Mobility patterns of the elderly and future trends

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Demographic trends in Europe

• **Ageing of the population EU member states**
  – The share of the 55+ population in Europe is forecasted to rise from 28% in 2005 to 40% in 2035

**Important trends for higher age groups**
The number of persons aged 80 and more should double by 2030 and triple by 2050

**Different dynamics across EU Members**
In 2035, 65+ people will be between 28-33% in Germany, 20-23% in Ireland, and around 25% in Norway
Demographic trends in Europe

• **Societal and cultural issues**
  – Diversification of life style will make the older generation more heterogeneous:
    • Single households
    • More activities related to sports, culture and recreation
    • But also significant number of “modest older people” less involved in society (economical issue)
  – Rising fuel cost will make the private car more expensive and difficult to maintain, particularly for single
  – But in a context of continuing urban sprawl it will be more difficult to organise life without using motorised vehicle
An ageing population: aged related constraints

Even if life expectancy without disability increases, the number of people with functional abilities degradation increases with age (especially after 70)

- **Mains functional areas concerned:**
  - Perception: vision, audition
  - Physical abilities: reduction of muscular strength for lower and upper limb, arthritis
  - Cognitive abilities: memory, attentional processes, executives functions

- **Personal constraints: Stress, fears**
  - Necessity to make a distinction between “young” older (before 75 years) and “old” older (over 75 years)
  - Older people need compensation strategies in order to maintain their mobility
An ageing population: aged related mobility

![Bar chart showing level of reported difficulties according to age group.](Source: INSEE – ENTD 2007-08)  
*(Dejoux et al 2010)*
An aging population: aged related mobility

Average number of trips per day according to age
(Source: INSEE – ENTD 2007-08)
(Dejoux et al 2010)
Mobility patterns of the aged population: more mobile, more driving

Main sources of data in France
- National Travel Surveys (NTS): DOT, INSEE and INRETS
- Household Travel Survey in the Paris Region
- Household Travel Survey in urban area other than Paris

Keys figures
- “Young” Older tend to have now the same mobility (in terms of trip frequency) as younger people (no work related trips)
- 62 % of persons between 65 and 74 years old have a driving license and 49 % drive often
- In the 70-79 age group, only 10% of men and 23.9 % of women with a driving license do not have a car; for the up to 80 years old: 36 % and 58 %
- Actual generation : issue for widowed women without driving license (or car) in suburbs or rural areas
- The higher the age is, the lower is the mobility (trips frequency and distance)
Mobility patterns of the aged population: more mobile, more driving

- Distances driven by the persons over 65 years has doubled between the two national transport surveys INSEE-INRETS of 1981-82 et 1993-94
- Modal split of journeys (Household survey 1995-2000 in 15 cities)
  - Public transport 8,3%
  - Walking 46,3%
  - Car (driver and passenger) 42,7%
  - Two wheels 2,2%
- Cities with guided public transport (tramway, metro) show higher level use of public transport
- Older people tend to travel at « off peak » hours, which means sometimes low service frequency and leads to long vehicle waiting times
- Response demand services: in urban and rural areas
Mobility patterns of the aged population: more mobile, more driving

- **Trends**
  - Car ownership will continue to increase during the coming years due to mobility habits of actual middle aged people.
  - Within the next 20-30 years, the rate of car and driving license of women will be the same as men in most EU countries (but trends will be slower in Central and Easter European countries).
  - Specific tools for the study of mobility trends: the age cohort approach (Dejoux et al 2009).
Mobility patterns of the aged population: Trends

- **The age cohort approach (Dejoux et al 2009)**
  - Based on an age-cohort approach taking into account the impact of the life-cycle and generation effects through time on travel behavior, which permits to outline the impact of age and generation combined with various structural variables: gender, spatial distribution, motorization of the households …

- Mobility is measured by two variables:
  - global mobility or frequency of trips (average number of trips per person for a typical week day)
  - distance travelled (number of kilometres travelled per person for a typical week day and average)
## Estimated average trip distance for elderly in the Paris area by age, gender, zone of residence and car-ownership

<table>
<thead>
<tr>
<th>Estimated average trip distance for the elderly population (in km per day)</th>
<th>Paris area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65-74</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
</tr>
<tr>
<td>Projection year</td>
<td>2005</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3.8</td>
</tr>
<tr>
<td>Female</td>
<td>3.2</td>
</tr>
<tr>
<td>Zone of residence</td>
<td></td>
</tr>
<tr>
<td>Central city</td>
<td>2.5</td>
</tr>
<tr>
<td>Inner suburbs</td>
<td>2.8</td>
</tr>
<tr>
<td>Outer suburbs</td>
<td>4.6</td>
</tr>
<tr>
<td>Level of car ownership</td>
<td></td>
</tr>
<tr>
<td>Households with no car</td>
<td>1.9</td>
</tr>
<tr>
<td>One-car households</td>
<td>3.5</td>
</tr>
<tr>
<td>Multi-car households</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Sources: Estimates based on Global Travel Surveys (1977, 1984, 1992 and 2002) and population projections according to censuses.
Mobility patterns of the aged population: Trends

- The age cohort approach (Dejoux et al 2009)
- Older people will tend to:
  - Keep the number of trips per day relatively constant
  - Increase the travelled distance
  - Increase the average travelled distance for each trip
  - Main effects in outer suburbs
  - Remaining question: impact of the rising of fuel cost
Safety issues for older people: Road users (French data)

- Older drivers are a growing part of the driver population
- 20% of killed on the road car users are over 65 years old
- As a result of functional vulnerability, older drivers have higher risk to be killed in a road accident
- Older persons tend to stop driving later **but**
  - Increase of the number of people developing pathologies linked with age (Alzheimer, Parkinson, macular degeneration, …)
    - Alzheimer: some DAT drivers have degraded driving abilities even at early stage, variability according to the level of dementia; limited awareness about their cognitive abilities
    - Concrete needs of support for the physician and hospital practitioners
- More than 50% of killed on the road pedestrians are over 65 years old
- Nearly 30% of killed on the road bicycles users are over 65 years old
Safety issues for older people: Public Transport users

- **Light/heavy rail systems**
  - European SAFETRAM project, related to passive safety in urban rail systems (Pereira et al. 2001)
    - 54% of the injured passengers were more than 55 years old
    - The main source of injuries is the floor, followed by other vehicle equipments
    - Most of the injuries sustained were not related to collision but unexpected deceleration
    - Falls are the main injury mechanisms
  - In the UK there are an average of about 200 incidents a year of passengers being injured trying to bridge the gap between the train and the platform; many are related to age or disability
Safety issues for older people: Public Transport users

• Bus context
  – The ingress-egress manoeuvres showed a high risk (Canavan et al., 2005) particularly for seniors over 65
  – Low floor reduced the problem, but only if the gap between the bus and the sidewalk is small
ACCESS2ALL framework for risk assessment

Definition of relevant criteria (proposal)

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Severity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Improbable</td>
</tr>
<tr>
<td>2</td>
<td>Unlikely</td>
</tr>
<tr>
<td>3</td>
<td>Even Chance</td>
</tr>
<tr>
<td>4</td>
<td>Likely</td>
</tr>
<tr>
<td>5</td>
<td>Almost Certain</td>
</tr>
</tbody>
</table>

From Travel on Land-LCC-UK (2005)

- Likelihood is evaluated in comparison with the travelers without any mobility restriction ie everybody can fall in a bus or when alighting the train but a traveler with mobility impairment has a higher probability
- Severity is estimated in terms of over injuries than every traveler can experience
## ACCESS2ALL framework for risk assessment

<table>
<thead>
<tr>
<th>User Groups</th>
<th>Sub-groups</th>
<th>Urban buses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ingress/ Egress</td>
</tr>
<tr>
<td>11. Age-related declines in abilities (&gt;65 years)</td>
<td></td>
<td>Fall/ impact against steps or sidewalk (Difficulty to handle complex environment)</td>
</tr>
<tr>
<td>• Psychomotor limitations (Increased reaction time, Lower range of motion, Poorer coordination, Lower strength)</td>
<td></td>
<td>Likely</td>
</tr>
<tr>
<td>• Visual limitations</td>
<td></td>
<td>From minor to major injury</td>
</tr>
<tr>
<td>• Cognitive limitations (Limited attention ability, Decreased problem solving ability)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Likely: From minor to major injury
- Even: Minor (no crash)
- Likely: From minor to major injury
So what to do?

As stated in the OECD report (2001) the Challenge for society and research community is
To preserve a safe mobility

and may be

To develop a “sustainable” social participation of older generation in society
Topics for future research
Mobility by public transports

Develop the attractiveness of the public transport services to the older part of the population

- In the context of the increase of the petrol price and the probable decrease of the purchasing power of older class
- Identification of transport needs and barriers of the targeted age cohorts (accessibility, comfort and safety issues)
- Identification of factors which impact mobility and social independency of older
- Anticipate a rapid growth in demand-response transport

• In growing cities and sparsely populated areas this should help:
  - to define future service offers on mobility regarding public transport, car use, and the inter-operability between these modes
  - to develop the use of soft modes for older citizen
Topics for future research
Road safety issues

Promote a safe mobility for older road users (driver and pedestrian) and a smooth transition between car use and alternative transports

- Potential benefit from the driving assistance technologies
  » Junction management
  » Use of road signing
- Potential benefit from the use of driving simulator
  » Develop self awareness about its own abilities
  » Training of driving skills, adaptation strategies
- Improve the design of barrier free environment for pedestrians
- Develop educational approach for older pedestrian to improve their safety (simulators as possible tools)
## Advanced Driver Assistance Systems

perspectives for older drivers

<table>
<thead>
<tr>
<th>Functionality</th>
<th>ADAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draw attention to the traffic</td>
<td>Collision warning systems (junction and rear-end) Assistance for merging and lane changing</td>
</tr>
<tr>
<td>Signal road users located in the driver’s blind spot</td>
<td>Assistance for merging and lane changing Detection of obstacles Detection of blind spot</td>
</tr>
<tr>
<td>Assist the driver in directing his attention to the relevant information</td>
<td>In vehicle signing systems Special Intelligent Cruise Control</td>
</tr>
<tr>
<td>Provide prior knowledge on the next driving situation</td>
<td>Systems that give information on the characteristics of complex intersections the driver is about to cross</td>
</tr>
</tbody>
</table>

From Davidse (2006)
ADAS perspectives for older drivers: main points of interest

• Orientation of attention: concerns complex driving situation where driver’s attention has to be directed to the relevant information,
• Attention flexibility: concerns transition phases between low level of attention to high level of attention; studies will concern normal driving situation and partially automated driving situation,
• Decision making: concerns situation where decision has to be made by the driver, situation like junction management, lane changing, merging, and overtaking
• Assessing traffic-related low attentional status
Mobility patterns of the elderly and future trends

- Mobility is an important factor to keep a good quality of life for older citizens
- Older will be a significant part of the travelling population
- Design of transport vehicle, infrastructure and operation should be improved
- News services should be developed to help older travelers
Thank you for your attention

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