

# Frequency distribution of daily travel distances

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## 1. Introduction

The distribution of the daily travelled distance by a person is crucial for his/her readiness to buy an electric car. If many days with a car travel longer than 100 Km are expected the likelihood of the acquisition of an electric car by this person will be low. The distribution of daily travelled distances is known from different mobility surveys, both at the national and at the regional level. However, most of this data are not helpful for the evaluation of the frequency. Ideally, one should use panel data for an evaluation of this kind.

This study will provide the cumulative frequency of the likelihood that a person driving a car will travel more than 80 Km and more than 100 Km in a day. To obtain this the following data sets will be used:

MZ Verkehr 2000 (Time span of the survey: 1 Day; Switzerland)

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Deutsches Mobilitätspanel 1996-2007 (Time span: three time 7 days; Germany)

Mobidrive 1999 (Time span of the survey: 42 days; Karlsruhe, Halle, Germany)

Thurgau 2001 (Time span of the survey: 42 days; Frauenfeld und Seerücken, Switzerland)

Clearchannel 2004 (Time span of the survey: 7 days; Zürich, Winterthur; Switzerland)

When possible, additional analyses for particular socio-demographic groups are provided.

## 2. Analysis

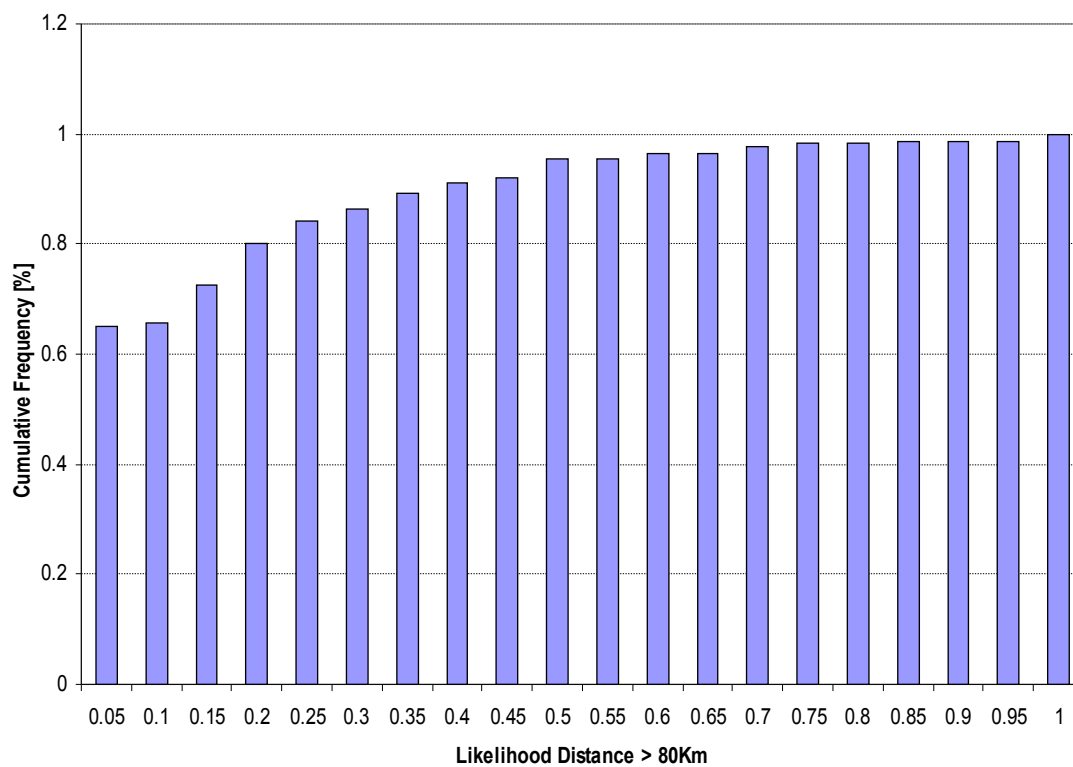
The analysis of the data sets has the goal to find out how likely is that a person driving a car in a given day will drive more than 80 or more than 100 km. To do this, for each person of the different data sets it has been find out how many days he/she drove the car and, of those days, in how many cases the relevant thresholds were surpassed. The division of these two numbers give the likelihood that the person drives more than 80 km (100 km) in a given day. These likelihoods are aggregated in a cumulative frequency distribution for each of the data sets and presented in specific graphics. By this it is possible to know how likely is that a given part of a population will drive more than the specified thresholds. Exceptions are the Swiss Microcensus data sets, since they report only on one day for each person of the sample.

### 2.1 Clear Channel Data 2004

This data set contains information obtained using GPS devices. The participants were carrying on a GPS device for about one week. The mode used has been retrieved ex-post using speed and acceleration data. Socio-demographics of the participants are not available. In the data set there are 3183 person who used the car at least on day of the survey. The figures below should be read in the following way:

- The first column represents the percentage of the persons having 0% likelihood to drive more than 80 Km with the car in a day in which they use the car (this means basically that they did not drive more than 80 Km in any of the surveyed days).
- Each other column represents the percentage of the persons having a likelihood corresponding to the value below the column of driving more than 80 Km in an average day. In more simple words, for example, the fourth column of the graph below corresponds to the value 0.2. The cumulative frequency for this column is 80%. This means that 80% of the persons has at most a likelihood of 0.2 of driving more than 80 Km.
- The difference between the two last columns represent the number of persons driving more than 80 Km with a likelihood of 1 (statistically, a certain event).

These interpretation guidelines are valid for other datasets too.



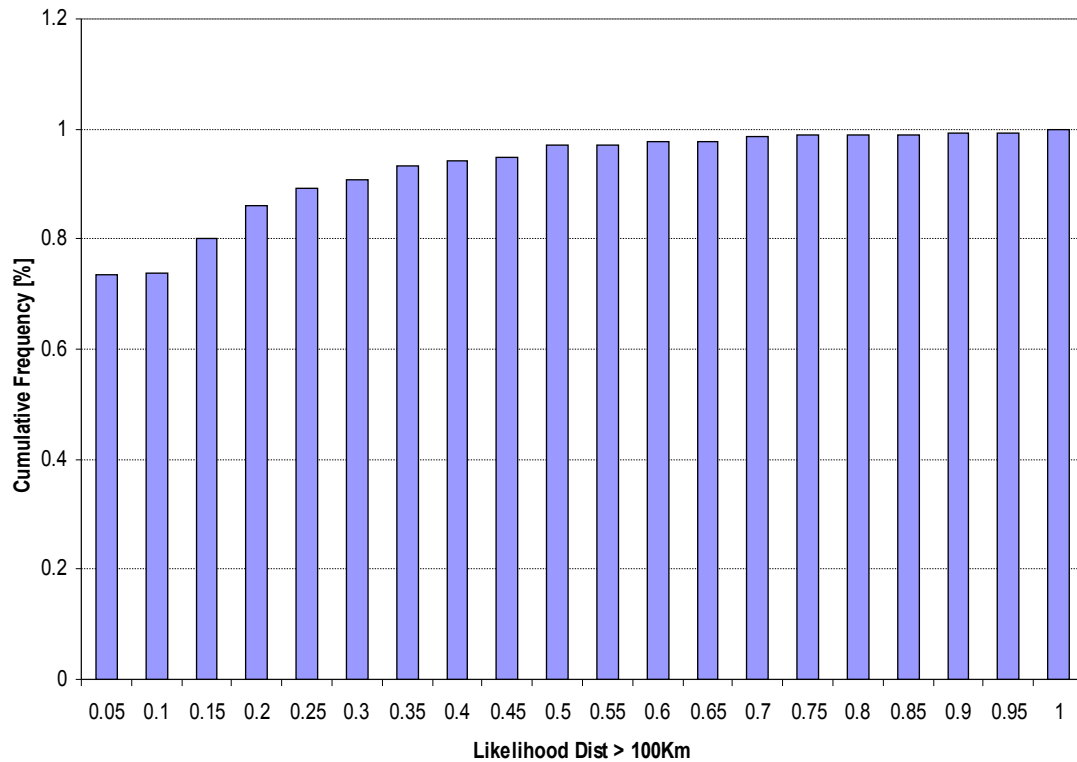
Key statistics:

Persons in the sample 3183

LH (Likelihood) = 0 → 63.9% of persons (using the car)

LH = 1 → 1.3%

Average LH → 0.11 (Std. Dev. = 0.199)



Key statistics:

Persons in the sample 3183

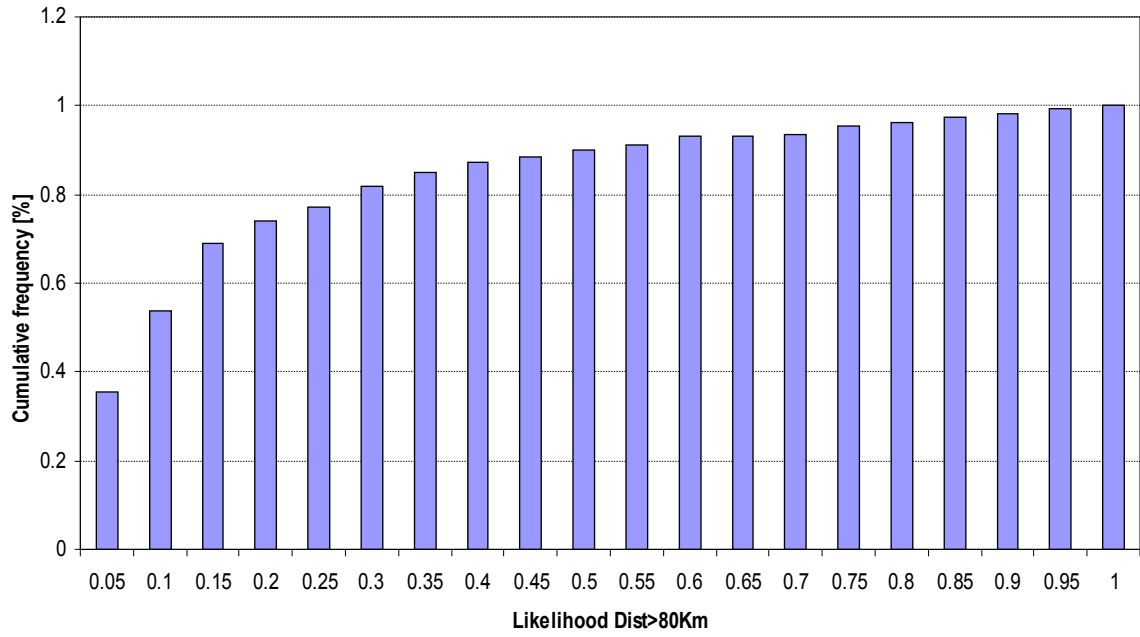
LH (Likelihood) = 0 → 73.5%

LH = 1 → 0.8%

Average LH → 0.08 (Std. Dev. = 0.170)

## 2.2 Thurgau Data 2003

This data has been obtained from travel diaries of 158 persons in the Thurgau region.



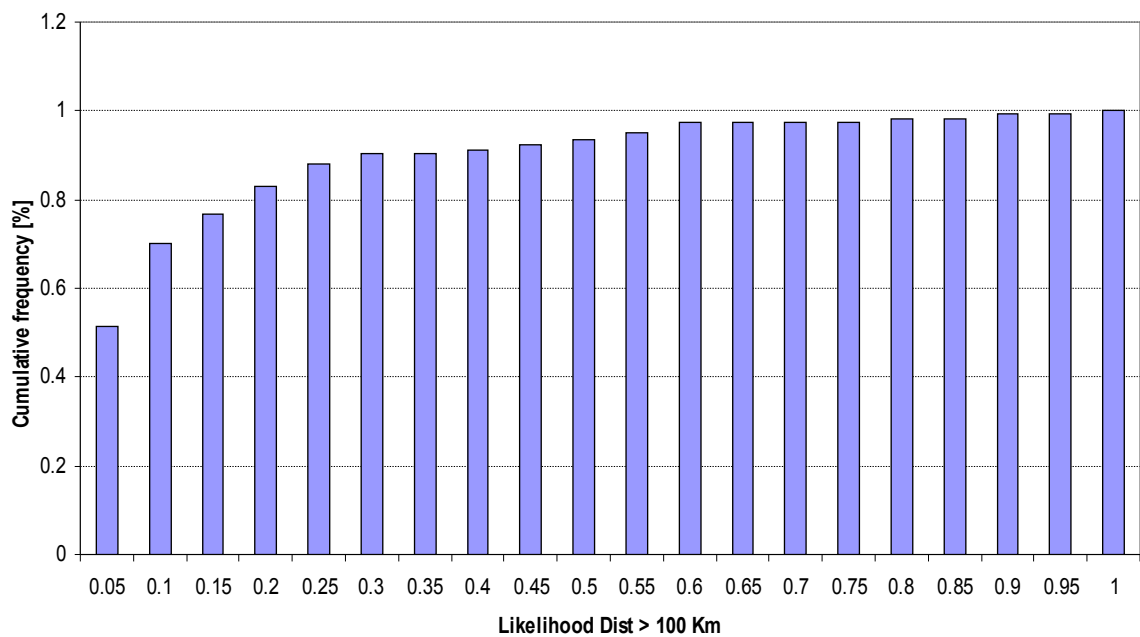
Key statistics:

Persons in the sample 158

LH = 0 → 27.2%

LH = 1 → 0.6%

Average LH → 0.17 (Std. Dev. = 0.226)





Key statistics:

Persons in the sample 158

LH = 0 → 41.1%

LH = 1 → 0.6%

Average LH → 0.11 (Std. Dev. = 0.186)

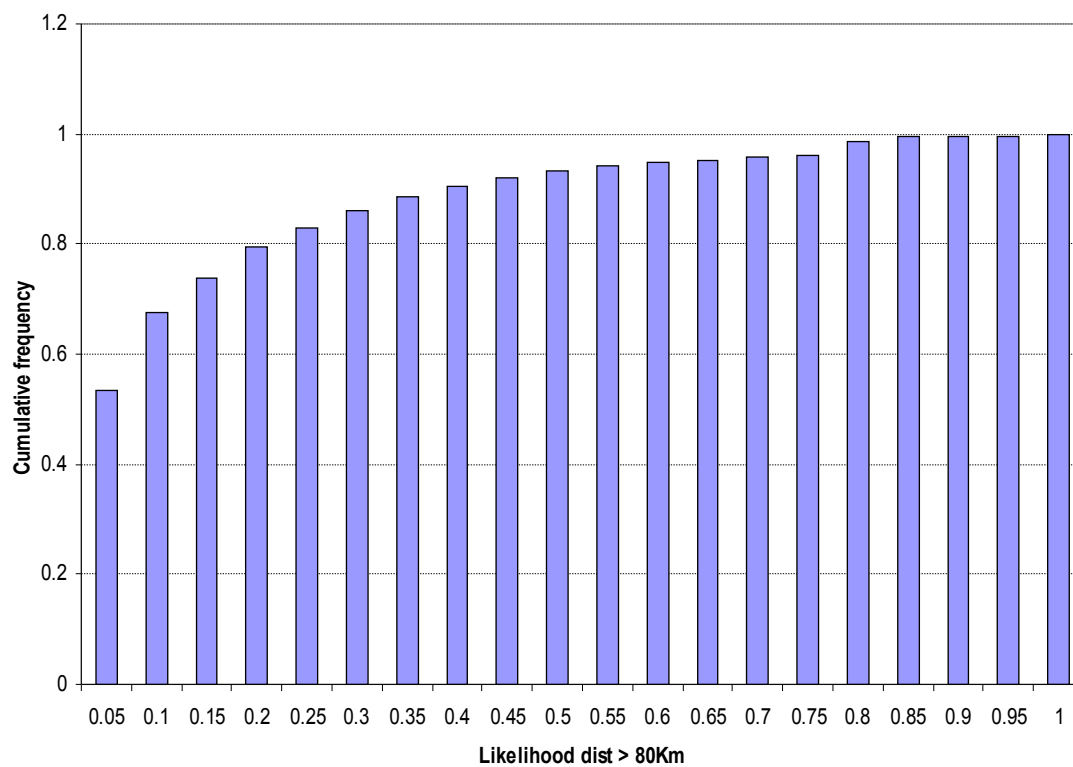
Some additional information can be obtained looking at some particular socio-demographic groups. The table below shows how the average likelihood changes for those groups.

	80Km			100 Km	
	Nr	Mean	Std. Dev.	Mean	Std. Dev.
Overall	158	0.17	0.226	0.11	0.186
Female	77	0.09	0.143	0.05	0.114
18-29	16	0.1	0.096	0.05	0.064
30-65	125	0.19	0.224	0.13	0.203
65+	17	0.07	0.103	0.04	0.065

As it was to be expected the likelihood of surpassing a given distance threshold is lower for females and for young (18-29) and older (+65) people.

### 2.3 Mobidrive Data 1999

This data has been obtained from travel diaries of 210 persons living in the German towns of Halle and Karlsruhe.



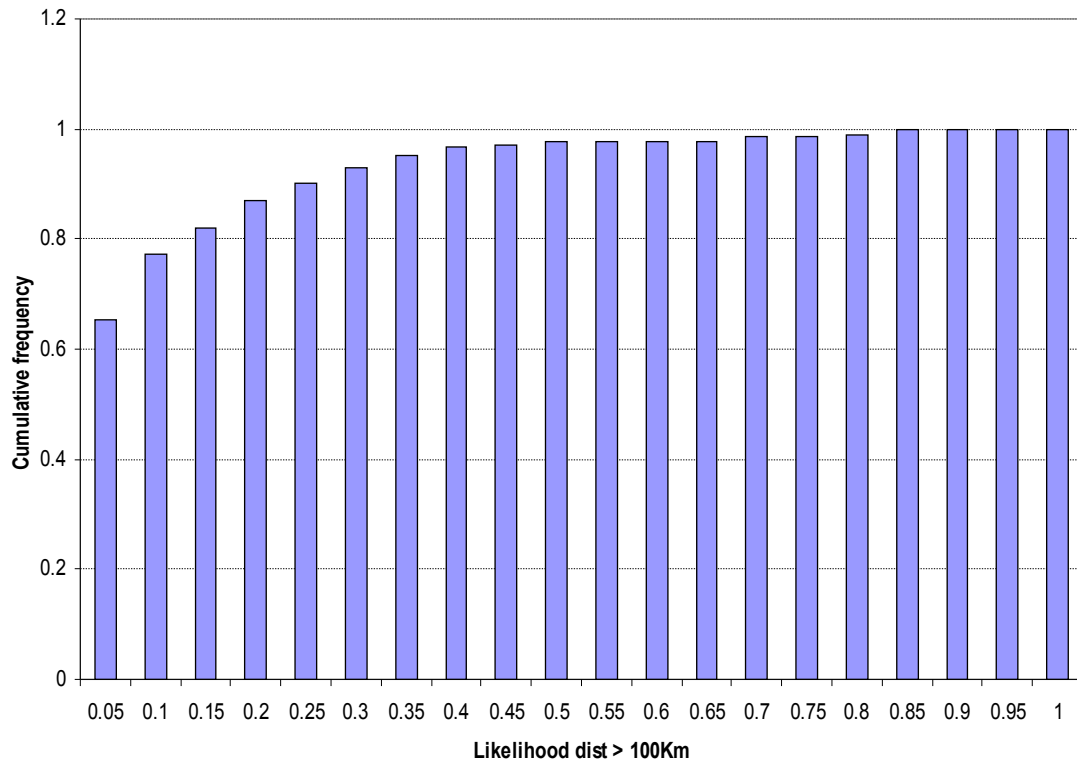
Key statistics:

Persons in the sample 210

LH = 0 → 38.1%

LH = 1 → 0.5%

Average LH → 0.13 (Std. Dev. = 0.199)



Key statistics:

Persons in the sample 210

LH = 0 → 47.6%

LH = 1 → 0.5%

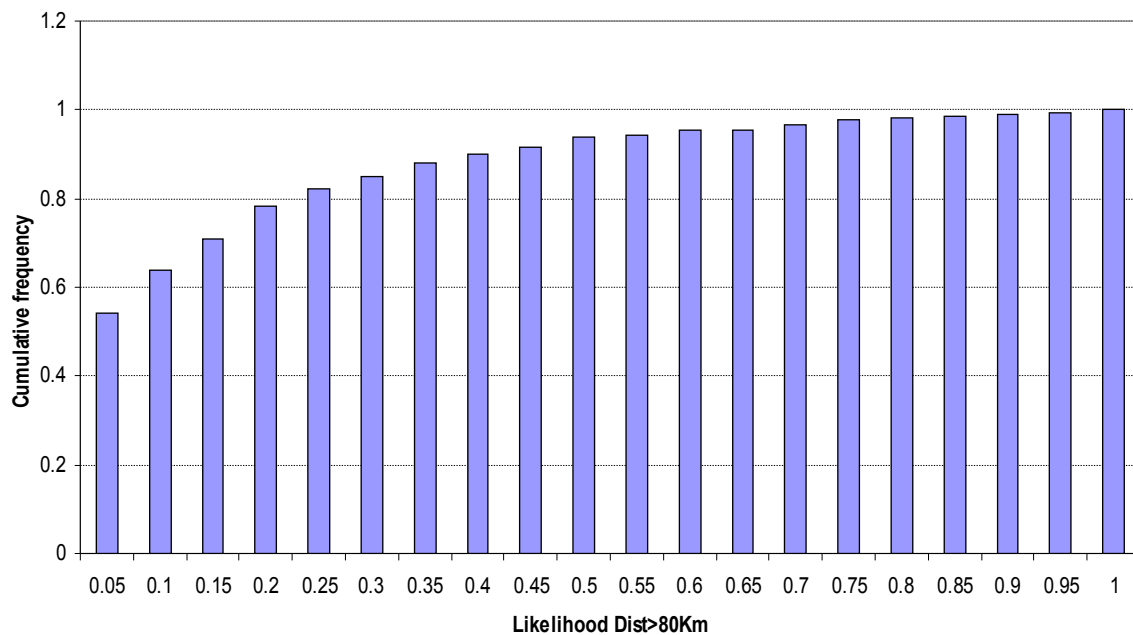
Average LH → 0.08 (Std. Dev. = 0.145)

	80Km			100 Km		
	Nr	Mean	Std. Dev.	Mean	Std. Dev.	
Overall	210	0.13	0.2	0.08	0.15	
Female	92	0.08	0.176	0.03	0.073	
18-29	35	0.11	0.186	0.05	0.101	
30-65	159	0.14	0.208	0.09	0.156	
65+	16	0.06	0.109	0.03	0.066	

Again results of the subgroups are pretty consistent with what expected.

## 2.4 German Panel Data 1994-2007

This data set has been obtained from travel diaries of more than 7000 persons. The data cover three weeks, each of them in one of three consecutive years (for example one week in 2007, one in 2006 and one in 2005). This basically means that: a part of the persons interviewed in a given year have been already interviewed the year before and a subpart of this part even one year earlier. Similarly, a part of the sample will be interviewed the following year after and a subpart of it an additional year later too. For each year the survey has a sample of about 1000 persons.



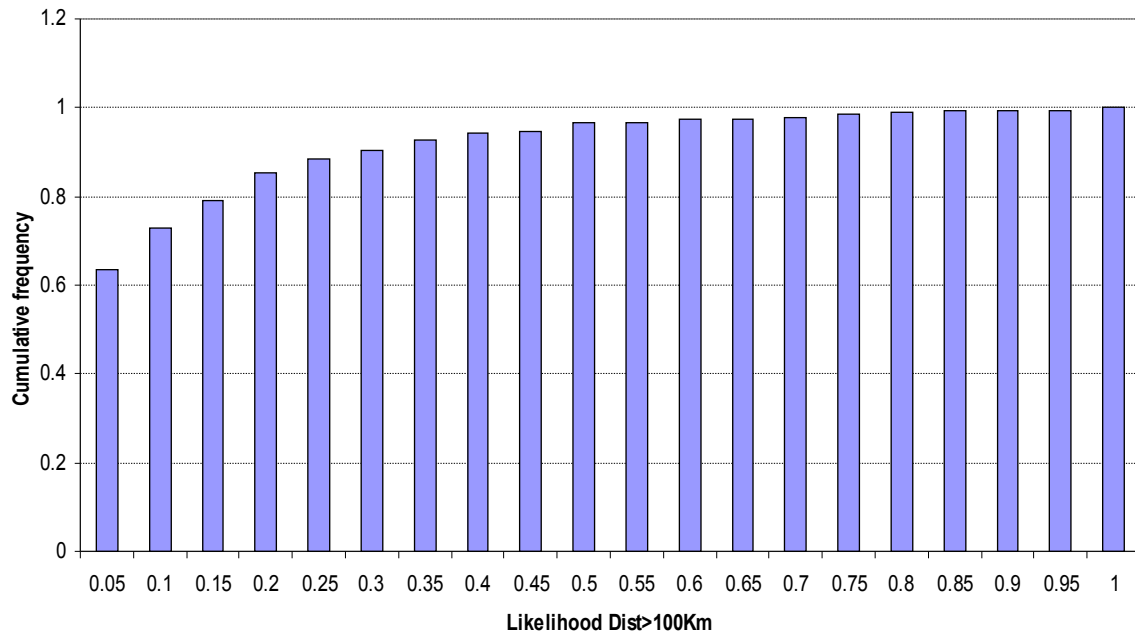
Key statistics:

Persons in the sample 7581

LH = 0 → 53.4%

LH = 1 → 0.8%

Average LH → 0.13 (Std. Dev. = 0.205)



Key statistics:

Persons in the sample 7581

LH = 0 → 62.4%

LH = 1 → 0.5%

Average LH → 0.09 (Std. Dev. = 0.170)

	80Km			100 Km	
	Nr	Mean	Std. Dev.	Mean	Std. Dev.
Overall	7581	0.13	0.205	0.09	0.17
Female	3613	0.08	0.17	0.05	0.132
18-29	1104	0.15	0.222	0.1	0.184
30-65	5471	0.13	0.21	0.09	0.175
65+	1208	0.1	0.158	0.07	0.135

Also in this case it results that females have a lower likelihood than males to travel more than 80 or 100 Km in a day. Older people also have a likelihood lower than the general average, while younger people, unlike to other data sets, have here a higher likelihood.

## 2.5 Swiss Microcensus Data 2005

Microcensus is obtained from travel diaries, it is a survey conducted every 5 years in Switzerland for a representative sample of the population. In the MC 2005 there are 14266 persons who travelled at least once as car driver. Since for each interviewed person only one day is reported in this survey, the cumulative frequency graphs can not be obtained. Instead one table summarizing travel distance distributions are reported here below.

	Dist > 80Km			Dist > 100Km	
	Sample	Frequency	Percent	Frequency	Percent
All	14266	787	5.5	554	3.9
Female	7211	280	3.9	190	2.6
City Center*	2756	83	3	66	2.4
Age 18-29	1962	142	7.2	94	4.8
Age 30-64	9984	567	5.7	398	4
Age +65	2126	70	3.3	55	2.6

\*According to the BFS definition

The percentage of persons driving more than 80 or 100 Km is particularly low in this data set. To some extent this is to expect since only one day is covered and the behaviour of a single person over a longer span of time cannot be captured. The behaviour of subgroups fulfils what expected and is in line with the results of other data sets.

## 2.6 Swiss Microcensus Data 2000

In the MC 2005 there are 14266 persons who travelled at least once as car driver.

	Dist > 80Km			Dist > 100Km	
	Sample	Frequency	Percent	Frequency	Percent
All	11579	1855	16	1313	11.3
Female	4135	535	11.5	360	7.7
Age 18-29	2127	388	18.3	251	11.8
Age 30-64	8414	1349	16	977	11.6
Age +65	1422	153	10.8	113	7.9

Here the number of person driving above the thresholds is considerably larger than in the other Microcensus data set, and more similar to results of other data sets. The behaviour of subgroups is in the norm.

### 3. Conclusions

The behavior of people in terms of daily travelled distance seems to show some regularity independently of the time and the place of the survey. Obviously differences do exist but from the results presented it seems clear that some general conclusions can be drawn. The first, and maybe most important observation is that, for all the data sets the large majority of persons has a really low likelihood to drive more than 80 or 100 km in one day. In some of the examples we observed even a majority having a 0 likelihood of driving more than the threshold distances (for example 62% of people in the German panel data has 0 likelihood of driving more than 100 Km). The average likelihood of a person to drive longer than 80 Km lies between 0.1 and 0.17, while that of driving more than 100 Km lies between 0.08 and 0.11. Even if it can be expected that using panel data over longer periods would push this numbers to higher levels, it seems safe to assume that the presented results reflects a general attitude of persons. Most of the people, in most of the days that they are driving a car, are driving for relatively short distances. Longer daily distances are exceptions for most of the people. Longer panel data would help capturing these exceptions, but it seems unlikely that the results could be substantially different. Another important point is that the behavior of some sub-groups of the population seems to show some regularity. In particular it seems that in average male drivers are traveling further than females, older people (+65) are driving shorter distances, and younger (18-29) longer. The type of urban environment could be taken into account only for one dataset (MC 2005) but it seems that persons living in the city center have the tendency to drive less far, as it was to expect.

In summary, it seems that most of the persons driving a car are driving less than the considered daily thresholds for most of the time, and this tendency is particularly strong among some socio-demographic groups, like females and older people.