CONCERNS & SOLUTIONS
Road Safety in the Ageing Societies

Mobility Patterns in the Ageing Populations

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Partners &
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Preface

This report constitutes the summary report workpackage 2 report on mobility patterns in the ageing European societs of the EU project CONSOL, “CONcerns and SOLutions – Road Safety in the Ageing Societies” (contract period: 2011-2013). All CONSOL partners contributed to the report by writing parts of the report (authors), participating in the literature research and/or commenting to earlier versions of this report.

In addition to the summary report a longer version (CONSOL -WP2 Technical report), including all steps of analysis for all used data sets, data description and Annexes including graphs and tables, is available.

Data analysis was based on travel survey data available to the participating partners gathered in course of other projects and national travel surveys. Data analysis was strictly based on accessible secondary data, with no new travel survey data has been produced I course of this workpackage.

All CONSOL partners contributed to the report by writing parts of the report (authors), participating in data analyses, interpretationa and/or commenting to earlier versions of this report.

We would like to give special thanks to Lidia Zakowska for constructive suggestions and review of the report supporting us to assure the quality of the report.

Executive Summary

The percentage of the elderly is growing in Europe, relative to the younger population. This ageing population is increasingly diverse with regard to age distribution, socio-economy status, health and household structure. The expected consequences highlight potential mobility and traffic safety considerations. This (WP 2) report of CONSOL is the empirical extension of an earlier (WP1) report, where theoretical considerations and the current state of the art were discussed.

There was no new data collected for the CONSOL project in this work package. There are already substantial data about the mobility and safety situation of older people in Europe. Here, we extracted empirical results from data conducted in the course of the SZENAMO survey, the French FNHS and FNTS surveys, the KITE survey, the SIZE survey as well as the Spanish MOVILIA survey. With such large, different and heterogeneous data sets it was especially important to resolve a detailed research design, to ensure a comparable level of data analysis as well as to value the specific focus of each survey. CONSOL therefore conducted a threefold approach. The first level concentrated on the production of simple, but comparable analysis of distributions and mobility patterns. The second level aimed at obtaining findings about the relation between mobility patterns and problems occurring. The third level focused on the specific emphasis of each survey.

Mobility patterns

Age effects are significant in all countries. One could conclude from the results of the CONSOL analysis that the age of 75 is an inflexion point in patterns of mobility, which was also identified in former studies. Of course it must be kept in mind that most data analyses use age groups to simplify presentation and therefore this inflexion point has to be considered as a period of a few years from 75 to 79. This needs to be set within the context of health and impairments. With rising age, in general, health declines with a rising number of impairments and health issues being observed. Health factors are most influential on the mobility of the elderly and older age groups. Statistics show that chronological age itself does not necessarily point to a decrease in mobility, especially for those not affected by debilitating health issues.

Gender proves to be a significant factor with regard to the mobility behaviour and the attitude towards certain modes of transportation. Women show a lower level of mobility, but the more important difference lies in actual mobility patterns, which differ from men. CONSOL suggests that there is a gender difference in mobility of older people, but this difference mostly stems from the special importance of the car for men, whereas women show a higher variety in modes of transportation.

The car is the most preferred mode of transport in most of the observed countries, with a shift from being a driver to being a passenger with rising age. This dependency on the car is a crucial point, being a mode that can be more suitable for older age groups if, for example, public transport is not

available. But cars have to be available and the driver licence maintained. If the licence is terminated, this dependency can lead to isolation and immobility. Other modes of transport differ by country, for example in Austria, walking is rated as the most preferred mode of transportation, with the car being less important in comparison (urban sample), riding a bicycle is very important in the Netherlands, the Swedish population rates walking second, the car again being the most preferred mode of transportation.

Problems issues and barriers

A core finding of the CONSOL WP2 is the importance of subjective, or self perceived health status. This factor was identified in the SZENAMO survey, the Spanish Movilia survey as well as the SIZE survey. The general assessment of self-perceived health is good in all samples; the share of those who are dissatisfied with their own state of health is rising mostly from 80 years on. A poor perception of health has a direct effect on mobility, suggesting that if a person perceives his or her own health as poor on a subjective level, he or she will exhibit a lower level of mobility.

Another interesting inference can be drawn. Self perception of health dominates other factors. Meaning that if a person reports having impairments, but rates his or her health as good, this person still shows a high level of mobility regardless of the impairment.

Motor impairments account for a significantly higher share in the oldest age group with, for example, a percentage of nearly 50% suffering from restricted mobility due to some kind of motor impairment in Austria. This is also observed in the Netherlands, Sweden and France, where almost 60% of population aged more than 80 years reported to suffer from an impairment. Sensory impairments (reduced eyesight, hearing) are rather widespread, but do not affect mobility in the same manner as motor impairment. There was no gender effect measured for impairments.

Impairments do have an effect, but do not automatically cease mobility. Findings point to a shift from leaving home everyday to leaving home only several times a week. In the Czech Republic 10% of non drivers report not driving because of sickness or impairments (main reason is not having a licence). In general it seems more appropriate to talk of a mobile older population, with a decline only in older age groups, driven by motor impairments or accompanied by a poor health perception.

The SZENAMO dataset provides data about the assessment of opportunities for using different modes of transport. This perception of opportunities is in general quite high, especially for walking and driving a car. Cycling shows a rather poor perception, whilst opportunities to use public transport is positively assessed in urban areas and rather negatively in rural areas in Austria. In Sweden the opportunity to drive a car is high, in comparison to Austria and the Netherlands. The Car was rated as the most important mode of transportation in most of the countries, but it is not available for all senior citizens. Thirty percent of Czech seniors report to have no car available and 31% percent of those having a car at their disposal report not having made any trip the in the past 8 weeks.

Retirement shows different influences in the data sets available. In Austria and France retirement has no significant influence on mobility. In the Netherlands and Sweden transferring into retirement does have a significant effect, but only of minor strength. Spanish data shows that mobility is changing to a lower frequency and shorter distances travelled from home.

The findings of the comprehensive study on mobility patterns in the ageing European populations provide comprehensive insight, not only to the state of actual mobility behaviour in relation to a wide variety of influencing factors, such as gender, age and health, but also on data availability and the way certain variables are assessed in the course of social surveys in the fields of transport and mobility. This study can provide some vital recommendations for future research endeavours in these fields.

Age itself is much less a predictor of mobility than has been assumed. Mobility only shows a strong decline after a turning point at around 75 years, until then people are mobile, but their mobility does not necessarily follow the same patterns. Work accounts for a high number of kilometres made per day or per week, but even when people are retired, the frequency of trips only decreases strongly about 10 to 15 years after retirement.

Sensory impairments do not show a strong effect on mobility in data available to CONSOL. Limited eyesight or hearing abilities are barriers which can be managed or compensated; motor impairments on the contrary are a severe threat to mobility. Data about the impact of different impairments are rare and therefore should be the focus of future studies.

CONSOL indicates a strong car dependency in most countries. The car can be an enabling and independent mode of mobility, maybe even more for older age groups, as only short distances need to be covered and door to door journeys are possible. The disadvantage is the strong habituation which leads to difficulties if a change to other modes of transport (walking, cycling, and public transport) is necessary. Research about appropriate methods of behaviour change tailored to the varied requirements of the elderly driver in different countries, should be a priority.

Contents

1. Introduction

The goal of the study conducted in course of the second work package of the CONSOL project, based on travel survey data from different European countries, was to apply a comparative approach allowing the involved partners to identify specific mobility issues, mobility patterns and needs in view of different subgroups of the ageing population. Data analysis served as a basis for a comprehensive transnational evaluation of relevant factors affecting the mobility behaviour of the older age groups, taking aspects such as health, gender and other labour and living conditions into account. This report is based on secondary data (from previous national and international research projects); no additional empirical data collection has been performed in the course of this work package. The comparative data analysis, making use of available material, had to tackle gaps in the accessible data sets. However, in order to provide a basis for transnational comparisons, the approach of the data analysis was based on the assumption that a *descriptive* comparison of already existing data sets would allow a comprehensive view on the mobility needs and problems of senior road users in Europe. Samples from Austria, Sweden, the Netherlands, the Czech Republic, Spain and France have been included. To overcome restrictions and the existing heterogeneity regarding the available data material, a three level approach was applied in course of the data analysis process:

- Level 1: Comparisons between all available national data sets, analysing general mobility patterns in the ageing population
- Level 2: Comparisons between at least two national data sets, assessing problems, issues and barriers of older road users
- Level 3: In-depth analysis of single data sets, assessing significant factors that influence the mobility behaviour of older road users

In the course of these steps of data analysis, different key questions were assessed, allowing for both a description of the current mobility patterns of older road users as well as an assessment of factors influencing respective needs and problems. The first level assessed mobility patterns based on available demographic data and compared these between the partner country samples. The second level analysis focused on health aspects such as physical fitness, impairments and disabilities and their effects on mobility. The third level of assessment highlighted the specific focus of each available data set by applying more complex statistical analyses to identify the relevance of different factors in explaining the mobility behaviour of the older age groups.

1.1. Mobility patterns in the ageing populations

With rising age, a number of factors exert significant impact on both the mobility behaviour and mobility needs of the elderly. Factors identified as influencing the mobility behaviour of the older members of the European populations range from health factors (including a variety of impairments that affect the opportunities to stay mobile autonomously) to life transition points (such as retirement and the change from a multi- to a single-person household) as well as social aspects (such as having

friends and family and a consistent and functioning social support network). Other socio-demographic variables, specifically gender, also play a major role in assessing the mobility behaviour of the older age groups.

1.1.1. Age

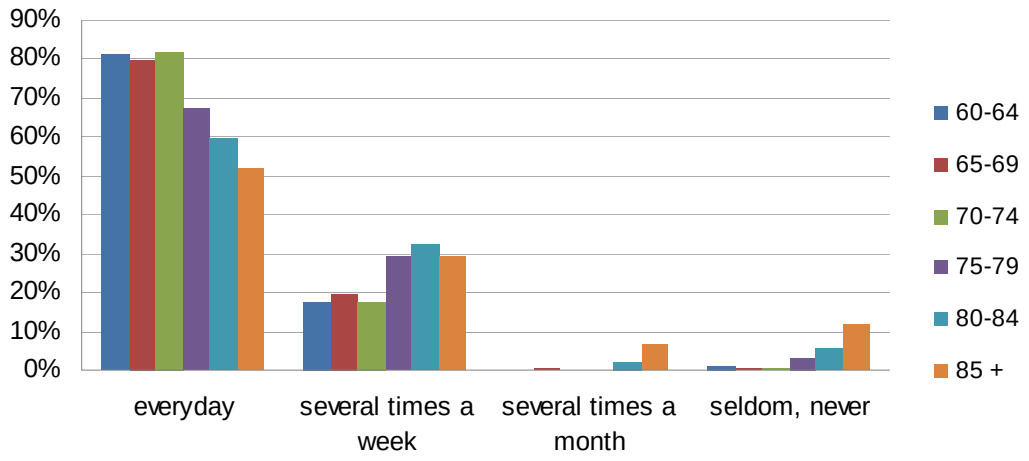

FIGURE 1: FREQUENCY OF LEAVING HOME BY AGE GROUP, AUSTRIA

Comparing the effect of age on mobility behaviour (see Figure 1), specifically in view of variables such as out-of-house frequency, travel distances and travel times, the data from the countries included in the CONSOL study show fairly similar results that are also generally consistent with mobility research (see also Haustein et al. 2012) in this regard.

With respect to the Austrian sample, it can be said that age alone has a very heterogeneous effect on everyday mobility, represented by the frequency of leaving home, in view of five-year age groups. Even the oldest age group is still leaving home quite frequently (at least several times a week) and therefore partly substitute their everyday work or general shopping trips with fewer journeys over a slightly longer period of time. This holds especially true for those aged 75 years onwards, where the frequency of leaving home every day slightly decreases and the frequency of leaving home several times a week increases compared to the other age groups. This development is also observed in the Netherlands and Sweden with generally high frequencies of leaving home up until the age of 75, when the percentage of those who seldom or never leave home increases. The mobility behaviour of the French seniors indicates a steady decrease in number of trips with age, including a first drop off in the age group between 60 and 69 years and an even stronger decline up to the oldest age group. These

findings apply to both the observed distances travelled per day and the respective time spent on trips on a regular basis.

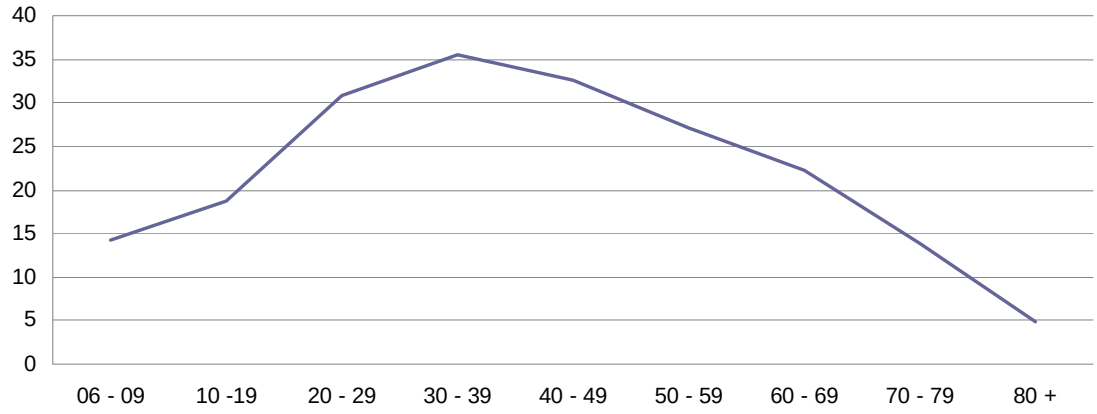

FIGURE 2: DISTANCE TRAVELLED PER DAY (KM), DIFFERENTIATED BY AGE CATEGORY

Among the elderly population from the Czech sample a rather low level of mobility was observed for both regular and irregular trips. A comparatively high percentage (73%) of Dutch seniors did not leave home for regular trips in the eight weeks prior to the survey, indicating a rather low level of out-of-house mobility in the Dutch population above 60 years of age. In line with expectation the Spanish Movilia data corresponds with the results of the mobility data analyses of other countries and indicates a decrease in the frequency of trips with rising age. Again the oldest age group, above 85 years, shows a distinct lower number of trips per weekday compared to the younger age groups, thus corroborating the findings from other national samples. Especially above the age of 80, the number of walking trips on weekdays appears to drop off. Overall the mobility level is high with a mean of three trips on weekdays in all age groups above 60 years (with a mean of 2.6 in the oldest age group of 85+).

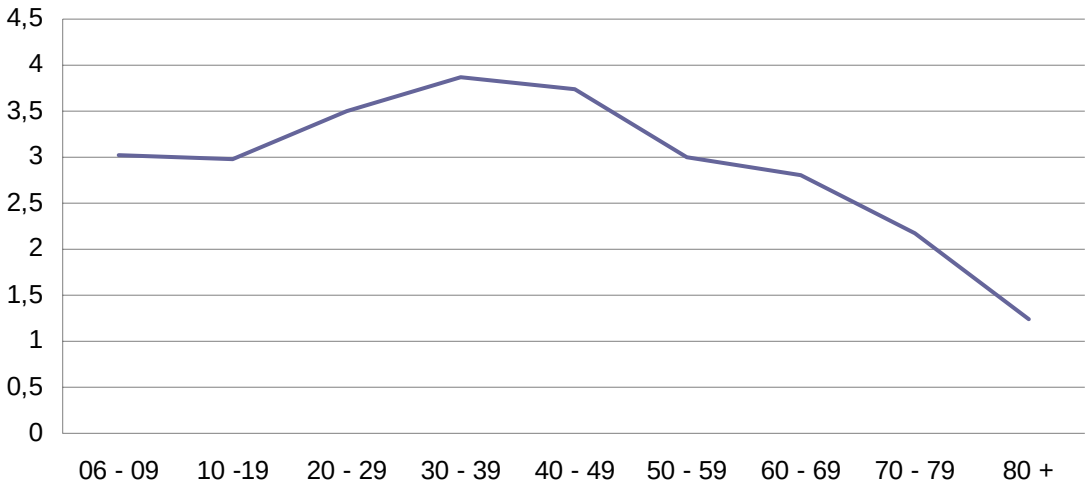

FIGURE 3: NUMBER OF DAILY TRIPS BY AGE CATEGORY, FRANCE

Overall age effects are significant in all countries. One could conclude from the results of the CONSOL analysis that the age of 75 is a turning point of mobility. The regression models calculated only show a significant effect for the age groups aged more than 80 years, in comparison to the 60-64 year old group (see table 1 below). In Austria, Sweden, the Netherlands and France, from that age on older people show a severe decrease in mobility, compared to those aged 60 to 64. The effect gets stronger for people in the oldest age groups above 85 years. Of course this clear cut in mobility from the age of 75 is mostly due to data structure and categorisation of age groups. However it can be concluded that between the age of 70 and 79 mobility is strongly decreasing. This needs to be discussed in relation to general and subjective state of health and various forms of impairments, relevant for the mobility behaviour of older road users. With increasing age, health declines and a rising number of impairments and issues are observed. Health factors are most influential on the mobility of the older age groups. However, statistics also clearly show that older age does not necessarily mean a decrease in mobility, especially for those who are not affected with health issues.

1.1.2. Gender

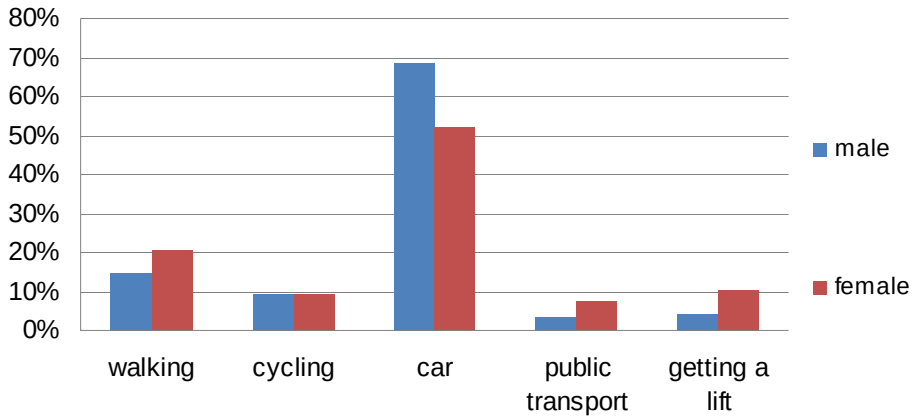

FIGURE 4: PREFERRED MODE OF TRANSPORT BY GENDER, SWEDEN

Gender proves to be a significant factor with regard to mobility behaviour and attitudes towards certain modes of transportation. Except for the Dutch seniors, gender has an effect on mobility or immobility in every country. In Sweden, Austria and the Czech Republic women appear to be less mobile than men. However, the effect of gender should not be stressed too far. Women show a lower level of mobility, but the more important difference lies in actual mobility patterns. Results from France suggest that immobility for one day per week does not show a gender difference, but does for at least two days of immobility. In Austria, the effect of gender decreases, when other factors are introduced into the model (controlled for interactions), meaning that the effect of gender is weakened by other factors (especially impairment and self-perception of health).

Women show less dependency on the car and rely more on walking and public transport. Men show a higher level of dependency on the car as a mode of transport, which also causes different problems for men and women. Women are more often travelling as passengers by car driven by their spouses or other people and therefore develop different attitudes to their own ability to drive a vehicle compared to men. On the other hand men, when they decide or are forced to cease driving, are more likely to be more negatively affected from this transformation in regards to their mobility behaviour but generally also adjust their lifestyle to other forms of transport mainly public transport and walking (WP1 report chapter 4.2). In the Spanish sample gender differences were especially obvious for car use and public transportation. Women report a preference for walking as a mode of transportation more often than men, while men prefer the car as a transport mode. Women also show a higher preference for the different public modes of transport (urban bus, metro, interurban bus). The gender differences, as well as corresponding reasons are discussed in-depth in the state of the art report (see pages 48 ff),

suggesting that socio-cultural norms or specific gender roles have a major impact on gender differences in all age groups.

1.1.3. Modal Choice

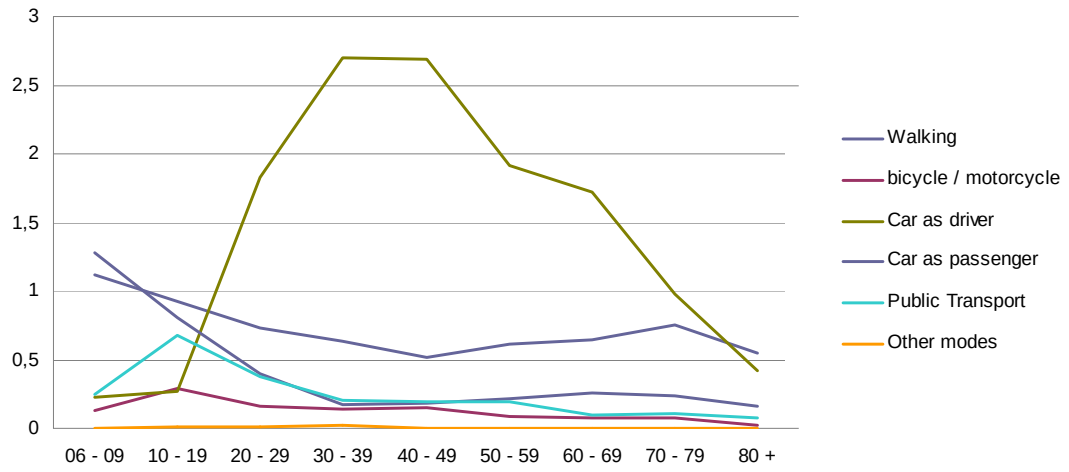

FIGURE 5: MODE SHARE BY AGE CATEGORY, FRANCE

In Austria the preferred mode of transport by the elderly is walking, followed by driving. In Sweden and the Netherlands this relation is reversed; the car is the preferred mode of transportation by the elderly. In France, the car is dominant for older age groups with a decrease from age 65 on, although remaining very dominant. Of increasing importance is being a passenger, as second most important mode, followed by public transport, with walking not being observed in this assessment. In the Czech Republic, the car is the most important transport mode for all age groups, without a possibility to assess differences in regard to this mode of transport between age groups. Cycling in all countries is of minor importance, except for the Netherlands.

The observed dependency on the car as a mode of transport is connected to other factors: a driving licence and a car need to be available. As shown above, access to a car is affected by gender only to a certain extent. Furthermore living on the countryside increases dependency on a car or getting a lift from somebody else considerably (see also Haustein et al. 2012, Chapter 3.3). Overall the car remains the main mode of transportation, especially for longer distance trips, in all samples included with the exception of Austria.

In Austria, the high proportion of people living in urban and suburban areas means that people usually are provided with comparatively good access to important infrastructure including public transport and opportunities for shopping etc.

Looking at alternative forms of transportation there are distinct differences between the countries compared. While walking gains importance with rising age in all countries, the elderly population in Austria reports walking to be the preferred mode of transport in all age groups and both genders, with the car being less important in comparison. In the Netherlands riding a bike is preferred even by older age groups (among the 80 to 84 years old a comparatively high percentage (more than 20%) prefer riding the bike than other transport modes). The Swedish population ranks walking second; especially among the oldest age group, walking and being driven by car are significantly more important modes than among those who are aged between 60 and 80 years. The French study emphasises the role of the car for the elderly to perform everyday trips. Walking, however, gains a considerable share of the modal choice with rising age.

The modal split differences between the involved European countries are not easily explained by the variable “living area” (urban, sub-urban, rural) and the corresponding infrastructure, with regard to available transport options, but supply opportunities and social support networks differ greatly between the involved countries (see also Haustein et al. 2012, Chapter 4.5.1); the elderly are confronted with differing requirements to fulfil their needs. The modal split is still a dimension of mobility with significant gender differences, especially with regard to driving a car. In all involved samples, except the Czech Republic, significantly more men prefer driving a car than women. Especially among the younger age groups driving a car proves to be the main mode choice for men; this is also true for women, although to a lower extent. In view of alternative forms of transportation there are still differences, but these are more subtle. Public transportation, as well as specially adapted forms of transportation, is generally not as important as the car, but gains importance with rising age. This emphasises the importance of accessible forms of public transport, especially for those, who are no longer able to take the car for medium and longer distance trips.

1.2. Problems, issues and barriers

In the second level evaluation of the comparative data analysis, factors negatively influencing travel behaviour of the older age groups were assessed. The main focus was placed on health and its effect on the mobility patterns of the older age groups as measured by self-report,

such as contentment with state of health, existing sensory and motor impairments or other disabilities posing a problem to unrestricted mobility. The main goal of this process was to take the state of health into account and to provide a basis for the evaluation of hindering factors related to health. The ageing population experiences an increasing number of impairments (see also Haustein et al. 2012, chapter 2.4.1.) which negatively affect mobility. The state of health is assessed in different ways by the

different studies included in this report. One of the main aspects measured in the Austrian, Swedish, Dutch and French surveys was the subjective assessment of respondents' own state of health. The Czech and the Spanish survey data do not allow for a specification of health-related aspects in view of mobility, but provide data on the development of mobility levels over age groups and offer insight into mode choice and travel motives.

1.2.1. Subjective assessment of the state of health and physical impairments

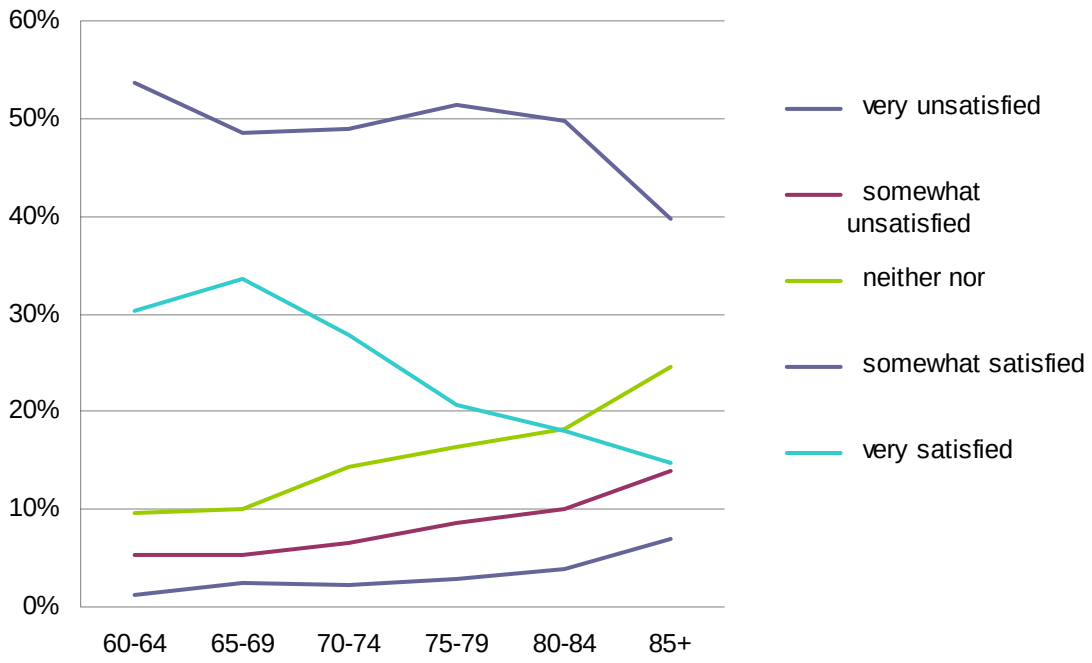

FIGURE 6: SELF-PERCEIVED HEALTH STATUS, SWEDEN

In general the subjective assessments of the personal state of health seem to be very positive in all samples included. In Austria, Sweden, the Netherlands and France the share of those who are dissatisfied with their personal state of health is very low up until the oldest age groups. Like in the above displayed example from Sweden it is visible that people very satisfied or somewhat satisfied clearly are the dominant group until 80 years. From the age of about 80 years onwards the subjective assessment changes and the share of those, who are dissatisfied with their own health, increases; this is true for all samples included. There is a noticeable reduction in subjective health among those, who are 80 years and older. Still the perception is mostly neutral or positive, even after the age of 80 years.

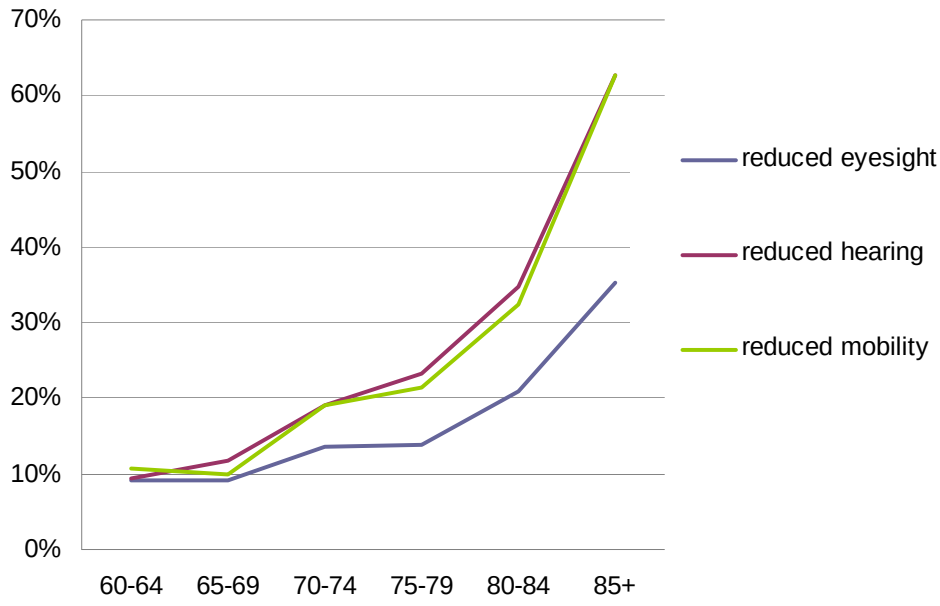

FIGURE 7: PHYSICAL IMPAIRMENT, NETHERLANDS

Looking at a more specific assessment of health, in view of different physical impairments, shows clearly that the share of people suffering from some kind of physical impairment increases with age. In particular, motor impairments account for a significantly higher share in the oldest age group of those, who are 80 years and older, with a percentage of nearly 50% suffering from restricted mobility due to some kind of motor impairment. This development is also observed in the Netherlands, Sweden and France, where almost 60% of the surveyed seniors, who are 80 years and older, have an impairment relevant to their trip.

Sensory impairments, such as reduced eyesight or reduced hearing, constitute a rather widespread issue which again shows a higher prevalence with rising age and follows a fairly linear trend. In France the age effect is also reflected by the higher share of those who are in need of walking aids and/or support personnel to walk without a problem for even short distances.

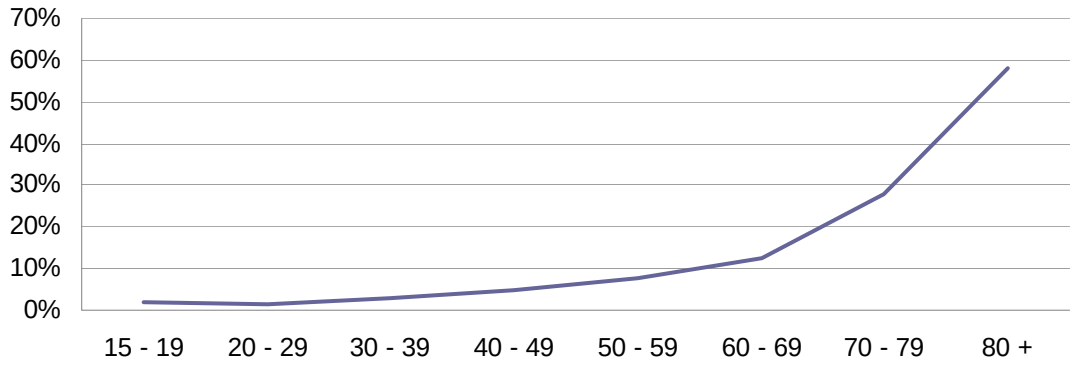

FIGURE 8 DECLARATION OF IMPAIRMENT WHEN MAKING TRIPS BY AGE CATEGORY, FRANCE

While there is no specification in impairments of the surveyed seniors in the Czech sample, there is a clear difference in the proportion of those, who state to have a disability between the older age groups and the rest of the Czech population. About 13% of those, who are at least 60 years old, are confronted with a disability, while only 3% of the general population are affected by impairments. No gender effect was found for any of the samples included as physical disabilities increased with age regardless of gender.

1.3. Mobility behaviour and impairments

Observing the general effects of impairments on a descriptive level in France indicates that physical impairments have a more detrimental effect on air travel than on trips by train. Taking the car as a mode of transport into account shows that about 10% of seniors state, that they do not drive a car due to reasons such as disabilities or sickness; with the main reason for not driving a car being not having a valid drivers license. Looking at the mobility level, indicated by the frequency of leaving home, in Austria, Sweden and the Netherlands, those, who are confronted with some kind of impairment and those, who are living with any physical impairments, shows, that the mobility level is generally quite high for both groups, with a majority of seniors in all three countries leaving home at least several times a week. Overall, there are no major differences between the three countries, with only Austria showing a rather high share of 5% of seniors having an impairment, who seldom or never leave their homes. The main difference between impaired seniors and those, who are living without impairment, is a shift from everyday trips to trips distributed over several times a week. This result indicates that seniors, who are suffering from some kind of impairment, still have a rather high level of mobility, but a comparatively lower frequency of leaving home.

1.4. Opportunities to stay mobile

The subjective perception of potential dangers, safety and opportunities, associated with the use of different modes of transport, can have a serious effect on the actual mobility behaviour (see Haustein et al. 2012, chapter 1.4.1.). In the Austrian, Swedish and Dutch studies participants were asked to assess their opportunities to use different modes of transport. In the Austrian sample the seniors assessed their opportunities to ride a bike as comparatively poor, while driving a car and especially walking were valued rather positively by the majority of seniors. Taking alternative forms of transport into account, shows that opportunities to travel by public transport are assessed positively among those, who live in urban areas and comparatively negatively among those, who live in rural areas; this can be attributed to the existing differences between urban and rural areas in Austria, with regards to the available infrastructure. In Sweden the subjective assessment of opportunities to drive a car is very high, compared to Austria and the Netherlands. Compared to the Dutch sample the Swedish seniors rate their perceived opportunities to ride a bike distinctly more negatively.

The opportunities to use public transportation are assessed as rather positive especially by those, who live in rural areas and who rate their options to mobility more positively compared to the Austrian and Dutch seniors. The Dutch seniors assess their opportunities to use the different modes as very good; in particular the opportunity to ride a bike is valued very positively compared to the other countries, thus emphasising the importance of this mode among the Dutch elderly.

The Czech study also provides evidence of the importance of the car as a dominant mode of transport among the Czech elderly. However more than 30% of seniors state, that they have no car available and 31% of those having a car at their disposal had not made a trip by car in the previous eight weeks. The Spanish data used in the CONSOL study shows a reduction of trips per day, with less than one walking trip performed by those, who are at least 85 years old. Moreover gender comparisons among Spanish seniors show, that men perform more walking trips, with walking trips being about ten minutes longer, compared to women. The main motives for these trips are strolling, shopping and or social contacts. As seen in the other samples, men use the car more often compared to women. The use of both, car and public transport, shows a similar decline with rising age, as in the other national samples.

2. Specifying mobility patterns in the ageing populations

Gender differences were found for all countries included in the present analysis and the results suggest that gender, even though it has an effect on mobility behaviour, should not be overemphasised in explaining mobility. As elaborated in Haustein et al. 2012 (chapter 4.1.1.) gender needs to be seen in relation to the mode of transportation and other relevant variables, such as trip purpose etc. Data from Austria show that the effect of gender diminishes with the introduction of other factors (whilst still remaining significant), but in general is on a low level of strength (Annex 1, table 1). In France no differences between men and women were found for being immobile for a single day per week. For immobility for at least two days women were found to be more affected than men. In Sweden the effect of gender is suppressed by the introduction of retirement and place of residence, meaning that those factors have a stronger effect on mobility than gender.

Based on linear regression (see Annex 1, table 1) age effects confirm the conclusions seen in Haustein et al. 2012 (chapter 1.1.), where age effects are identified to decrease mobility mainly after the age of 75 years. This drop in mobility at the age of 75 years should, however, not be taken as an exact turning point in the mobility of older people. Instead a margin of a few years should be considered, since most models included an age grouping that did not allow for a sensible interpretation of more subtle age intervals. However results from Austria, the Netherlands and Sweden show that compared to the youngest available age group, the age group of 60 to 64 years, the group of 65 – 69 and the groups of 70 – 74 year old people do not show a significant difference in mobility. Austria and the Netherlands indicate to another conclusion regarding age in relation to the subjectively perceived status of health. With the introduction of physical impairments age effects decrease, suggesting that effects of age are dependent on effects of impairment and therefore closely related to the state of health in general. Impairments proved to have an effect nearly regardless of how old a person is, while the perception of health is dependent on age, hence the older a person is, the more does perception of health influence mobility.

Results show clearly that retirement is not significant for Austria (Annex 1, table 1), but has a significant influence on mobility in the Netherlands, France and Sweden. Like shown in table 2, in France a retired person is 1.5 times more often immobile for one day and 2.1 times more often immobile for two or more days. France indicates to a strong effect of retirement, whereas in Austria the effect is rather minor and further declines with the introduction of physical impairment and contentment with the own state of health. After all, retirement provides some explanation for the decrease in mobility, but set in conjunction with other variables, especially physical impairment and perception of health, it should not be overemphasised as its explanatory power is limited (Annex1, table 1).

For the France data the calculation of a logistic regression (see Annex 1, table 2), shows the odds ratio to be immobile for a single day and for immobility of two or more days. The results are integrated in the following.

Living in an urban environment, compared to a rural environment, has a positive effect on mobility in France, Austria, Sweden and the Netherlands, as it seems to increase the mobility level. Results from the French calculation show that there is no difference in immobility between city or suburbs, but that people living in a rural environment have a higher risk (1.2 and 1.9 times) of being immobile. This contradicts findings of other studies presented in Haustein et al. 2012 (chapter 4.5.1.) to some extent, where findings do not point to a difference in total mobility, but to rather different patterns in mobility behaviour concerning mode of transportation and travel distances. Findings from France are in line with these results, showing a difference between living areas (city centre, suburban, rural) in daily travel time and daily distances travelled.

As comprehensively elaborated in Haustein et al. 2012 (chapter 2.2.4.), knowledge about effects of mild impairments is limited. Data from Austria and the Netherlands allow for some insight. Physical impairments prove to be a strong predictor of the level of mobility, but effects of different types of physical impairments are heterogeneous. In general, sensory impairments do not show any significant effect. Furthermore, the combination of reduced hearing and reduced eyesight does restrain people from being mobile. As soon as motor impairments appear, mobility is strongly limited. Reduced eyesight, motor impairment, reduced hearing and the combination of all three types of impairment are all highly significant with strong effects on mobility, with the effect of all three impairments combined being the strongest. The introduction of physical impairments generally decreases the effects of age, emphasising the importance of the state of health. These results account for place of residence as well, meaning that people are more mobile in urban areas, until somebody is affected by an (motor) impairment, in which case mobility is severely restricted in both environments, urban and rural. The French data also suggest a strong effect of impairments, as a person with an impairment is 2.8 times more likely to be immobile for two or more days a week (Annex 1, table 2).

Contentment with one's own health has a strong effect on mobility, suggesting that if a person perceives his or her own health as poor on a subjective level, he or she exhibits a lower level of mobility. In Austria contentment with own state of health has the strongest effect on mobility (Annex 1, table 1), even stronger than mobility restrictions.

This factor is especially interesting as it leads to the conclusion that self-perception of health does superimpose other effects, especially the effects of specific impairments decrease with the introduction of contentment with one's own health. For a person, who suffers from a specific form of impairment, but still does not perceive his or her state of health to be poor, regardless of the impairment, the

mobility level can still be high. Other surveys show that the assessment of subjective health is poorer among women, but not if controlled for objective health issues (functioning, disease, impairment). If a person is suffering from a disease, self-perception of health does not differ significantly between men and women (see Haustein et al. 2012, chapter 2.4.1.).

For France, data analysis provides information on the effect of education and income on mobility of the elderly. Compared to a high school diploma, persons with lower education have a higher likelihood to be immobile for at least two days a week, but there were no significant results for being immobile for only one day per week (Annex 1, table 2). Having a higher education than a high school diploma decreases the probability of being immobile for at least two days, but does not show any results for immobility of one day per week. Compared to respondents with an income below 1.600 Euros, higher income seniors exhibit a lower probability of being immobile for at least two days a week, with the strength of the effect being the same for all income classes above 1.600 Euros.

Results for the effect of the transition from working life into retirement are varied. In Austria retirement does not have any influence on general mobility. In the Netherlands retirement decreases mobility of the elderly, but the effect loses strength with the introduction of other factors. In Spain analysis shows that before retirement, work provides one of the main frameworks of mobility for most people with an increased diversification of mobility patterns after retirement. Before retirement, work provides one of the main frameworks of mobility for most people. With retirement this framework vanishes and the variation of mobility patterns diversifies. In Spain it is also observed that retirement leads to a shift in modes of transportation. The share of car drivers decreases, whereas the share of people walking increases significantly. These results suggest that not only the mode of transport is changing, while mobility in general decreases slightly, but also trip length declines, suggesting that mobility patterns after retirement focus more strongly on walking and destinations in a closer vicinity to home. This is also supported by the shift in social life observed in Spain, where strollss increase, while leisure and visiting trips are decreasing. In France, retired and non-working persons in the higher age groups are more often immobile for at least two days a week, compared to those who are still working.

Living in a rural or urban environment is suspected to have an effect on mobility even though comparisons between countries do not allow for definite conclusions (WP1 Chapter 4.4). On the one hand, concepts of measurement vary between countries and on the other hand, living in the countryside does not mean the same in all countries, for example Germany and Spain vary greatly regarding access to public transport options, based on the available infrastructures. In Austria and the Netherlands, there is no effect of retirement compared to working status. In Sweden, there is a negative effect of living in a rural area on observed mobility, compared to living in an urban environment. In France the probability of being immobile for one day is slightly increased when living in a rural area, not including suburbs, and has a strong effect on being immobile for at least two days per week. The observed difference in trip frequency is small, but there are differences in the quality of

trips, meaning that in an urban environment public transport services are more dominant, whereas in the countryside the car is of most importance to mobility. Another difference observed between people living in rural and urban areas are different trip purposes (see Haustein et al. 2012, chapter 4).

There is little data on the effect of household size. Previous studies show that in single-person households there is more desire to stay mobile and therefore more trips are made. France shows the same results with a lesser probability of single-person households than two-person households to stay immobile for at least two days a week. Results from Spain suggest that the average trip frequency of people living alone compared to those living in a multi-person household is about the same. This means that single-person household members have a vaster variation in how often they leave home. Again, there are not only differences in trip frequency, but also differences in mode choice. Persons in single-person households are more dependent on walking and there is no possibility to drive a car; they are much more dependent on public transport as opportunities of getting a lift are scarcer (see Haustein et al. 2012, chapter 4).

3. Conclusions

The findings of the comparative study on mobility patterns in the ageing European populations produced in this project provide comprehensive insight, not only on the state of the actual mobility behaviour in relation to a wide variety of influencing factors, such as gender, age, health, major life transition points (retirement and the transition from a multi- to a single-person household) or living area, but also on data availability and the way certain variables are assessed in course of social surveys in the fields of transport and mobility. In this regard this study can provide some vital recommendations for future research endeavours in these fields. Data available in the CONSOL project suggests some major shortcomings in measuring factors on mobility behaviour and mobility needs of the elderly, especially in the age groups of persons above 85 years. Concepts of mobility and mobility behaviour differ considerably between the partner countries and the available data sets.

It has to be said that the involved data sets have been produced in course of previous research projects with varying foci and research goals, but mobility is assessed in significantly different ways. In regard to mobility patterns there is of course a variety of possibilities to evaluate and assess the available data sets based on varying sets of available mobility related variables in course of surveys. Variables such as the frequency of leaving home, trip purposes, number of trips per given time period or weekday, preferred or principal mode of transportation, etc. all assess a variety of mobility related dimensions but there is a lack of uniformity found among the information available in this study providing more in-depth country comparisons. Hence countries need to be compared on a strictly descriptive level. Based on the nature of a certain survey and the inherent goals in view of the research process, these issues are not easy to come by, at least not in the case of a secondary data analysis.

The data analysis highlights the importance of subjective factors, such as the self-perception of health status. CONSOL suggests that the perception of the health status is a strong determinant of the mobility level of a person. This is most interesting, because it points to countermeasures, not only aiming at increasing the health of Europe's older generation, but also the perception of their health.

Age itself is much less a predictor of mobility than maybe assumed. Only after a turning point at around 75 years mobility shows a strong decline, meaning that until then people are absolutely mobile, not meaning that their mobility must follow the same patterns. Work accounts for a high number of kilometres made per day or per week, but even when people are retired, the frequency of trips only decreases strongly about 10 to 15 years after retirement.

Sensory impairments again do not show a strong effect on mobility in data available to CONSOL. Limited eyesight or hearing are barriers, which can be managed or compensated. On the contrary, motor impairments are a severe threat to mobility. Data about the impact of different impairments is rare and therefore should be focused by future engagements.

CONSOL indicates a strong car dependency in most countries. The car can be an allowing and independent mode of mobility, maybe even more in higher age groups since it allows for short walk distances and direct transport etc. The opposite side is the strong habituation which leads to difficulties if a change to other modes of transport (walking, cycling, and public transport) is necessary.

Driver licence screenings should (also) be considered as a threat to mobility since the loss of the car, if used to it, is hard to come by in terms of compensation. Not only because public transport might not be an option, but also because the patterns connected to car usage a hard to break and rather lead to a loss of mobility, than a change of mobility.

Driver license screenings could be extended by actions aiming at an early preparation for the loss of the license and the need to change mobility patterns. This could also be connected to other actions in terms of public health for seniors. Events like public walks, guided tours, cycling trips supported by alternatives to driving a car like senior taxis (see best practice CONSOL WP 5) would be a holistic approach to circumvent immobility of seniors.

Especially since the travel distance decreases with higher age, short distance vehicles, possibly by electric motors (e.g. e-bikes, small and light cars, scooters), should be supported as well as the infrastructure to use them. This also includes weather protected, anti-theft and easily accessible parking possibilities for bicycles as well as easy and quick intermodal transport.

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5. Annex 1

5.1. Table 1: MULTIPLE LINEAR REGRESSION ON MOBILITY INDEX FOR AUSTRIA (excerpt, only significant coefficients displayed)

	coefficient (st.)
(Constant)	*12.290****
male[a]	*0.064**
65-69[b]	
70-74[b]	
75-79[b]	
80-84[b]	*-0.145****
85+[b]	*-0.207****
Retirement[c]	
Urban[d]	*0.060***
reduced eyesight[e]	
reduced hearing[e]	
reduced mobility[e]	*-0.200****
reduced eyesight + hearing[e]	
reduced eyesight + mobility[e]	*-0.147****
reduced mobility + hearing[e]	*-0.105****
all three[d]	*-0.160****
Contentment with own state of health	*-0.269****
R^2 (explanation of total variance, cor.)	*31.8%*

TABLE 1SOURCE: SZENAMO 2010, OWN CALCULATION,

*P< 0.05 **P < 0.01 ***P < 0.001

A REFERENCE CATEGORY: FEMALE

B REFERENCE CATEGORY: 60-64 YEARS

C REFERENCE CATEGORY: WORKING

D REFERENCE CATEGORY: RURAL

E REFERENCE CATEGORY: NO IMPAIRMENT

5.2. Table 2: Sociodémographic characteristics which explain immobility (odds ratio)[1]

Characteristics		Observed immobility in a week			
		A single day		At least two days	
impairment	Yes	0.7	***	2.8	***
	No	1		1	
Gender					
	Man	*1*		1	
	Woman		*ns*	1.4	***
Age					
	Less than 55 years		*ns*	0.5	***
	55-64 years		*ns*	0.8	***
	65-74 years	*1*		1	
	75 years and +		*ns*	1.5	***
Professional activity					
	Workers	1		1	
	Non-workers	1.6	***	1.9	***
	Retired	1.5	***	2.1	***
Educational level					
	Sup. than high school diploma		*ns*	0.8	**
	High school diploma	*1*		1	
	Inf. to high school diploma		*ns*	1.3	***
Living area					
	City centre	1		1	
	Suburb		ns		ns
	Rural Zone	1.2	***	1.9	***
Household size					
	1		*ns*	0.7	***
	2	*1*		1	
	3 or +		*ns*		ns
Level of motorization					
	0 car	0.6	***		ns
	1 car	1		1	
	2 cars or +		ns	0.9	**
Household income					
	< 1600 €	1		1	
	1600-2400 €		ns	0.7	***
	2400-3400 €		ns	0.7	***
	> 3400 €	0.7	***	0.6	***

[1] SIGNIFICANCE LEVELS (CHI2) : NS= >0,05 (NON SIGNIFICANT) ; **=<0,05 ;***=<0,01