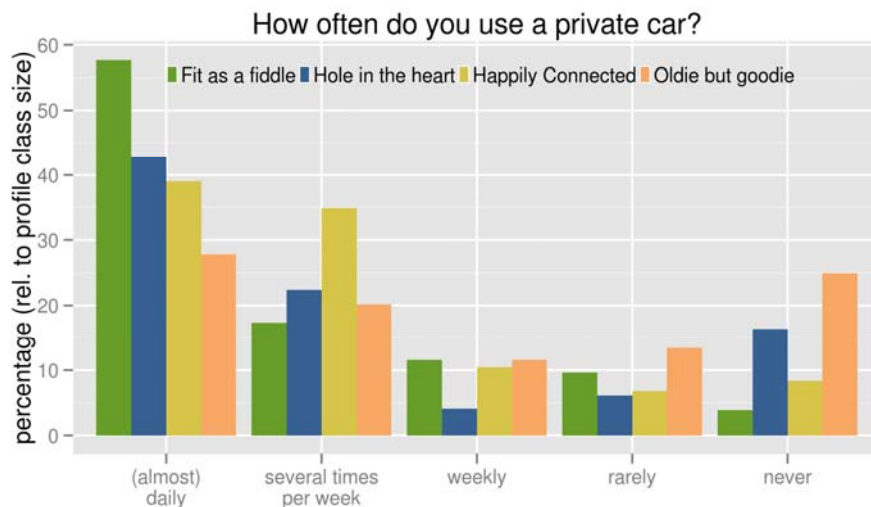


Figure 7-12: Frequency of car usage (allocated to the five profiles).

Figure 7-12 shows the usage of private cars. 75% of the participants indicated that they use a private car daily or several times per week. The lowest car dependency can be observed among the Oldie but a Goodie group. This group also has the highest number of car passengers, the highest number of people without driving licenses (about 35%) and the highest number of people owning a seasonal or annual ticket (25%) for public transport. The highest rate of car usage can be observed within the Fit as a Fiddle profile; all participants of this group have a driving license. Another interesting fact concerns differences within the Hole in the Heart group. There is a high number of people using the car very often, but there are also some who never use a car (25% of the Hole in the Heart profile does not even have a driving license).

There are several reasons for not using transport modes: the own car is the most preferred mode of transport for many survey participants. They do not see any necessity to use other modes of transport. Using a car seems to be connected to independency for many participants. There are also complaints about inappropriate public transport infrastructures, schedules, bad connections or the poor availability of public transport (particularly in rural areas). Physical impairment, illness and heavy loads e.g. from shopping hinder the usage of public transport as well.

There are also interesting findings concerning gender differences in the usage of cars. In general, men use the private car significantly more often than women (Figure 7-13) and they are also more often the main driver while women are the passengers (Figure 7-14). Especially within the profiles Happily Connected and the Oldie but a Goodie group gender-related roles in private transport seem to be clearly defined: in these groups women are significantly more likely to be the passenger, while men are the main drivers.

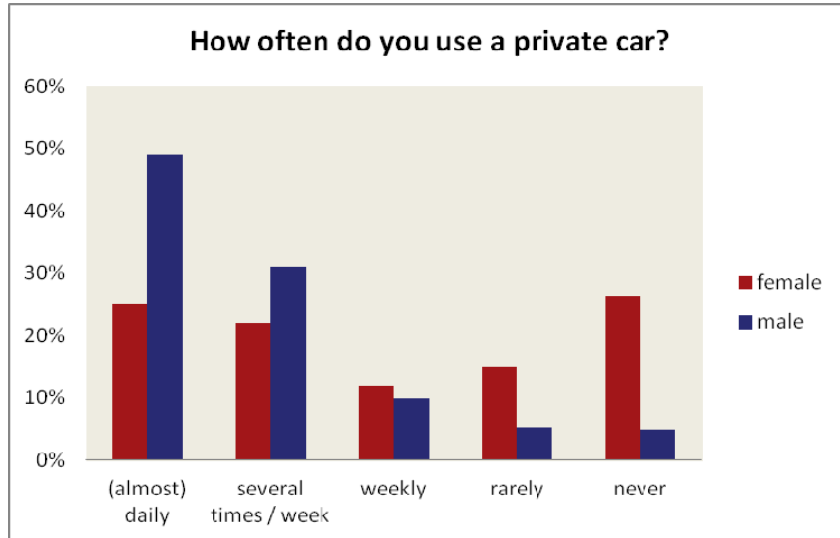


Figure 7-13: Gender differences in the frequencies of car usage.

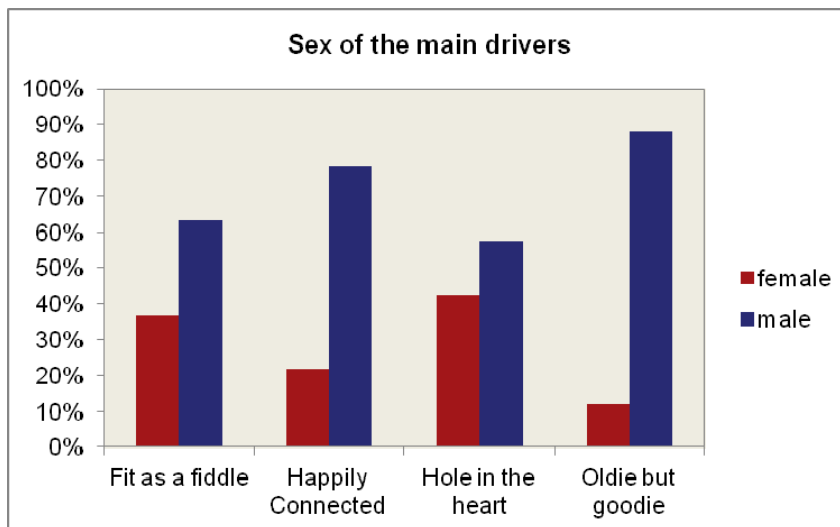


Figure 7-14: Sex of the main drivers/comparison of the five profiles.

7.2.3 Technologies and Information

The participants were asked how they usually obtain necessary transport information when they have to go to an unfamiliar urban district or city. The preferred information sources are maps and the internet, which are used by more than 50% of the respondents. Maps are popular among all profiles, but there are differences concerning technology usage. The Fit as a Fiddle profile has the highest technology usage rate; navigation systems, route planers and the internet are used. The lowest technology usage can be observed within the Oldie but a Goodie profile. This group prefers maps and asking friends and family and has the highest number of people avoiding unknown trips (more than 20%). Avoidance of unknown trips can be noticed within the Hole in the Heart group as well (Figure 7-15).

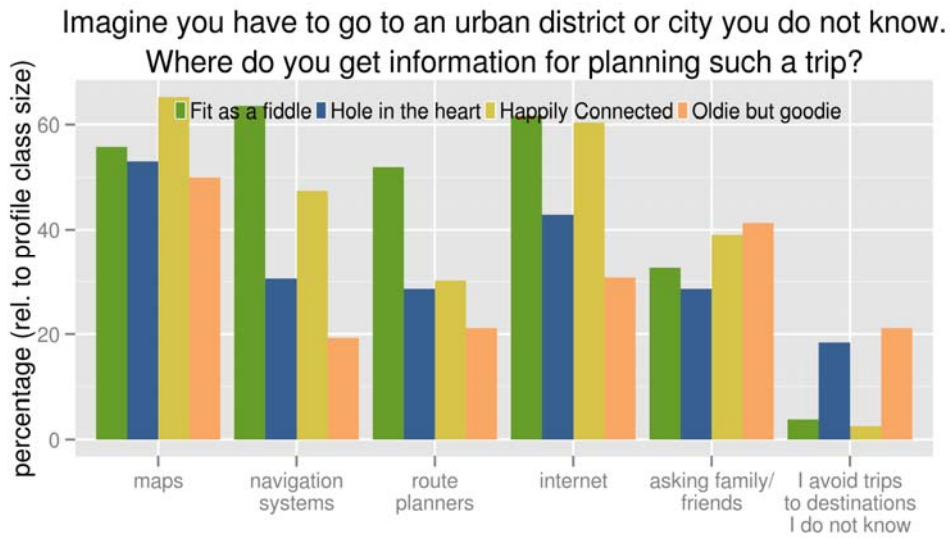


Figure 7-15: information tools for planning a unknown trips (allocated to profiles)

The general question about information technologies shows a similar picture. The internet is the most popular (particularly for Fit as a Fiddle and Happily Connected), followed by navigation systems and online route planners. GPS and smart phones are least used by all groups (Figure 7-16). There is highest refusal of information technologies in the Oldie but a Goodie group (more than 40%) and the Hole in the Heart group (about 30%).

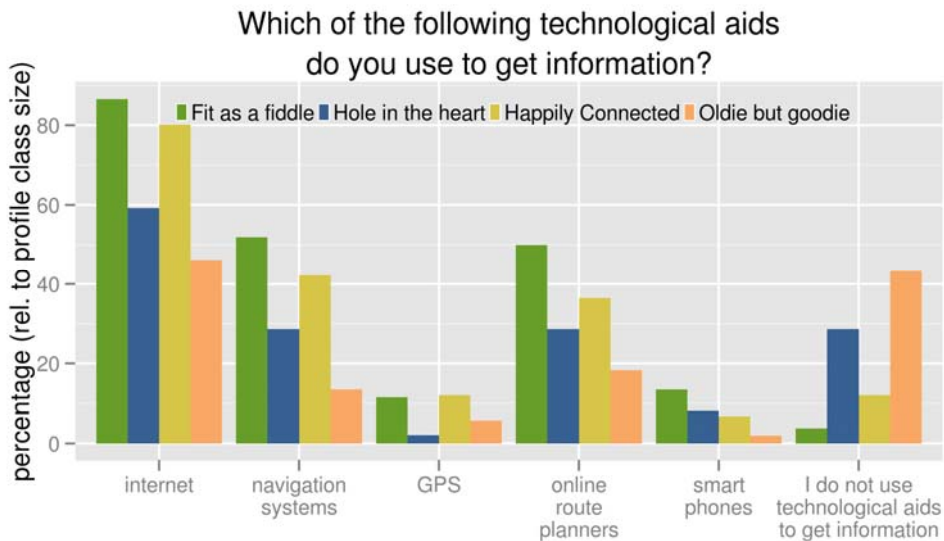


Figure 7-16: Usage of information technologies (allocated to profiles).

About one quarter of the respondents use (technological) aids to improve their mobility; particularly driving assistance systems are used. These are especially popular among the Happily Connected and the Fit as a Fiddle profiles (Figure 7-17). The usage of E-bikes lies below 10%. They are mostly used by the Fit as a Fiddle and the Happily Connected profiles.

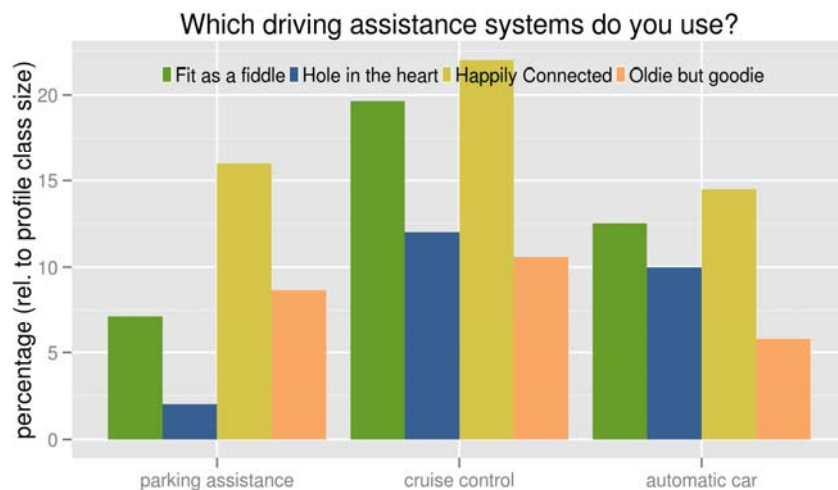


Figure 7-17: Usage of driving assistance systems (allocated to profiles).

7.2.4 Transition Points

There are specific changes in older people's lives (transition points) that significantly affect their opportunities, behaviour or everyday mobility. Figure 7-18 shows the most significant life-changing events in the past of the respondents. Retirement, illness and death of a partner/spouse/close relative are the most common transition points. Other transition points reported in an open answer category are divorce, marriage, children moving out and the birth of grandchildren. Coping problems can be observed particularly after the death of a partner or close person and severe illness. Members of the Fit as a Fiddle group indicated less live changing events than the other groups. In the Happily Connected group retirement is the most live changing event, while for the Hole in the Heart and the an Oldie but a Goodie profiles severe illness and death of the partner or a close relative is relevant.

After retirement in many cases sadness, depression, loneliness and less contact to family and friends were reported as well as financial difficulties. Severe illness also causes sadness and depression as well as more dependency on others. After the death of a partner or a close person the participants reported to suffer from sadness, depression and loneliness as well.

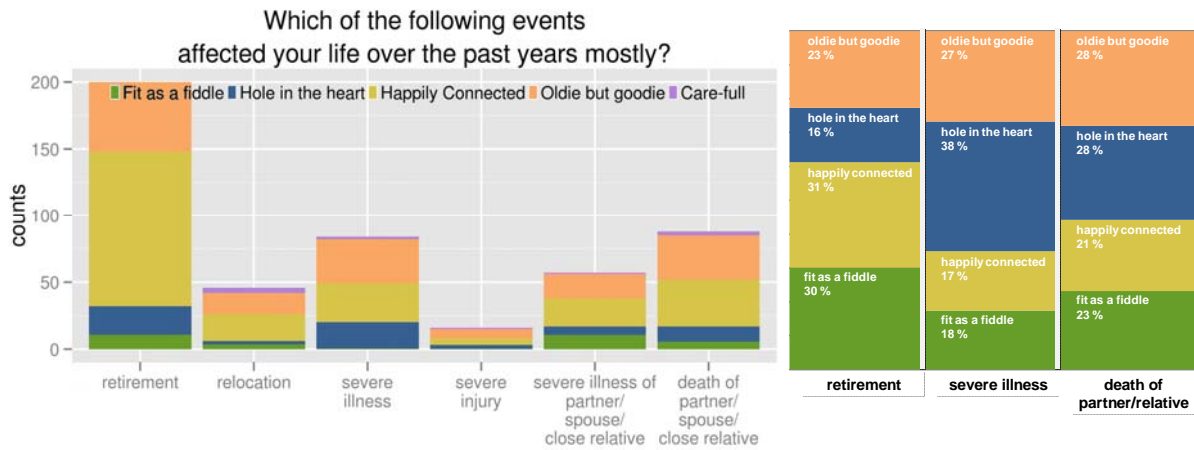


Figure 7-18: Life-changing events (allocated to profiles).

Most problems in coping with the live changing events can be observed among the Hole in the Heart profile (about 55% of this group indicated having problems in coping with the situation) followed by the Oldie but a Goodie profile (25%). The Figure 7-19 shows a comparison of the coping problems occurring after retirement, relocation, severe illness, severe injury, severe illness of a close person and death of a close person in the five profiles. Here again members of the Hole in the Heart profile and the Oldie but a Goodie profile indicate the most problems.

Members of the Hole in the Heart and the Oldie but a Goodie group are also more dependent on others (20%-25%) and they need special services like meals on wheels, mobility services, mobile nursing care (10%) after the live changing events, particularly after illness or the death of the partner/close person.

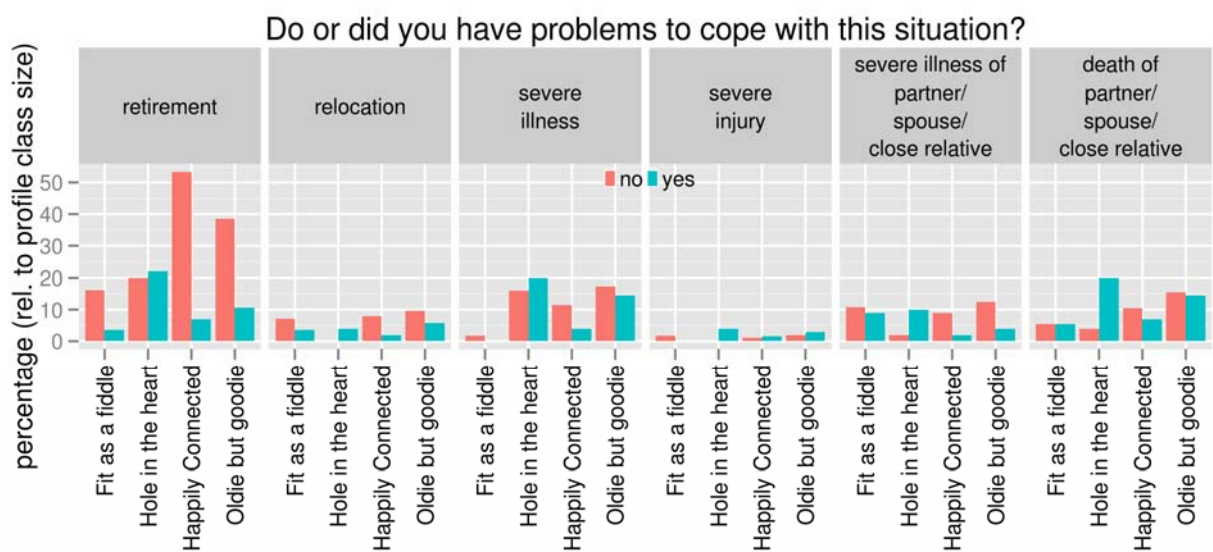


Figure 7-19: Coping problems after life-changing events comparison of the profiles

Mobility behaviour also changes after the transition points. After retirement for example the distances covered by the Happily Connected get longer, while in the Oldie but a Goodie profile distances get shorter. After severe illness and the death of a partner or a close person, distances decrease for all profiles (.

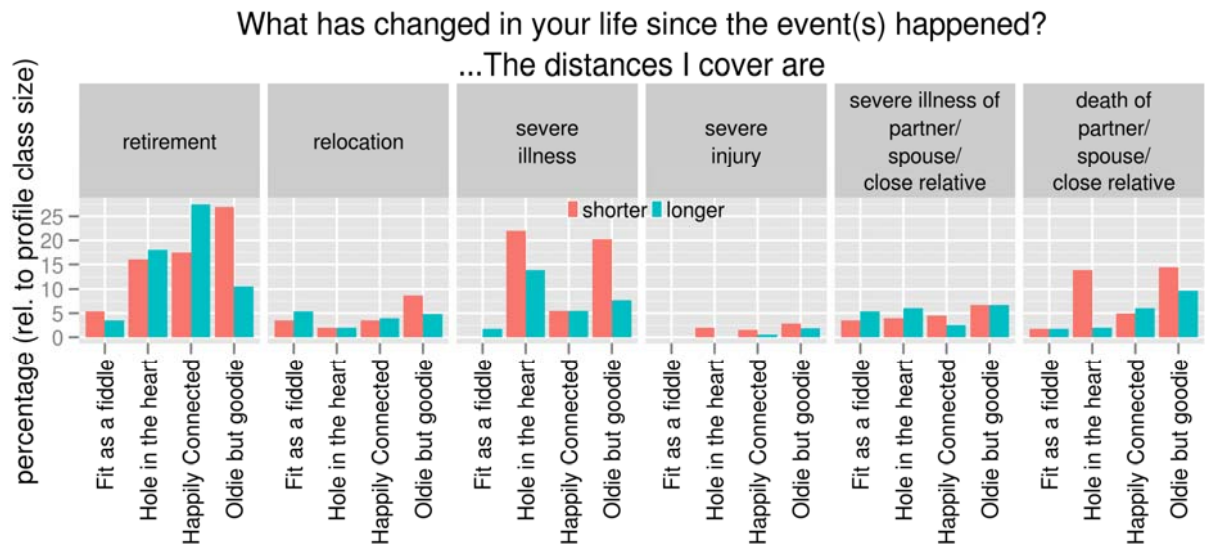


Figure 7-20: Distances covered after transition points; comparison of all profiles

There are also changes in the usage of transport modes after live changing events. As Figure 7-21 shows, members of the Happily Connected and the Oldie but a Goodie group walk much more often, while from the Hole in the Heart profile a reduction of walking was reported. The Oldie but a Goodie group uses the car less often or not at all anymore and there are differences within the Hole in the Heart profile concerning public transport usage. While one part of this group uses public transport more often, others do not use it anymore. Public transport strongly depends on the experiences and knowledge people have with public transport (persons without public transport experience are unlikely to start to use it at high age) such as the availability public transport infrastructure (see above).

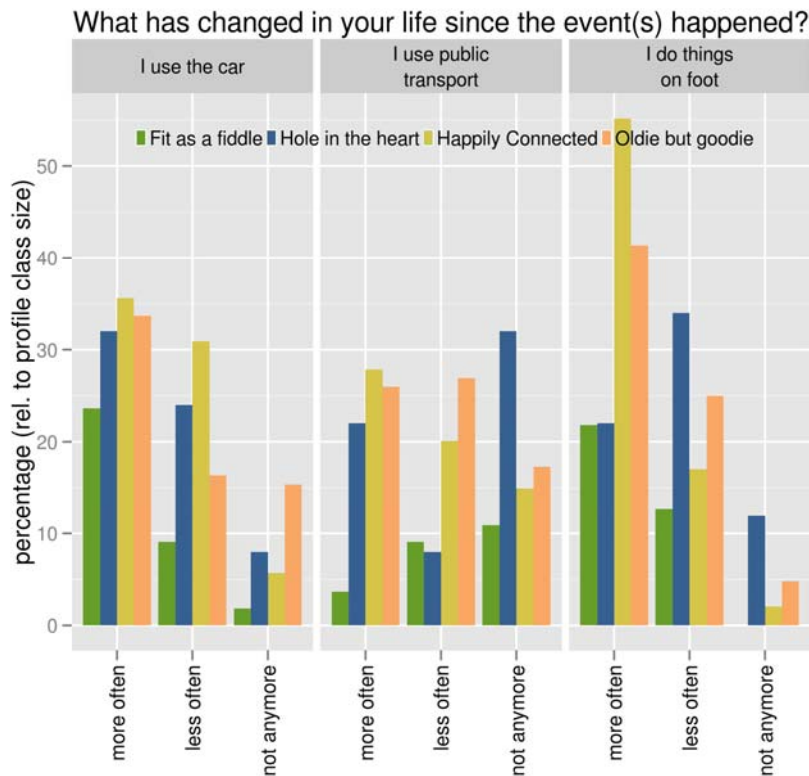


Figure 7-21: Usage of transport modes after transition points (allocated to profiles)

7.3 Main Results of Survey 2: Problems and Transition Points in Older People’s Lives (In-Depth Interviews)

As part of the surveys 51 experts and intermediaries (care personnel, researchers, stakeholders, representatives of senior citizens associations, etc.) were asked about their experiences concerning main problems, technology usage and transition points in older people’s lives via web-based in-depth interviews.

7.3.1 Physical and Mental problems / Coping Strategies / Strategies for staying autonomous and fit

The first group of questions was focusing on physical and mental problems, the influence of these problems, the coping strategies and the strategies of older people to improve health, fitness and autonomy.

7.3.1.1 Fit as a Fiddle

The experts agree that there are no serious physical and mental limitations among the Fit as a Fiddle profile; the profile members are not limited in their daily activities. A decrease of physical fitness, overweight, injuries (from sport) and first problems with the musculoskeletal system (back, knees, joints) could be indicators for limitations in the following years.



Members of the Fit as a Fiddle group try to cope with their beginning problems by doing exercise and sport to stay fit. Cycling and other sports such as hiking and gymnastics are performed frequently within this group. Especially women take part in courses (often sports or language courses) and travelling is also popular among the Fit as a Fiddle profile. Other important activities for staying fit are working (many are still employed) and social events.

7.3.1.2 Hole in the Heart

The members of the Hole in the Heart profile suffer from physical and mental limitations. The experts conclude that cardiovascular disease, problems with the musculoskeletal system, diabetes or obesity such as mental problems like depression and inflexibility are common within this group. Caused by these problems dependency increases and people need help in their households (cleaners, meals on wheels, etc.) or even nursing care. High expenses on therapy, aids, for support, etc. are problematic for social groups with lower income. The bad state of health causes mobility limitations and an increasing the risk of social exclusion, depression and addiction (alcohol, pills, etc.).

The coping strategies within the Hole in the Heart profile differ individually. While one part is resigning, the others try to change their bad situation and are open for new experiences, social contacts, therapies and technologies. In order to cope with the problems social support, especially from family or close friends is important. Therapy, support groups and new social contacts can help members of the Hole in the Heart group to get better. For parts of this profile technologies may improve their communication (especially internet) and mobility (navigation systems, driving assistance systems, etc.).

7.3.1.3 Happily Connected

The range of problems among this group may vary from no problems to beginning severe physical (and mental) limitations. The difference of this group compared to the others is the ability to cope with problems and the ability of adapting to new strategies rather quickly. The support of family and friends is very important in this context.

Members of this group may be afraid of physical limitations as well as isolation. Those who can afford it, use their financial resources to improve their health. Stays at health resorts, health gymnastics, massages and special health programmes are popular among this group. Other activities to improve the physical and mental health are physical exercise and sports (together with the partner), courses (further education), reading and walking such as being active in organisations and clubs. Financial problems may occur after the death of the partner, especially when women were depending on the earnings of their husbands.

7.3.1.4 An Oldie but a Goodie

Physical and mental abilities of this profile decrease, mainly caused by the high age. Members of the Oldie but a Goodie profile need more time for their daily activities, they need more time to relax and they are not that active and independent any more. Limitations of the

musculoskeletal system make activities in household and garden exhausting. More help of others (family, friends, or professionals) is needed. Forgetfulness and starting Alzheimer's disease such as physical limitations may cause dissatisfaction. To cope with the problems and to stay physically and mentally fit people are trying to stay active, they take walks, meet friends, watch TV or play parlour games.

7.3.1.5 The Care-Full

The members of the Care-Full profile suffer from severe physical as well as mental problems. The experts conclude that this group has a high need for nursing care and is not able to manage their lives without support any more. Special services, support and care are expensive; this fact may cause less support for people with lower incomes. Caused by cognitive decline and immobility people lose social contacts and feel lonely. A few close friends and family members are the main social contacts. Coping with the problems is hard; people compensate by doing indoor activities in their homes like watching TV or reading newspapers.

7.3.2 Use of Technologies

The second question block covered questions concerning technology usage of older people. The experts and intermediaries were asked about the problems of older people with orientation and navigation in unfamiliar areas, the use of technologies for orientation and navigation, general technology usage and the problems and reasons for not using technologies.

7.3.2.1 Fit as a Fiddle

Members of the Fit as a Fiddle group do not have serious problems with orientation and navigation in unknown areas. One of the experts states that older people living in rural areas have more problems with orientation and navigation in unknown areas than people living in cities. Among the Fit as a Fiddle group the internet, navigation systems (and smart phones) are used frequently. The preferred way of usage and the frequency depend on experiences e.g. from profession or personal interest. For the orientation and navigation in unknown areas conventional timetables and maps are used besides technologies. Although the technologies are used frequently, problems with complicated handling, rapid changing systems, too small devices and keyboards as well as text sizes occur.

7.3.2.2 Hole in the Heart

The experts and intermediaries conclude that members of the Hole in the Heart group prefer well known and familiar environments. Doing unknown trips may cause insecurity or even fear, hence often support and companionship is needed.



Members of the Hole in the Heart profile use less technology. To get information for their trips they prefer asking family or friends or the usage of maps and timetables. Some members of this group see technologies as very important possibility to improve their quality of life: They use the internet to get in contact with others and to stay informed, and navigation systems and driving assistance systems are used to improve mobility. Others do not use technologies at all because for them they are too complex (missing information and explanation, no experiences, refusal of new things) or their physical and cognitive deficiencies to not allow usage of modern technologies.

7.3.2.3 Happily Connected

In general the navigation and orientation in unknown areas gets harder with age, but abilities strongly depend on experiences (profession, personal interest, education, etc.), support and encouragement to use technologies by family, friends and grandchildren. Some high-end technologies are often too complex for this profile, but navigation systems or the internet are used within this group. For navigation orientation maps and timetables are often preferred over technologies.

Problems are caused by too complex handling, rapid changes and updates, changes of the interfaces, small font sizes, too small sizes of the devices, missing information and knowledge about usage, too complicated language and technical terms such as psychological barriers (people are afraid of mistakes, asking others for help, little usage within the peer-group).

7.3.2.4 An Oldie but a Goodie

Among the Oldie but a Goodie profile unknown areas are avoided whenever possible. Orientation and navigation problems increase with age and beginning physical and mental limitations. The main information sources are newspapers and TVs, and some members of this profile also use simple applications on the computer.

Problems and barriers against using technologies are too complicated handling, too small devices, missing information about technologies, missing explanations, missing experiences, psychological barriers, especially fears of making mistakes.

7.3.2.5 The Care-Full

Members of the Care-Full profile have a very small radius of movement in their well-known environment. They do not do any unknown trips without support. If they need information they prefer asking their families. Technologies like radio or TV are used because they have experiences in using them from the past. Problems with technologies are their cognitive limitations, lack of access and information about the possibilities as well as their averseness to try something new.

7.3.3 Transition Points

The main transition points in the lives of elderly are retirement, death of the partner/spouse, death of friends (loss of social contacts and peers), severe illness or injury, or relocation. Other events reported are children moving out, care for own parents, death of own parents, birth of grandchildren, divorce and marriage. In general there is a strong individual component defining the effect of specific events on potential transitions between profiles. The transition points which are hardest to cope with are the death of the partner / spouse or the loss of social contacts and networks.

Most of the experts mentioned that after these transition points negative aspects like more dependency on others, isolation and loneliness, problems to manage daily life, immobility, lack of perspectives, stress or depression occur. Others concluded that not only negative developments are possible. New activities or new social contacts after a positively experienced transition point may change the life in a positive way.

Coping strategies strongly depend on the person. While some older people fall into depression, isolation and give up social contacts, others try to make the best out of their situation and start new activities or even a new life. For coping with difficult situations the support of family and close friends is very important. The persons with strong social networks are more likely to overcome serious problems like the death of a partner or severe illness than people without families and small social networks.

Table 7-1 shows an overview of the transition points related to the ingress to a profile, departures from a profile as well as possible succeeding profiles for each of the five defined profiles.

	Get into Profile	Leave Profile	Follow-up Profiles
Fit as a Fiddle	<ul style="list-style-type: none"> • age • retirement • children leave home 	<ul style="list-style-type: none"> • death of close person • illness or injury • retirement • grandchildren 	<ul style="list-style-type: none"> • Happily Connected (strong social contacts) • Hole in the Heart (bad health)
Hole in the Heart	<ul style="list-style-type: none"> • illness • injury • bad state of health 	<ul style="list-style-type: none"> • worse or better physical and psychological state of health • new social contacts 	<ul style="list-style-type: none"> • Happily Connected or Oldie but Goodie (health, social contact) • the Care-Full
Happily Connected	<ul style="list-style-type: none"> • retirement • loss of partner • age • starting limitations • grandchildren • active social life 	<ul style="list-style-type: none"> • severe illness • dependency on others • loss of partner • loss of social contacts • less activities 	<ul style="list-style-type: none"> • Hole in the Heart or the Care-Full (illness) • an Oldie but Goodie (loss of partner, but still quite active)
an Oldie but a Goodie	<ul style="list-style-type: none"> • no severe health problems despite high age • positive attitude towards live • independency 	<ul style="list-style-type: none"> • death of a close person; • severe illness; • in profile till they pass away 	<ul style="list-style-type: none"> • the Care-Full (physical / mental health get worse)
the Care-Full	<ul style="list-style-type: none"> • severe illness • bad health conditions 	<ul style="list-style-type: none"> • pass away • positive: health getting better, more independence 	<ul style="list-style-type: none"> • an Oldie but Goodie (unlikely)



	• (nursing) care needed	(unlikely)	
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Table 7-1: Transitions between profiles (overview).

According to the experts it is hard to leave the “problematic” groups like Hole in the Heart or the Care-Full again. Particularly for the Care-Full the chances to leave the profile are very low. For the Hole in the Heart group activities, physical and mental exercise, therapy and training as well as support groups might be helpful. In this group, new social contacts and friendships or even a new love can change a lot. Among the members of the Hole in the Heart profile openness towards new things and the willingness to change are necessary. Support of family is important here again. Family members like the own children or grandchildren may help people to start new activities, new therapies or trainings and to get new self-confidence. It was also mentioned that prevention and strategies for not reaching problematic profiles are very important. Older people, even if they are still healthy and fit, have to be aware of their own ageing process and should take arrangements for the worst case in advance.

7.3.3.1 Fit as a Fiddle

People get into the Fit as a Fiddle group when they grow older and after the children moved out. Some of them are retired, but all are healthy, fit and satisfied with their lives and they still want to experience new things. After retirement, birth of grandchildren, death of the partner or a close person such as illness or injury people may leave this profile again. The most likely profiles to follow are Happily Connected (having a more family oriented live, looking after grandchildren or get socially active after the loss of a partner) and Hole in the Heart after illness or injury.

7.3.3.2 Hole in the Heart

Older people are in this profile because of severe illness or their bad physical and mental health status. There are two main paths to leave this profile again. On the one hand there is the “bad” way; the illness gets worse, people need more care and they lose more social contacts and the Care-Full profile will follow. On the other hand members of the Hole in the Heart group can also get better, recover and find new activities, support or a new love (see above). Profiles like Happily Connected or an Oldie but a Goodie can follow.

7.3.3.3 Happily Connected

The Happily Connected group is characterised by the active social life of the members. People get into this profile after retirement, the birth of the grandchildren, the death of the partner (more contact to families and friends) and when some physical and mental limitations start. There are also many potential ways to leave the Happily Connected group again. When health is getting worse and people cannot be that active anymore or after the death of a

partner and the decrease of social contacts, the Oldie but a Goodie profile may follow. If the physical and mental health gets worse e.g. after a severe illness or the death of a close person the profiles Hole in the Heart or in the worst case the Care-Full may follow.

7.3.3.4 An Oldie but a Goodie

Older people get into the Oldie but a Goodie group when they are not that active anymore, because of high age and some physical (and mental) limitations. Despite the high age their health is rather fine and they live quite independently (some make use of meals on wheels, mobility services, help in the household, but they are able to manage these things on their own) and have a positive attitude towards life. After a severe illness or the death of a close person people may develop physical and mental problems and are likely to enter the Care-Full profile. Once reached this profile the probability to transfer into other profiles (except the Care-Full) is small. Older people of this group often pass away after a satisfying life.

7.3.3.5 The Care-Full

People are in this profile because they are in a very bad state of health and due to their need for care and support. It is hard to leave the Care-Full profile again. When the state of health gets better through successful therapy and daily activities can be managed independently the Oldie but Goodie profile may follow.

7.4 Overview of the results of the surveys

Based on the findings from the analysis of the surveys the following conclusions are drawn on living conditions and social networks, mental problems, residential areas and mobility behaviour, technology and information (Table 7-2):

	Fit as a Fiddle	Happily Connected	Hole in the Heart	an Oldie but a Goodie	the Care-Full
living conditions and social networks	<ul style="list-style-type: none"> live with families (maybe children still at home); daily contact to family, close friends less activities and participation in clubs 	<ul style="list-style-type: none"> live with partner well connected with friends and neighbors; very active in clubs 	<ul style="list-style-type: none"> family and friends very important; less participation and activities in clubs 	<ul style="list-style-type: none"> highest rate living alone; less contact to family and friends but active in clubs 	<ul style="list-style-type: none"> often nursing care or support needed; supported by family or live in homes for elderly / assisted living
mental problems	<ul style="list-style-type: none"> no mental limitations 	<ul style="list-style-type: none"> starting forgetfulness, starting cognitive decline 	<ul style="list-style-type: none"> cognitive decline, depression, unreasonableness missing flexibility, inactivity 	<ul style="list-style-type: none"> forgetfulness, more dependency on others; being slowly → dissatisfied with themselves 	<ul style="list-style-type: none"> cognitive degradation, dependency, depression, loneliness, aggressively, anxiety
residential area and mobility behaviour	<ul style="list-style-type: none"> highest rate in suburbs and many in rural areas; leave home daily; prefer the car (all have driving licenses) 	<ul style="list-style-type: none"> live in villages, rural areas or big cities; leave homes often; prefer driving; most have a driving license and are the main drivers 	<ul style="list-style-type: none"> live in cities or villages, not in suburbs; leave homes less often; do not like the public transport connections in their residential area; are passengers often; avoid unknown trips 	<ul style="list-style-type: none"> live in cities, villages not in the suburbs; are still quite active; leave home regularly; highest rates of public transport usage passengers in cars; avoid unknown trips 	<ul style="list-style-type: none"> not able to be mobile on their own; need special mobility services and/or help of family members; avoid unknown trips
technology and information	<ul style="list-style-type: none"> little problems with technology usage use internet, navigation systems, route planners use e-bikes 	<ul style="list-style-type: none"> usage of technological aids depend on experiences use internet, navigation systems and route planners but also maps highest usage of e-bikes and driving assistance systems 	<ul style="list-style-type: none"> differences within the profile: some see technologies as useful support (communication, mobility, etc.) others avoid technology 	<ul style="list-style-type: none"> technology avoidance prefer asking friends on unknown trips or use maps 	<ul style="list-style-type: none"> technology avoidance
transition points	<ul style="list-style-type: none"> retirement or severe illness (of a close person) after life changing events: tend to use the car more often but also to do more things on foot 	<ul style="list-style-type: none"> retirement and loss of social contacts do things on foot much more often; use public transport more often (but car still very important) 	<ul style="list-style-type: none"> most problems in coping main: severe illness, death of a close do things on foot less often; differences within the usage of public transport; depend more on others; shorter distances 	<ul style="list-style-type: none"> severe illness, death of partner/spouse; highest number not using car anymore; do things on foot more often; depend more on others and special services; distances get shorter 	<ul style="list-style-type: none"> severe illness; injury; bad health conditions; nursing needed

Table 7-2: Overview of survey results.

8 Final Profiles

As described above the development of the final profiles includes detailed information from literature, the clustering of the SHARE database, additional information from SHARE, information from other surveys (Keep Moving from the Netherlands, MID from Germany, ISTAT from Italy), feedback from international experts (Workshop) as well as information from two small additional surveys. The following sections provide the concluding and summarised information for each profile.

8.1 Fit as a Fiddle

The younger and fit elderly belong to this group, who do not consider themselves as “old people”. Most of them are between 50 and 60, are married, live in a partnership or also with their children, have excellent physical and mental health and are still employed. The dependence on the car is high and the average number and length of trips does not differ from the average population. The group members have a comparably high income and are satisfied with their autonomy and their quality of life. Furthermore, they are very active and have excellent social networks. Technologies are used regularly but the amount of the usage depends on experiences. Main life-changing events are retirement or illness / death of a close person. The profiles Happily Connected or Hole in the Heart are the most likely to follow.

Fit as a Fiddle	
<p>Demographics</p> <ul style="list-style-type: none"> do not consider themselves as “old people” the „youngest“ (between 50 and 60) higher income and education still employed 	<p>Health and Life Satisfaction</p> <ul style="list-style-type: none"> excellent physical and mental health, very active high quality of life and life satisfaction
<p>Living conditions and social networks</p> <ul style="list-style-type: none"> married or in a partnership (many live with their families – children are still living at home) good social networks less memberships in organisations and clubs (employment, lack of time) 	<p>Mobility Behaviour</p> <ul style="list-style-type: none"> prefer private cars and driving, almost everyone has a driving license use public transport on a little amount lengths and average number of trips does not differ from average population value their mobility opportunities better than average
<p>Living Environment</p> <ul style="list-style-type: none"> little problems with living environment 	<p>Technology and Information</p> <ul style="list-style-type: none"> little problems with technology usage (internet, navigation systems, route planners are used regularly) depend on experiences (especially of profession, personal interest) use e-bikes



<p>Transition Points:</p> <ul style="list-style-type: none"> retirement, severe illness (of a close person), birth of grandchildren may be life-changing leaving the profile: Happily Connected or Hole in the Heart may follow 	<p>Future Trends / Research Needs</p> <ul style="list-style-type: none"> prevention and training (staying fit and mobile; using other transport modes than private cars)
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8.2 Hole in the Heart

In spite of their relatively young age (50 to 75), the members of this group suffer from pain and illness and are severely limited in activities. Chronic diseases like fatigue, diabetes, obesity or cardiovascular disease are often diagnosed among this group. Besides the physical problems, many group members are depressed, have fears and feel lonely. Limited activities and mobility problems also may lead to exclusion of participation in social life. The car is the preferred mode of transport because it is more comfortable and easier to use than public transport, but the risks for accidents of drivers in this profile increases. When members of this profile are not able to drive any more they use public transport only if they have made experiences in using public transport services before. Because of their health problems, the number of trips is reduced, they are shorter and there are more trips to hospitals and medical facilities. Members of this profile have the most problems coping with life-changing events like retirement, illness or the loss of the partner. If the physical and mental state of health gets worse, they will end in the Care-Full group, but therapy, support groups or new social contacts may change the situation and they can reach the Happily Connected or the Oldie but a Goodie group.

Hole in the Heart	
<p>Demographics</p> <ul style="list-style-type: none"> between 50 and 75 have lower income almost everyone retired, permanent sick or disabled 	<p>Health and Life Satisfaction</p> <ul style="list-style-type: none"> poor to bad physical and mental health suffer from fatigue, diabetes, cardiovascular disease, depression severely limited in activities and mobility
<p>Living Conditions and Social Networks</p> <ul style="list-style-type: none"> limited activities and mobility problems lead to exclusion of participation in social life family and friends are very important less participation and activities in clubs or associations 	<p>Mobility Behaviour</p> <ul style="list-style-type: none"> depend on driving (easier, more comfortable, familiar); have problems with using alternatives use public transport if they live in a well connected area and have positive experiences reduction and shortening of trips many trips to hospitals and medical facilities avoid unknown trips if possible
<p>Living Environment</p> <ul style="list-style-type: none"> need barrier-free infrastructure are dissatisfied with facilities in their 	<p>Technology and Information</p> <ul style="list-style-type: none"> differences within the profile: some see technologies as useful aid to get in



neighbourhood / public transport • are afraid of vandalism and crime	touch with other people, to improve mobility and to make driving easier • others avoid technologies
Transition Points • most problems to cope with severe illness, death of the partner, retirement • worsening of physical and mental health → the Care-Full • new social contacts, friends, new love, therapy → an Oldie but a Goodie or Happily Connected	Future Trends / Research needs • technology acceptance: special aid and technology may help to stay autonomous and to keep in touch with their social contacts • technologies to improve mobility • lifestyles and coping strategies • alternatives to driving are needed / usage of transport modes

8.3 Happily Connected

This profile is characterised by a very active and social lifestyle. Most of the group members are between 60 and 75, are married or live in a partnership. The family and especially the care for their grandchildren are very important. Besides that, this group has a very active social life doing volunteer work, helping friends and neighbours, being members of seniors' clubs and organisations. All these activities and their good health lead to a high life satisfaction. Driving is the most important transport mode, where the men are the primary drivers and their women are mainly passengers. The members of this group do a large number of car trips and complex trip chains, but they are driving fewer kilometres than younger drivers and they are favouring calmer roads and avoiding traffic peaks and night time driving. After retirement they do more things on foot. The usage of technology is high among this profile compared to the other groups but there are differences within the group, depending on the experiences from former jobs etc. The internet, navigation systems and route planners such as driving assistance systems and e-bikes are used. Retirement and the loss of social contacts as well as injuries or illness are important life-changing events. Profiles like Hole in the Heart or the Care-Full may follow after worsening of the state of health. After the death of the partner or loss of social contacts they might get into the Profile an Oldie but a Goodie if they are still active and independent.

Happily Connected	
Demographics • are between 60 and 75 • some are still employed, but the most retired	Health and Life Satisfaction • good to fair health • very active: do exercise for staying mobile, independent and fit • are satisfied and mobile
Living Conditions and Social Networks • are married or live in partnership • high importance of family (grandchildren) and friends • have an active social life: do a lot of volunteer work, help friends and neighbours,	Mobility Behaviour • prefer driving (especially men; their women are passengers) • do more things on foot • avoid night time driving, traffic peaks, highly frequented streets

are members of senior's organisations and clubs	<ul style="list-style-type: none"> do complex trip chains but fewer distances than the average population
Living Environment <ul style="list-style-type: none"> little problems with infrastructure in their living environment 	Technology and Information <ul style="list-style-type: none"> usage of technologies depend on former experiences use internet, navigation systems, route planners use driving assistance systems and e-bikes
Transition Points <ul style="list-style-type: none"> Retirement and changing of social network are the reasons to get into this group following profiles: <ul style="list-style-type: none"> an Oldie but Goodie (after loss of close person, less social activities) Hole in the Heart or the Care-Full (after severe illness, injury and increasing dependency on others) 	Specialities / Future Trends <ul style="list-style-type: none"> increasing number of female drivers differences between men and women differences in residential area (usage of transport modes, facilities and services that could be reached,....) lifestyles (coping with problems, being aware of getting older,....) usage and acceptance of technologies

8.4 An Oldie but a Goodie

The members of this group are aged 80 to 90. Most of them are female and are living single. Despite of their high age, they are quite healthy and they are not severely limited in activities. Caused by their living alone, they are forced to manage daily live without support of others and to leave the house or flat. Walking and public transport (except underground) are their preferred modes of transport. Members of this group do not have as much contact to family and friends (compared to other groups) but they are active in clubs and organisations. They do less and shorter trips and use the time periods between rush hours. The high live satisfaction and self-efficacy of this group influences their physical health and their mobility in a positive way. Members of the Oldie but a Goodie profile avoid technologies and unknown trips if possible. The death of a close person or a severe illness could be incisive transition points after those people may leave this profile and change to the Care-Full group.

An Oldie but a Goodie	
Demographics <ul style="list-style-type: none"> between 80 and 90 more female all retired 	Health and Life Satisfaction <ul style="list-style-type: none"> good health despite high age limited in activities but not severely high self-efficacy and life satisfaction influence health and mobility in a positive way use aids like cane, walker,...
Living Conditions and Social Networks <ul style="list-style-type: none"> living alone (are forced to manage their 	Mobility Behaviour <ul style="list-style-type: none"> low number of car drivers



<ul style="list-style-type: none"> daily live without lot support by others) some need services like meals on wheels or help in their households less contact to families, friends (compared to other profiles) active in clubs and senior's associations 	<ul style="list-style-type: none"> depend on public transport – reduction of public transport will cause problems walking gets more and more important do less and shorter trips avoid extreme weather, waiting times, special social groups, transport modes (underground, cycling) and unknown trips (when possible)
<p>Living Environment</p> <ul style="list-style-type: none"> need local access to public transport need barrier-free infrastructure (broad sidewalks, ramps, elevators, traffic free zones,...) 	<p>Technology and Information</p> <ul style="list-style-type: none"> technology avoidance prefer asking family or friends using maps
<p>Transition Points</p> <ul style="list-style-type: none"> severe illness or death of a close person → physical and mental problems, higher dependency on others and more need for special services following profile: the Care-Full 	<p>Specialities / Future Trends</p> <ul style="list-style-type: none"> higher life expectancy (of women); many women not married → growing group driving will increase (more women with driving license) increasing need for services (meals on wheels, household help, mobility services, etc.) gender differences residential area ambient assistance living

8.5 The Care-Full

This is the group of the very old and frail elderly, who suffer from severe physical and mental diseases such as dementia, Alzheimer's disease, senility or Parkinson. The eyesight and the hearing are bad. Most members of this group depend on care, assistance and help of others. Caused by the diseases and mobility limitations the members of this group do not leave their homes very often. When they do so, most of them need assistance from their families (lift in cars) or they use special transport services. Usually, the very old are doing passive activities in their homes like watching TV, listening to the radio or reading newspapers. There is a high risk of social isolation, which is why this group especially likes receiving visitors. It is hard to leave this group again. Improvement of the physical and mental health conditions and less dependency on others may in some cases lead to the Oldie but a Goodie group.

The Care-Full	
<p>Demographics</p> <ul style="list-style-type: none"> the group of the very old and frail elderly (age 85 to 100) most widowed lower income 	<p>Health and Life Satisfaction</p> <ul style="list-style-type: none"> very bad physical and mental health suffer from dementia, Alzheimer's disease, Parkinson bad eyesight and hearing many do not have hopes for the future
<p>Living Conditions and Social Networks</p>	<p>Mobility Behaviour</p>

<ul style="list-style-type: none"> depend on care and help of others and nursing care like receiving visitors live with family or in a home for elderly/assisted living 	<ul style="list-style-type: none"> highest use of transport services travelling (especially in public transport) causes stress prefer walking, but some do not even feel safe walking outdoor mobility decreases dramatically avoid unknown trips
<p>Living Environment</p> <ul style="list-style-type: none"> barrier-free and handicapped accessible infrastructure necessary do passive activities within their homes (newspapers, TV, radio) and like receiving visitors 	<p>Technology and Information</p> <ul style="list-style-type: none"> avoid technologies use TV, radio
<p>Transition Points</p> <ul style="list-style-type: none"> get into Profile because of bad physical and mental health and the need for support and care group hard to leave improvement of health conditions and less dependency → an Oldie but a Goodie 	<p>Specialities / Future Trends</p> <ul style="list-style-type: none"> the need for caregivers assisting immobile seniors will multiply in future the ratio of elderly who are severely limited will grow ambient assistant living

8.6 Discussion of the final profiles (Workshop 2)

The final profiles were presented at the SHARE Users Conference in Venice (June 28-29). In the first Session the work of the project GOAL was introduced by members of the project team. The talks included the development of the profiles from the SHARE database, the main results concerning mobility behaviour and transition points and the role and potential of typologies in research about elderly and mobility. Afterwards there was a panel discussion with the invited international experts focusing on the profiles of older people.

In the second Session international experts gave talks about heterogeneity of the target group of older people. The presentations focused on reflections about diversities and inequalities among older people (J. Dangschat, Vienna University of Technology), the interplay between mobility, aging and health (A. Dellinger, CDC Centers for Disease Control and Prevention, Atlanta USA) and the risks and resources between autonomy and need for care (S. Blüher, Charité Berlin).

The third Session focussed on the staying active, fit and mobile in higher ages. Talks were given from about the usage of public transport (J. Janse, JJ Advies) and age and activity-friendly open spaces (R. Diketmüller, University Vienna).

9 Conclusions and Future Work

9.1 Use of Profiles for Mobility Research: Behavioural Levels

The profiles developed in the course of this Work Package provide comprehensive and excessive information about five different types of older people. The profiles have been repeatedly deepened and discussed within the GOAL team and with external experts from different disciplines (especially during a second workshop at the SHARE User's Conference on June 29 in Venice, see Appendix for details concerning agenda and invited experts).

In order to successfully use the profiles for assessing the potential of current developments in mobility research, the numerous different aspects of the profiles have to be systematically considered. As the profiles contain commonly regarded measurable characteristics such as physical or mental limitations as well as more qualitative attributes concerning life styles, coping strategies or attitudes towards different aspects of mobility, it is necessary to provide a framework for the assessment of R&D activities in mobility research with regard of all profile-related aspects. In this respect, a model of mobility behaviour levels may provide a valuable structure for systematic assessments of transport solutions in the following work packages of the GOAL project.

Human mobility is embedded in social as well as in the technological environment. Human beings are one of the many components of the transport system. There are a number of basic tasks that together constitute the set of relations between people and environment in which they attempt to satisfy their mobility needs. In this context John Michon (1979, cited in Michon 1985) introduced the idea that road users make decisions on a hierarchical three levels based on skills and control (Michon 1985): *strategic* (where to go), *tactical* (how to do it) and the *operational* decisions (the actual walking, driving, being mobile). Donges (1982 cited in Donges 1999) combined the performance levels according to Rasmussen (1986) and the model of Michon (1985). Rasmussen distinguishes between *knowledge-based*, *rule-based* and *skill-based* levels of a task (Figure 9-1).

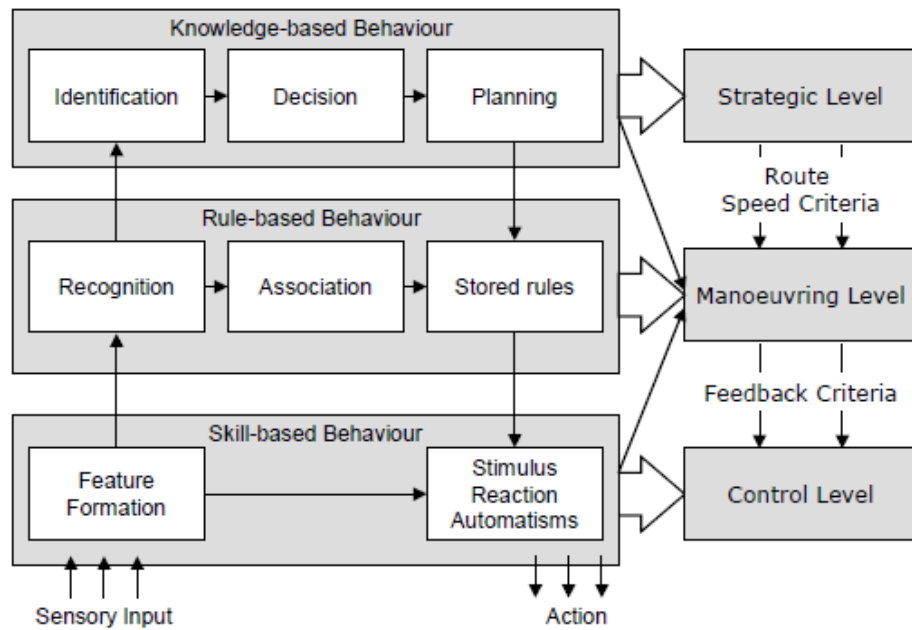


Figure 9-1: Combination of performance levels of Rasmussen and the model of Michon (Donges 1999)

A further development of the levels of behaviour was done by Hatakka et al. (1999), who introduced the lifestyle level. For each level there are specific needs, opportunities and abilities to be taken into account. The levels are described as follows based in PQN⁶ (2010):

Lifestyle level: decisions like where to live, where to work, what kind of job one takes, marriage, getting children, retire from work etc. This relates to goals for life and skills for living. Existential decisions relate to ‘being’ and identity.

Strategic level: the decisions one takes before one gets into traffic, like travel choice (motive), where to (destination) and which mode will be used. Strategic decisions relate to ‘going’.

Tactical level: decisions one takes in traffic with regard to the route to be taken, where to cross, walking or driving speed and so on. Tactical decisions relate to ‘travelling’.

Operational level: reactions to other road users, the traffic situation and other interacting persons and animals. With regard to pedestrians, operational decisions relate to ‘walking’.

Table 9-1 gives a combined overview of the models briefly described above.

Level of Behaviour	Level of Performance	Type of Decision	Behavioural Goal
Lifestyle	Lifestyle based	Fundamental decisions related to goals for life and skills for living.	Being and Identity

⁶ Report on Pedestrian Quality Needs



Strategic	Knowledge based	Decisions relating to travel purpose (motive), where to go (destination) and which mode will be used	Going
Tactical	Rule based	Decisions with regard to the route to be taken, places to cross, walking or driving speed, etc.	Travelling
Operational	Skill based	Operational decisions or reactions relating to other road users, traffic situations and the interacting with persons and obstacles.	Walking

Table 9-1: Overview of Behavioural Levels (combined information from Michon 1985, Rasmussen 1986, Hatakka et al. (1999) based on Decomobil (2011); modified.

By considering these different behavioural levels current developments concerning driving, use of public transport, walking and cycling as well as transport information systems can be efficiently assessed with respect to their potential for success regarding the specific support of people belonging to the different profiles. In this way, areas of intensive research and development activities (e.g. certain technological aids on the operational level) can be equally identified like aspects that are currently still largely disregarded (e.g. approaches fostering training or expanding social activities on the strategic and lifestyle levels). Additionally, solutions that appear highly beneficial can be more thoroughly investigated concerning the question whether they provide equivalent advantages for all older people or just some of the profiles, whereas other profiles cannot benefit from these solutions and may require different approaches. Finally, the consideration of transition points and related consequences for profile transitions provides the chance to particularly focus on solutions fostering desirable “profile careers” and avoid unfavourable transitions.

In order to provide suitable starting points for the assessment of research developments in relation to the profile-related needs of older people, the factors influencing each of the behavioural levels for the five profiles are summarised in the tables below.

Fit as Fiddle	
Lifestyle	<ul style="list-style-type: none"> do not consider themselves as old live with family or partner still employed (less financial problems)) good social networks high life satisfaction and autonomy transition points: retirement, severe illness, birth of grandchildren
Strategic	<ul style="list-style-type: none"> car important mode of transport / less public transport used travel purpose: work, leisure use internet, route planners, technologies
Tactical	<ul style="list-style-type: none"> all routes are taken / no limitations no mental problems like depression, fears, etc. do complex trips chains (length and number of trips does not differ from average population)



	<ul style="list-style-type: none"> • use navigation systems, route planners
Operational	<ul style="list-style-type: none"> • excellent health • no problems with eyesight / hearing • do not need drugs • low risk of accidents • good cognitive skills

Table 9-2: Aspects influencing behavioural levels of the Fit as a Fiddle.

Hole in the Heart	
Lifestyle	<ul style="list-style-type: none"> • lower quality of life • most retired or permanently sick • less social contacts / activities – risk of loneliness • two main coping strategies: 1.try to get better (therapy, social contacts, technology usage, etc.); 2. Resigning (withdrawal from social life, giving up hopes) • most coping problems • transition points: illness, death of close person (partner), new social contacts or loss of social contacts
Strategic	<ul style="list-style-type: none"> • lower flexibility • driving preferred mode (easier, experiences, familiar, comfort.) • more trips to hospitals / medical facilities • often assistance needed (ride in cars from family members) • dissatisfaction with public transport • technology avoidance (one part of the profile) while other part use internet, route planners • avoidance of unknown trips if possible
Tactical	<ul style="list-style-type: none"> • avoiding activities (psychological / health reason) • reduction and shortening of trips • avoid driving at night, poor weather, unfamiliar roads • afraid of crime • fear of falling
Operational	<ul style="list-style-type: none"> • poor health (cardiovascular disease, cognitive decline, depression) • mobility problems: (walking stairs, getting up, sitting longer, etc.) • pain • drugs needed • high risk of (car) accidents

Table 9-3: Aspects influencing behavioural levels of the Hole in the Heart.



Happily Connected	
Lifestyle	<ul style="list-style-type: none"> • live in a partnership • very good social network (family, care for grandchildren, friends, clubs, volunteering,...) • high quality of life • autonomy • most retired • saying fit and healthy important goal • transition points: severe illness or injury, loss of social contacts (family member or friends)
Strategic	<ul style="list-style-type: none"> • car trips preferred (particularly by men; their women are passengers or use public transport) • increasing importance of walking • leisure activities, family, friends, clubs travel purpose • technology usage strongly depends on experiences: navigation systems and driving assistance systems are used
Tactical	<ul style="list-style-type: none"> • avoid night times, peak hours, crowded public transport • shorter trips than average population but still complex trip chains • low score of fears • little problems with infrastructural conditions
Operational	<ul style="list-style-type: none"> • beginning health problems (cardiovascular disease, musculoskeletal system, dementia,...) • no serve mobility limitations (getting up from chair, sitting longer, kneeling, etc.)

Table 9-4: Aspects influencing behavioural levels of the Happily Connected.

an Oldie but a Goodie	
Lifestyle	<ul style="list-style-type: none"> • more living alone / more female (higher life expectancy of women) • retired • some financial problems • satisfaction and self-efficacy • autonomy • transition points: severe illness, death of a close person
Strategic	<ul style="list-style-type: none"> • need mobility aids • highest rates of public transport usage • walking most important mode • trip purpose: visiting friends or family, daily shopping • often passengers in cars • assistance needed for important and unknown trips • do not use technologies (use maps)
Tactical	<ul style="list-style-type: none"> • getting slowly, need more time to relax • less and shorter trips (avoid unknown trips if possible)



	<ul style="list-style-type: none"> • need accessible and barrier-free environment • need local access to public transport • avoid extreme weather, confrontation with social groups (fears), transport modes (underground) • fear of falling
Operational	<ul style="list-style-type: none"> • health okay despite high age • beginning dementia • hearing and eyesight fair to poor • some mobility problems: specially stairs, heavy loads,... • limited in activities but not severely

Table 9-5: Aspects influencing behavioural levels of the Oldie but a Goodie.

The Care-Full	
Lifestyle	<ul style="list-style-type: none"> • living without partner (family or home for elderly / assisted living) • lowest autonomy and life satisfaction • (nursing) care needed • risk of social exclusion • do passive activities within their homes, like receiving visitors • transition points: severe illness, dependency on others, loss of social contacts
Strategic	<ul style="list-style-type: none"> • assistance needed: mobility services or companionship from family • need mobility aids • often passengers in cars (family) • traffic participation = problematic • trips to hospitals / medical facilities • avoid travelling alone
Tactical	<ul style="list-style-type: none"> • fear of falling • avoid unknown trips • outdoor mobility decreases dramatically (small radius around home) • severe problems with snow, ice, steps, crossings, vehicles on footpaths, lack of ramps,...
Operational	<ul style="list-style-type: none"> • very bad health (mental and physical) • severely limited in mobility • problems: eyesight, hearing, dementia, pain • drugs needed • cognitive decline

Table 9-6: Aspects influencing behavioural levels of the Care-Full.

9.2 Future Trends and Research Needs

In the further course of the GOAL project, the analysis of existing and upcoming developments regarding the different modes of transport addressed in the respective work packages should be performed with respect of each of the profiles, even if a specific mode of transport is not frequently (or not at all) used by the people belonging to a profile. Generally, it is desirable that all older people are able to use as many different modes of transport as possible. This provides them more degrees of freedom in selecting appropriate options, gives them more self-dependency and decreases the risks of mobility limitations in case a specific mode can be used no longer (e.g. loss of driving licence, no more public transport station in reach after relocation). For each of the profiles, specific attention should be drawn on reasons why people of a profile may not at all/not any more/not yet use a specific mode of transport. This can lead to further insights into potential approaches for achieving a more extended freedom in mode choice and form the basis for recommending future research focuses aiming at widening the range of mode selection for older people and preventing older people from changing into or maintaining in a profile with low activity levels and limited mobility.

Although the profiles comprise of very extensive information resources compared to other approaches, some information concerning determinants of elderly mobility is still hard to achieve. The different steps along the way of identifying the GOAL profiles have revealed several potentially important gaps in relevant data (either because the respective data is not existent or not available) and related literature (insufficient or unclear knowledge about certain aspects of elderly mobility and its future development). Therefore, it is recommended to consider the following suggestions in future research activities for preparing a broader and deeper information basis for further investigations of older people's transport patterns and needs.

The initial development of the profiles was based on the SHARE database, which has a strong focus on health related features. Although the SHARE database is very rich, little information is known or available concerning mental health and cognitive skills of older people related to mobility, as there is only limited transnational data available.

As described in Chapter 3.1 and 3.2, there are more determinants influencing mobility behaviour besides health-related attributes. The residential area including the quality of infrastructure (barrier free access) and the availability of facilities nearby, the perceived safety of the neighbourhood as well as the availability of public transport play an important role. In this context a deeper investigation of the profiles might be necessary, as representatives of the profiles may be found (to different extents) in all types of residential areas, but their reaction to these dissimilar circumstances and hence their mobility behaviour and needs can differ. The consequences e.g. for members of the Fit as a Fiddle group living in rural areas without public transport are completely different than for members of the Hole in the Heart profile.

The lifestyles of older people are crucial influence factors of mobility but still insufficiently recognised in transport studies. Though there is a lot of data available concerning socio-demographic features, research about lifestyles has to include a wider perspective and requires the consideration of approaches from different scientific disciplines. In the context of the GOAL profiles it is for example necessary to learn more about the different coping strategies or transition points. Hence, future research on older people has to put a stronger focus on different lifestyles and other concepts taking account of specific preferences, aversions and general attitudes. In this respect it would be especially beneficial to develop a commonly agreed and approved evaluation of lifestyles in social sciences, which is not yet available.

Transition points (life-changing event such as e.g. where older people stop driving or using special modes of transport, reduce their mobility radius or stop leaving their homes) should be investigated in more detail, as they can cause an older person to drop out of a more active and mobile profile and enter a profile with more limitations and less opportunities. The additional surveys provided first insight into this matter, but further research taking longitudinal and statistically representative data into account are needed to explore the most important influencing factors and potential paths through the profiles.

Another important point which has to be addressed in future is technology usage and technology acceptance. A lot of effort is put into the development of ambient assistant living systems and technologies helping older people to remain independent as long as possible (in their homes and during outside activities), but there is not much knowledge about whether these development are useful for all older people alike or if different types would need different support. For the development of such systems the requirements of the different groups/profiles of older people as well as their attitudes towards technologies, their experiences and their previous knowledge should be taken into account.

According mobility behavioural levels (see Section 9.1) most research activities are focusing on solutions addressing issues on the operational level. In this respect, a lot of information is available, e.g. information concerning physical health and performance like in the SHARE database. The tactical and strategic levels may be covered by additional surveys and information from relevant findings in the literature, but to increase knowledge on a detailed level, more research has to be done. Little information is available on the lifestyle level, although this level is very important and has strong influence on other levels, especially regarding the potential of changing disadvantageous behaviour.

Finally, regarding the profiles themselves, some specific research needs become apparent within each of the described combinations of characteristics:

- The members of the Fit as a Fiddle group are still very active and their travel patterns do not differ from the average population. Here topics like raising awareness of possible upcoming problems and developing strategies to cope with these problems as well as prevention and training and their consequences and impacts are important.



- In connection with the Hole in the Heart group several aspects should be addressed in future research. On the one hand a more detailed look on cognitive skills and mental limitations particularly in combination with driving is important. On the other hand there are some differences within this profile concerning lifestyles, coping strategies and transitions into other profiles. Some of the results of our investigations indicate that it might be beneficial to divide the group into two sub-groups according to their ways of coping with their situation. The first group tries hard to get better, using supportive technologies (for social contacts or improving mobility), undergoing therapy etc. while the second group resigns. Influencing factors for this different behaviour and their impact on potential paths through the profiles should be considered in future work.
- Concerning the Happily Connected profile further research should especially focus on the transition points (when and why people are leaving the profile and which profiles are following) because there are apparently several different plausible follow-up profiles (Oldie but a Goodie, Hole in the Heart and the Care-Full). In this context lifestyle as well as prevention measures and strategies for staying healthy and fit play an important role. Other potential topics for more intensive research can be found in connection with the beginning physical and mental problems within this group and especially the related coping strategies. The experts emphasise that the advantage or difference of this group in comparison to others is their ability to cope with the problems of getting older.
- The members of the Oldie but a Goodie group especially suffer from beginning cognitive problems. Slight dementia or even Alzheimer's disease as well as problems with eyesight and hearing are reported within this group. Strategies for coping with these problems and services as well as technologies for support should be investigated to give the members of this group the possibility to stay independent as long as possible. In this context ambient assistant living and other assistive technologies (mobility aids) play an important role, though the potential of fostering their acceptance needs to be especially investigated, as this groups currently shows the most explicit averseness to technological aids.
- The Care-Full group is a very hard to reach profile in terms of possibilities to collect data, hence concrete and well-founded knowledge is difficult to achieve: To improve the knowledge about this group it may be necessary to develop different methods and new concepts of identifying and reaching potential representatives. Members of this group are often severely limited and need nursing care. Caused by their physical illness the often lose social contacts. Services to improve their social lives have to be taken into account. For most older people this will be the terminal profile they enter in their lives, but longitudinal studies may reveal cases of older people being able to leave this profile towards a more active and mobile profile. Close investigation of such cases and the factors determining these developments can provide important information about possibilities of fostering behavioural changes.

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11 Appendix

11.1 Input Sources for Draft Profiles

11.1.1 Cluster 1 (Fit as a Fiddle)

Clustering	Literature	SHARE-Data additional
Demographics		
<ul style="list-style-type: none"> most between 50 and 59 years; almost all under 70 more male married or in partnership can easily make end meets 	<ul style="list-style-type: none"> high income → autonomy and life satisfaction higher education high quality of life most still employed 	<ul style="list-style-type: none"> employment situation: more than half employed (most)
Health / Mental Health		
<ul style="list-style-type: none"> not ill, no pain, no sleeping problems, no dementia not limited in activities excellent health no problems with eye sight and hearing no mobility problems no not need any aids, drugs 	<ul style="list-style-type: none"> excellent health high activity level 	<ul style="list-style-type: none"> best mental health sad or depressed last month: 25% (fewest of all clusters) no hopes for the future: 5% (fewest of all clusters) depression ever: 20% (fewest)
Transport		
<ul style="list-style-type: none"> possess lot of cars 	<ul style="list-style-type: none"> use public transport in very little amount low risk of car accidents (lower than age 18-24) suburban areas highest dependence on car complex trip chains more trips and longer trips, also working trips, commuting average number and length of trips does not differ from average population leave the house more often than other groups (leisure, social contacts, work,...) travel purposes: visiting friends and relatives, religious and volunteer organisations, work make more holiday trips travelling important 	
Social Life and Life Satisfaction		
	<ul style="list-style-type: none"> car (80% of households) → independence, better social networks, more leisure activities; membership in organisations look after grandchildren, ill family members satisfied with possibilities to reach every destination to not consider themselves as "old people" 	<ul style="list-style-type: none"> 58% do activities (most) Most voluntary/charity work provide help for family, friends, neighbours (26%, most) go to sport, social or other kind of club (most 26%)
Living Environment		
	<ul style="list-style-type: none"> little problems with infrastructure conditions 	<ul style="list-style-type: none"> are satisfied with the possibilities for public transport in their neighbourhood least afraid of vandalism or crime (only 15%)
Future Trends / Technologies		
	<ul style="list-style-type: none"> increasing mobility of persons between 50 and 65 90% own a mobile phone; 75% internet 	

	connection <ul style="list-style-type: none"> • higher understanding and acceptance of technologies than other groups • number of women with driving licence increasing → more female drivers 	
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11.1.2 Cluster 2 (An Oldie but a Goodie)

Clustering	Literature	SHARE-Data additional
Demographics		
<ul style="list-style-type: none"> • most between 80 and 90; some even older (almost no one between 50 and 70) • more female • living single • rather difficulties with making ends meet 	<ul style="list-style-type: none"> • living alone – people are forced to leave home • women have lower income • higher life expectancy of women 	<ul style="list-style-type: none"> • employment situation: most retired or homemakers (more than 90%)
Health / Mental Health		
<ul style="list-style-type: none"> • suffer from cataracts • suffer from dementia (Alzheimer's disease, dementia, senility) • limited in activities but not severely • health fair to good • hearing rather fair to poor • eyesight rather fair to poor, some blind • some mobility problems (walking longer distances, getting up from chair, kneeling, carrying weights etc.) • persons use aid like cane, walker, wheelchair or scooter • take some drugs but not too much 	<ul style="list-style-type: none"> • women are more autonomous; more active → lower risk of losing mobility, less functional limitations • have high self-efficacy → positive impact on mobility functions (walking, stairs,...) - this is increase by good social contacts • women are aware of physical limitations – adapt lifestyle, better coping with situation • general decline in activity with higher age 	<ul style="list-style-type: none"> • Good mental health compared to high age • only 25% do not have any hopes for the future, • 75% have still high interest in things, • less than 30% had depression ever (better than cluster 3 and 4)
Transport		
<ul style="list-style-type: none"> • possess no cars 	<ul style="list-style-type: none"> • in general women less mobile; but when they are alone, they have to take care for themselves and to leave their home • highest rates of public transport and highest rate of taxi usage • walking most important transport mode • tube and underground least favoured mode of transport (buses / street cars preferred) • high rates of shopping and leisure trips • less trips, shorter trip than “younger elderly” • use time periods between rush hours • for important/ unknown/ difficult trips companionship by family members, friends or professionals • often passengers in cars 	
Social Life and Life Satisfaction		
	<ul style="list-style-type: none"> • as long people are mobile, many leisure activities; no difference between middle old elderly and very old • higher life satisfaction, better health because of social and physical activities • need more time for naps an relaxing, but are still very active 	<ul style="list-style-type: none"> • Activities: very active for old age (more than Cluster 3 and 4) • provide help for family, friends, neighbours: 11% • go to sport, social or other kind of club: 12% • take part in religious organizations: most compared to other clusters



		(16%)
Living Environment		
	<ul style="list-style-type: none"> • accessible locations (broad sidewalks, little traffic, traffic free zones, etc.) • local access to public transport • avoid extreme temperatures, confrontation with special social groups, waiting times, some transport modes (tubes, cycling,...) • especially in urban areas problems with social behaviour of others on the streets 	<ul style="list-style-type: none"> • Area where respondent lives: 33% big city, 22% rural area or village • Sufficient possibilities for public transport in the neighbourhood: 77% yes • Neighbourhood suffering from vandalism and crime: only 20% (less than cluster 3 and 4)
Future Trends / Technologies		
	<ul style="list-style-type: none"> • many women not married – group is growing • driving will increase in this group – more older women will have driving licenses and cars • decline of public transport → mobility problems especially for this group • problems with using technologies, ticket machines, internet,... 	

11.1.3 Cluster 3 (Hole in the Heart)

Clustering	Literature	SHARE-Data additional
Demographics		
<ul style="list-style-type: none"> • Between 50 and 75 • Few more female • Have (great) difficulties to making ends meet 	<ul style="list-style-type: none"> • low income → negative effect on mobility, Quality of Life • relatively low employment rate even in younger ages → loss of social contacts 	<ul style="list-style-type: none"> • more than half retired; • most permanent sick or disabled (compared to other clusters); • 15% homemakers; • only 11% employed
Health / Mental Health		
<ul style="list-style-type: none"> • suffer from pain (back, knees, hips, other joints) • Have sleeping problems / suffer from fatigue • are severely limited in activities • have poor and bad health • suffer from swollen legs and breathlessness • no problems with hearing or eyesight • have mobility problems: walking longer distances, getting up from chair, kneeling, carrying weights,... • bothered by falling, fear of falling, dizziness • need a lot of drugs (pain, sleep problems, depression,...) 	<ul style="list-style-type: none"> • Negative emotions (fear of falling, victimisation of the behaviour of vehicle drivers) influence mobility decisions • Chronic illness (fatigue, diabetes, obesity, cardiovascular disease,...) – mobility decrease • Avoiding any sort of activity has often psychological reasons (depression, lack of motivation, fears, loneliness) • lack of physical activity → reduction of muscles and bones → risk of falling, fractures, etc... → lack of social interaction → problems with mental health 	<ul style="list-style-type: none"> • Highest rates of depression (even more than cluster 4) • No hopes for the future: 27% (second after cluster 4)
Transport		
	<ul style="list-style-type: none"> • Lower flexibility caused by bad health • Lose ability to drive because of health - very traumatizing → depression • Illness, pain reduce mobility and well being • Often car preferred because easier than public transport, more comfortable; • High risks of car accidents • problems driving at night, at poor weather conditions, unfamiliar roads 	



	<ul style="list-style-type: none"> • Most trips by private transport (driving or passenger) • many rides from family or friends • reduction of trips, shortening of trips • More trips to hospitals and medical facilities 	
Social Life and Life satisfaction		
	<ul style="list-style-type: none"> • Often embittered and lonely • Need for assistance to getting around • Limited activities and mobility – social exclusion, exclusion of participation in social life 	<ul style="list-style-type: none"> • 62% do not do activities • Most popular activity: help to family, friends, neighbours or clubs • (all clusters except cluster 4 do more activities)
Living Environment		
	<ul style="list-style-type: none"> • Living environment very important because of limitations (barrier free environment, sidewalks, etc.) • People from rural areas suffer poorer health 	<ul style="list-style-type: none"> • Sufficient supply facilities in area: 38% dissatisfied • 30% dissatisfied with public transport in neighbourhood (second after cluster 4) • most afraid of vandalism or crime in neighbourhood (26%)
Future Trends / Technologies		
	<ul style="list-style-type: none"> • better medical science -> reduction of this group? • Ambient assisted living may be one solution • not very open minded about new technologies • finding new possibilities within transportation system is difficult; lack of (perceived) mobility alternatives 	

11.1.4 Cluster 4 (The Care-Full)

Clustering	Literature	SHARE-Data additional
Demographics		
<ul style="list-style-type: none"> • very old; most between 85 to 100 • living without partner / spouse • have difficulties to make ends meet 	<ul style="list-style-type: none"> • lowest income • lowest value in autonomy and life satisfaction 	<ul style="list-style-type: none"> • no one employed anymore • most retired or permanent sick or disabled • some homemakers
Health / Mental Health		
<ul style="list-style-type: none"> • very bad health • suffer from Parkinson, cataract, dementia, Alzheimer's disease, senility, swollen legs, breathlessness • severely limited in activities • have problems with hearing and eyesight (most of the blind people are in this cluster) • have the most mobility problems: walking or sitting longer, getting up from chair, kneeling, , carrying weights • have problems with falling, fear of falling, dizziness • need a lot of drugs • need aid (cane, walking stick, walker, wheelchair) 	<ul style="list-style-type: none"> • impairments – autonomous life gets more difficult or is not possible anymore • outdoor mobility decreases • receive extensive assistance → discouraged from engaging in activity → risk of falling – further mobility limitations • psychological disorders: depression, schizophrenia, anxiety,... • often nursing care dependency 	<ul style="list-style-type: none"> • 2/3 sad or depressed • Approximately 50% do not have any hopes for the future (far the most) • 30% have less interest in things than usually mentioned



Transport		
<ul style="list-style-type: none"> Possess no cars 	<ul style="list-style-type: none"> do not feel safe walking travelling (especially with public transport) causes physical stress difficulties with buying tickets, orientation, planning of trips outdoor mobility and traffic participation highly problematic drastically reduction of number of trips due to significant limitations in autonomy very short trips and no long distances high use of transport services dependent on assistance and help of others walking preferred mode of transport many trips caused by medical reasons many lifts in other people`s (family) cars 	
Social Life and Life Satisfaction		
	<ul style="list-style-type: none"> risk of social isolation avoiding any sort of activity – psychological such as physical reasons like receiving visitors passive activities within the home (TV, radio, newspapers) dissatisfied with possibilities of getting where they would like to go 	<ul style="list-style-type: none"> Most do not do any activities (80%) most popular activity: visiting religious organisations / services
Living Environment		
	<ul style="list-style-type: none"> barrier free and handicapped accessible infrastructure very important affected by problems in the area of walking (vehicles on footpaths, lack of ramps, loose animals, snow or ice) problems in public transport (overcrowded, technically maladapted, maladapted in routes and frequencies) 	<ul style="list-style-type: none"> 35% dissatisfied with public transport in neighbourhood 25% are afraid of vandalism or crime
Future Trends / Technologies		
	<ul style="list-style-type: none"> have heavy problems with using technologies, ticket machines, internet,... ambient assisted living possibilities for this group the need for caregivers assisting immobile seniors will multiply in the future the ratio of seniors who are severely restricted in their mobility will progressively grow assisted mobility will become very important 	

11.1.5 Cluster 5 (Happily Connected)

Clustering	Literature	SHARE-Data additional
Demographics		
<ul style="list-style-type: none"> most between 60 and 75 Living in marriage, partnership household is fairly easily or with some difficulties able to make ends meet 	<ul style="list-style-type: none"> higher income live independently 	<ul style="list-style-type: none"> 26% still employed; more than 50% retired, 15% homemakers
Health / Mental Health		
<ul style="list-style-type: none"> some bothered by pain (back, knees, hips, etc.) limited in activities but not 	<ul style="list-style-type: none"> exercise very important, important to stay fit (sports, walking, cycling, etc.) and mobile 	<ul style="list-style-type: none"> Lowest rate of depression (after cluster 1) Lots of hopes for the future (best



<ul style="list-style-type: none"> severely Hearing and eyesight fair to good do not use / need aids no problems with falling use almost no drugs 		after cluster 1)
Transport		
<ul style="list-style-type: none"> Possess cars 	<ul style="list-style-type: none"> large number of car trips complex trip chains less kilometres than younger drivers walking gets more important over 90% men are primary drivers favouring calmer roads, avoid traffic peaks, night time driving, prefer greater accessibility travel for entertainment, visiting family / friends, clubs, religious organisations, sport, recreation activities, shopping 	
Social Life and Life Satisfaction		
	<ul style="list-style-type: none"> autonomy and life satisfaction self-efficacy – positive impact on mobility and social context leisure activities very important general high activity level care for grandchildren, family members very important 	<ul style="list-style-type: none"> very active Especially with helping family, friends and neighbours sports, social or other kinds of clubs are important for 25%
Living Environment		
	<ul style="list-style-type: none"> barriers in public transport: overcrowded vehicles, ruthless drivers, insufficient routes, lack of punctuality, bad infrastructure access low score of fears little problems with infrastructural conditions 	<ul style="list-style-type: none"> 33% dissatisfied with possibilities for public transport in their neighbourhood 20% afraid of crime or vandalism in their neighbourhood 80% satisfied with facilities in living environment (high rate)
Future Trends / Technologies		
	<ul style="list-style-type: none"> more and more drivers in this group (higher driver license rates especially women) reduction of public transport in rural area → car will get more important for elderly pre-trip and on-trip information have to be adopted to the needs of older people want to learn how to use the internet in older ages; open minded compared to other groups 	<ul style="list-style-type: none">

11.2 Workshop 1: Draft Profiles of Older People⁷

11.2.1 Agenda

No.	Time	Topic
Day 1: Monday, 27 February, 1:30 – 6:00 p.m.		
1	1:30 – 2:00 p.m.	Arrival & registration
2	2:00 – 2:05 p.m.	Welcome (<i>K. Schechtner, Head of DTS, Mobility Department, AIT</i>)
3	2:05 – 2:10 p.m.	Introduction WS Day 1 (<i>A. Millonig, GOAL WP2 leader, AIT</i>)
4	2:10 – 2:30 p.m.	Mobility for the Ageing Society (<i>M. Williams, Project Officer – EU Policies, EC</i>)
5	2:30 – 2:50 p.m.	GOAL: Growing Older – Staying Mobile (<i>M. Hoedemaeker, GOAL coordinator, TNO</i>)
6	2:50 – 3:10 p.m.	Coffee
7	3:10 – 3:30 p.m.	Road safety in the ageing societies - CONCerns and SOLutions (<i>D. Bell, FACTUM</i>)
8	3:30 – 3:50 p.m.	Profiles of Older People: Background & Methodology (<i>A. Millonig</i>)
9	3:50 – 4:20 p.m.	Profiles of Older People: Preliminary Results & Draft Profiles (<i>WP2 Team TNO & AIT</i>)
10	4:20 – 4:40 p.m.	Coffee
11	4:40 – 5:30 p.m.	Group discussions (plausibility, gaps; related to categories of characteristics)
12	5:30 – 5:50 p.m.	Presentation of group results
13	5:50 – 6:00 p.m.	Summary and Closing of Day 1 (<i>A. Millonig</i>)
14	07:30 p.m.	Dinner (<i>in town</i>)
Day 2: Tuesday, 28 February, 9:00 a.m. – 1:00 p.m.		
1	9:00 – 9:30 a.m.	Coffee
2	9:30 – 9:40 a.m.	Welcome & Introduction Day 2 (<i>A. Millonig</i>)
3	9:40 – 10:00 a.m.	Project TRACY (<i>M. Gather, TRACY project coordinator, FH Erfurt</i>)
4	10:00 – 10:30a.m.	GOAL: Next Steps Profiles (<i>A. Millonig</i>)
5	10:30 – 10:50a.m.	Coffee
6	10:50 – 11:40a.m.	Group discussions (input survey, related to WP topics)
7	11:40 – 12:00a.m.	Presentation of group results
8	12:00 – 12:15p.m.	Summary & Closing of Day 2 (<i>A. Millonig</i>)
9	12:15 – 13:00p.m.	Lunch

11.2.2 List of participants

No.	Name	Organisation	GOAL member
1	María Alonso	Fundación CIDAUT, ES	Y
2	Niccolò Baldanzini	1 Università degli Studi di Firenze, IT	Y

⁷ Presentation slides can be found on the GOAL project website <http://www.goal-project.eu/>.

3	Daniel Bell	FACTUM OHG, AT	N
4	Stef van Buuren	TNO, NL	Y
5	Sabine Degener	GDV e. V.; Unfallforschung der Versicherer, DE	N
6	Sandra Franz	FH Erfurt, DE	N
7	Veronika Friedl	Austrian Institute of Technology, AT	Y
8	Matthias Gather	FH Erfurt, DE	N
9	Stephan Hartmann	Austrian Institute of Technology, AT	Y
10	Marika Hoedemaeker	TNO, NL	Y
11	Peter Jorritsma	Netherlands Institute for Transport Policy Analysis, NL	N
12	Rupert Kisser	Kuratorium für Verkehrssicherheit KFV, AT	N
13	Michael Kolb	University of Vienna, AT	N
14	Frank Krause	TNO, NL	Y
15	Alexandra Lach	RWTH Aachen Institut für Kraftfahrwesen, DE	Y
16	Bettina Lackner	Austrian Institute of Technology, AT	Y
17	Mike McDonald	TRG, University of Southampton, UK	Y
18	Bettina Mandl	Austrian Institute of Technology, AT	Y
19	Roel Massink	TNO, NL	Y
20	Alexandra Millonig	Austrian Institute of Technology, AT	Y
21	Rom Perenboom	TNO, NL	Y
22	Gabriele Schaal	Grüne SeniorInnen Österreich, AT	N
23	John Schoon	TRG, University of Southampton, UK	N
24	Anita Weggemans	TNO, NL	Y
25	Elena-Mihaela Williams	Project Officer – EU Policies, EC	N
26	Ellen Wilschut	TNO, NL	Y
27	Adrian Zlocki	RWTH Aachen Institut für Kraftfahrwesen, DE	Y
28	Gertrude Zupanich	Gplus Grüne Wien (Grüne SeniorInnen Österreich), AT	N

11.3 Workshop 2: Final Profiles of Older People

No.	Name	Organisation	GOAL member
1	María Alonso	Fundación CIDAUT, ES	Y
2	Stefan Blüher	Charité – Universitätsmedizin Berlin, Institute of Medical Sociology, DE	N
3	Carlos Juan Chiatti	INCRA – National Institute of Health and Science on Aging, IT	N
4	Jens Dangschat	Vienna University of Technology, AT	N
5	Ann Dellinger	US Centers for Disease Control & Prevention, US	N
6	Rosa Diketmüller	University of Vienna, Institute of Sport Science, AT	N
7	Marika Hoedemaeker	TNO, NL	Y
8	Johan Janse	JJAdvies, NL	N
9	Frank Krause	TNO, NL	Y
10	Bettina Mandl	Austrian Institute of Technology, AT	Y

11	Roel Massink	TNO, NL	Y
12	Mike McDonald	TRG, UK	Y
13	Andrea Meneghin	UNIFI, IT	Y
14	Alexandra Millonig	Austrian Institute of Technology, AT	Y
15	Anabela Simoës	ISEC, PT	N
16	Giovan Battista Tiengo	Consulta Nazionale Sicurezza Stradale (CNEL)	N
17	Gert Weller	TU Dresden, DE	N
18	Ellen Wilschut	TNO, NL	Y

11.3.1.1 Agenda

Program Workshop 2

Friday, June 29th, 2012 – Ca' Foscari University of Venice

No.	Time	Topic
Session 1: The Work of GOAL Project (9:30 – 11:30 a.m.)		
1	09:30 – 10:00 am	Developing profiles of older people from SHARE database (R. Massink, TNO)
2	10:00 – 10:30 am	Transition points in the mobility behaviour of older people (B. Mandl, AIT)
3	10:30 – 11:00 am	The role and potential of typologies in research about the elderly and mobility (A. Millonig; AIT)
4	11:00 – 11:30 am	Panel Discussion (Stefan Blüher, Carlos Juan Chiatti, Jens Dangschat, Ann Dellinger, Rosa Diketmüller, Johan Janse)
5		<i>Break</i>
Session 2: Heterogeneity in Older People (2:00 p.m. – 3:30 p.m.)		
1	02:00 – 02:30 pm	Reflections about diversities and inequalities among older people (J. Dangschat, Vienna University of Technology)
2	02:30 – 03:00 pm	The Interplay between Mobility, Aging and Health (A. Dellinger, CDC)
3	03:00 – 03:30 pm	Risks and Resources between Autonomy and Need for Care – A Cohort-Study at Charité University Berlin (S. Blüher, Charité Berlin)
4		<i>Break</i>
Session 3: Activate Mobile Aging (3:45 p.m. – 5:15 p.m.)		
1	03:45 – 04:15 pm	Seniors are driven by fun (J. Janse, JJAdvies)
2	04:15 – 04:45 pm	Age and activity-friendly open spaces (R. Diketmüller, University Vienna)
3	04:45 – 05:15 pm	Aging, mobility and Physical-Spatial-Technical environments. Research and policy implications." (C. Chiatti, INCRA)