

The 1994 Microcensus on Transport Behavior A Case Study of Switzerland

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ABSTRACT

This paper discusses the latest microcensus on travel behavior in Switzerland, held in 1994. The growing variety of users interested in this piece of information, such as planning authorities, marketing departments of public transport companies, insurance companies and many others, requires a permanent growth of the surveys' topics. Compared with former surveys on travel behavior, the 1994 study design underwent a number of substantial innovations, thus better covering and informing on the daily travel patterns in Switzerland. The main changes consist of a switch from a written survey form to computer-assisted telephone interviewing. The careful and extensive procedures of contacting the persons selected for the interview, the numerous possibilities of on-line plausibility checks and the explanatory support in direct dialogue lead to a substantial decrease of overall and of item nonresponse. In addition, the computer-assisted telephone interview is able to cope with a degree of complexity, which is necessary for the recording of every single stage of all daily trips recorded for one day. Thus, it has been possible to record, for the first time on a national level, the manifold combinations of different public and private, motorized and non-motorized transport modes chosen for each single trip.

INTRODUCTION

The era of the microcensus on transport behavior began in the early seventies. The economic boom had dramatically changed the transport system in Switzerland—as in every other industrial country. Especially after the oil shock, these changes were accompanied by infrastructural and financial shortfalls. As a consequence, there was a further need for policy coordinating, especially in the regional, energy, tourism and transport sectors. This is how the so-called “global concepts” and, especially, the one of the transport sector started (1).

The authorities and other planning institutions on communal, cantonal and national levels began to focus on the transport behavior of the Swiss population, which was first described for different groups of persons and then linked to regional and economic indicators. One started to search systematically for patterns and relationships that would explain the positive and the negative impact of transport on the population's quality of life. Five surveys were designed since 1974, the most recent of which was done in 1994 (2).

In order to explain its design development and to analyze the adequacy of its results for the planning authorities and many other users, it is necessary to first recall the surveys' evolution since 1974 .

The 1974 and 1979 time budget studies were replaced by the so-called “Kontiv design” (Kontinuierliche Erhebung des Verkehrsverhaltens), which was applied in Switzerland for the first time in 1984. Given the available resources, such a change in

method first increased the surveys' quality, since their results were now representative on a national level. But Kontiv transport surveys done merely through written questionnaires were compromised by the complexity of the items considered.

The difficulties encountered in the 1984 and 1989 surveys required a second change of method. In 1994, the Kontiv design was thus used in computer assisted telephone interviewing (CATI), providing a higher response rate and a better data quality. Another important improvement consisted in dividing the variable "trip" into its "stages", information particularly important for market research in the public transport sector.

As a result, the survey could be better adapted to the needs of previous customers, as well as to a greater variety of different user groups. Its traditional use by the road and railway planning authorities is bypassed by the wider possibilities opened to other sectors, such as market research, policy evaluation or social and environmental impact assessment. Furthermore, the importance of transport in the Swiss political agenda requires adequate transmission of the information to a large readership of interested citizens.

TRAVEL SURVEYS IN SWITZERLAND FROM 1974 TO 1994

Time-Budget Studies

Table 1 shows a historical overview of the different types of surveys on transport behavior held in Switzerland on a national level since 1974.

The first 1974 and 1979 studies were designed as so-called "daily activity studies" or "time-budget studies". Their aim was twofold: First of all, the people's mobility behavior was to be analyzed, together with all the other daily activities and a set of sociodemographic and geographic conditions of the household or the person (e.g., distance from home to work, etc.) in order to discover cluster-specific behavior patterns. Therefore, all the members of a chosen household were included in the sample. Secondly, a detailed inquiry of "trips" was to provide average measures on length, duration, purpose, means of transport used and number of people traveling in the same car (degree of car occupation). These measures all helped to refine the transport modeling. This inquiry also aims at validating the information on commuting that was collected during the 1970 population census.

In 1974, communities and trips' starting points were selected by random sampling, and the households were chosen by random route. Sociodemographic, economic and geographic information on the household were collected in a first face-to-face interview with one adult member of the household. Written questionnaires were handed out on this occasion, and a key person out of all adult household members was chosen at random for the second face-to-face interview, for which an appointment was made.

In the self-administrated questionnaires, all family members reported their daily activities during a key day. The children's (schoolchildren from 6 to 15 years old) questionnaires were to be answered in a proxy interview by the parents. One or two days after the reporting day, the interviewer collected the questionnaires and checked them, and then interviewed the key person. In this second face-to-face interview, all the trips (7130 units) made by the key person (2114 persons) were registered, and one of them was chosen at random (1883 units) and analyzed in detail.

The results showed that indicators on transport behavior were related to a variety of spatial and sociodemographical criteria.

TABLE 1 National Surveys on Transport Behavior in Switzerland, 1974-1994

Year	Sample	Study period	Method	Main issues
1974	2 144 households, all members aged 6 and above (weighting bases population census 1970)	autumn 1 key day	combination of written and personal interviews	time-budget study on all daily activities, details on selected trips
1979	2 000 households, all members aged 10 and above	autumn 2 key days	same as 1974	same as 1974
1984	3 513 households, all members aged 14 and above (weighting bases population census 1980)	spring 1 key day	written questionnaire	Kontiv design, details on all trips, details on all households and their members
1989	20 472 households, all members aged 10 and above (with regional densification of sample=boost sample) (weighting bases population census adapted to 1980, ESPOP) ¹⁾	spring 1 key day	same as 1984	same as 1984
1994	16 570 households, 18 020 members aged 6 and above selected at random (with regional densification of sample=boost sample) (weighting bases population census, 1990, adapted to 1993 ESPOP) ¹⁾	all 1994	computer-assisted telephone interview (CATI)	concept similar to 1984/1989, the smallest unit of mobility is the "stage" instead of the "trip"

1) ESPOP, Statistik des jährlichen Bevölkerungsstandes (annual statistics of the population, annual update of the 1990 population census (2,3,4,5,6).

The examples for *spatial criteria* are the following: quality of the neighbourhood (degree of zonal mix: dwelling/industrial/agricultural), location of the household within the community (central, peripheral), type of settlement and housing, accessibility to shopping facilities or recreation facilities, etc. The *demographic criteria* were covered by a large number of variables referring to the household and its members, such as household size, number of available vehicles, education level, professional level, situation at work, and others. In 1974, there were even questions on the available income per person, which had to be evaluated through a rough classification. Due to high item nonresponse, this indicator had to be canceled in later surveys.

In these first time-budget studies on daily activities, a large number of average values had been calculated for some key indicators on mobility, i.e., the average frequency of trips per day, the trip duration and distance, according to the purpose, and the means of transport (3, 4). Although we are fully aware that it is difficult to compare data generated by different survey methods, we find it interesting to observe that in 1974, the Swiss made an average of 3.4 trips per person per day, spent about 77 minutes traveling and covered a

distance of 26 km. Today, that is, 20 years later, we register similar figures: 3.3 trips per person per day, 78 minutes of traveling and a distance of 33 km.

In the 1974 survey, a set of questions also covered transport passes and other costs. As a result, the indicators on the daily mobility were also related to daily expenditures, especially for the public transport means. Besides cost questions, questions regarding other salient criteria for the choice of the transport mode—travel time, punctuality, travel comfort, the need to change from one means to another, etc.—were included.

Besides transport-related questions, the time-budget studies also generated a rich collection of data that could be exploited for other analyses in social science and market research, since all activities were reported in time intervals of 15 minutes and assigned to 43 different categories.

From Time-Budget Studies to Kontiv Design Studies

In the 80s, the Swiss time-budget studies were replaced by the so-called “Kontiv design” developed in Germany. It is based on the concept that “trips” are considered as an operational theoretical construction. Trips are the analyzed units, and individuals are the observed units. The households may be understood as transmitting units that deliver information as well. The Kontiv design’s main assumption is that, with a sufficiently large observation area (e.g., a country) and a sample of adequate size, the collected number of trips allows a thorough analysis of the mobility in the analyzed area (e.g., in Switzerland, divided in linguistic regions). Additional surveys, e.g., on trips over the border to/from another country, help in estimating the missing part of the overall transport volume. Furthermore, the key-days concept allows us to refer to the real transport behavior of the previous day. We are thus analyzing a time span, the details of which the interviewed person can easily remember.

The 1984 and 1989 microcensi based on the Kontiv design were done with written questionnaires. All members of the chosen households aged 14 and above in 1984, and 10 years and above in 1989, were included in the sample (5,6). Thus the sample size, especially the one in 1989, could be increased considerably compared with the time-budget studies, which had been carried out with written questionnaires and two face-to-face interviews, therefore costing much more.

Nevertheless, changing the analysis method had one important disadvantage, since comparing the results of the time-budget studies with the results of the microcensi was highly compromised (7). As time-budget studies focused on all daily activities divided in 15-minute intervals, the microcensus design mainly recorded trips, in detail, with the exact starting and arrival time. One of the main difficulties consisted in transforming ex post the time-budget activities related to mobility into “trips”.

Table 2 compares the profiles of the 1974 and 1979 time-budget studies with the 1984 microcensus, where other sources of differences are obvious. The authors of this analysis stress that the comparison difficulties are not the same for all mobility indicators: whereas the mobility rate (number of mobile persons on the recording day) had been registered in the same way for all three surveys, this was not the case for mobility indicators referring to trips. In general, comparing absolute values such as travel time and distance per trip and per person is more delicate than comparing relative figures (for example, the percentage of leisure trips, etc.). The most prominent source of incompatibility was tackled in a special project, based on algorithms that extracted “trips”

out of the time-budget protocols in a way that allowed comparison with the trips registered in 1984. A matrix of 140 combinations of trip duration, travel purpose and modal choice helped to replace the lack of information on the trips' distances of 1974 and 1979 by the average distances calculated in 1984 (8).

TABLE 2 Mobility Indicators in 1974, 1979 and 1984

	1974	1979	1984
Mobility rate	89.7 %	85.1%	84.0%
Number of trips per mobile person per day	3.9	3.7	4.0
Travel time per mobile person per day (in minutes)	82.2	92.0	85.3
Travel distance per mobile person per day (in kilo-meters)	34.3	44.7	41.5

Main Problems of the 1984 and 1989 Microcensi Based on Written Questionnaires

Besides giving more detailed information on an increasing number of mobility indicators, the 1984 and 1989 microcensi also gave rise to a number of problems due to their design. Table 3 gives an overview of the main uncertainties and difficulties.

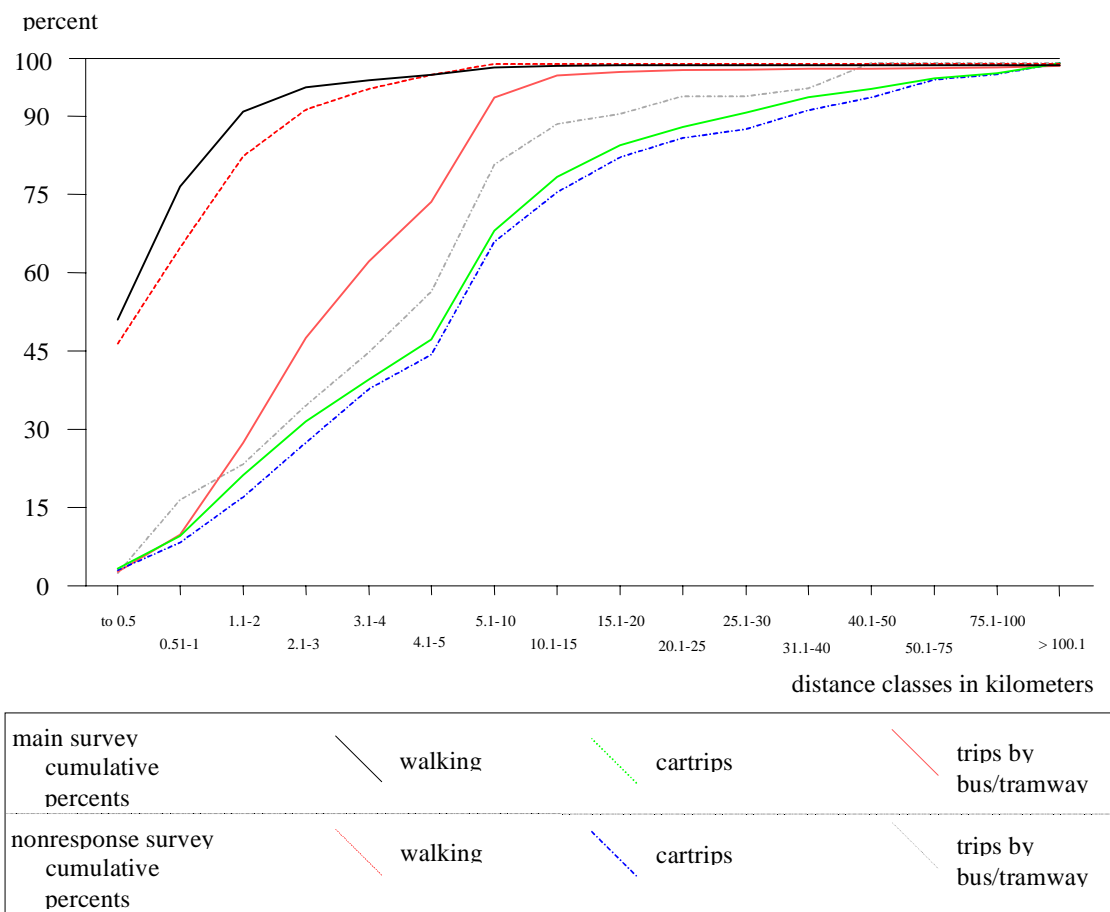
For some of the questions presented in the above list, several strategies were developed in the course of the 1984 and 1989 microcensi. In order for the interviewed persons to better understand the "trips" concept, the 1989 questionnaire defined and explained it with several examples, also including the "return trips" and the "round-trips". A hot line was opened for questions and remarks. No compensation was given to the interviewed, but they could order a summary report on the results with the questionnaire already.

TABLE 3 Difficulties Observed During the 1984 and 1989 Microcensus Experience

Validity	Do the interviewed persons understand the survey concept and the criteria they are asked about?
Reliability	Do the interviewed persons all understand the concepts (e.g., "trips") in the exact same way?
Representativity	Are the highly mobile persons sufficiently represented?
Identification	Is the questionnaire filled in by the right person, does it refer to the correct time span and is it adequately detailed? For example, do household members "delegate" the job to the mother or the housewife?
Incomplete information/ manipulation	Are all trips correctly reported (e.g., return trips or very short trips)? Are all trip indicators, such as starting and arrival time, distance, transport mode and travel purpose, correctly reported? How is missing or wrong information replaced?
Assignment	Multipurpose trips or trips using several transport modes are often dealt with by rules of assignment. Some information gets lost in this process.

The 1984 and 1989 microcensi did not include the people living in collective homes or those who did not know the language, that is, foreigners with a residence permit who were not able to answer the questions in one of the survey’s three official languages (German, French, Italian).

In autumn 1989, a nonresponse survey was conducted with approximately 500 households/950 people who had refused to send back the written questionnaires. This sample was chosen at random and respected the regional and weekday distribution of the main survey. CATI was the chosen method. It contained some mobility indicators, as in the main survey, such as availability of vehicles and parking lots, annual kilometers of the first/second/third car, ownership of public transport passes and driver’s licenses, extensive protocol on the trips of the previous day, and sociodemographic questions. The results of this nonresponse survey showed a slightly higher rate of persons having a driver’s license, owning a car and using a free parking lot at work. Nevertheless, as far as the trips are concerned, the differences between the main survey and the nonresponse survey in modal choice and distribution of trip distance for different population groups proved to be very small (see Figure 1 below). Thus, for the main survey, no special nonresponse weighting was considered to be necessary (9).



Data source: IPSO (9).

FIGURE 1 Cumulative trip distance by mode: comparison between the 1989 main and nonresponse surveys.

In 1984 and 1989, extensive corrections had to be made with regard to forgotten return trips, missing and/or wrong information on travel time and distance, etc. The geographic codification was especially difficult, since the area codes and the zip codes attributed to the trips' origin and destination addresses were not always unequivocal.

The 1984 and 1989 results comparison generated observations that were somewhat contradictory to the experts' expectations:

- Compared with 1984, the percentage of mobile persons had dropped in 1989;
- A very high rate of noncommuters, especially schoolchildren, was observed;
- The number of daily trips per person had diminished;
- But the average length of trips had considerably risen.

These inconsistencies had to be further analyzed and explained (10). The main reasons were the new questionnaire and the different observation period, which coincided with the spring holidays in certain regions.

Another reason was that some trips were omitted from the 1989 survey, because the survey form had space for only 5 trips, while some people made more trips. If necessary, further forms could be ordered, but this procedure was obviously too complicated. Therefore, people tended to skip the short trips—and especially the ones done on foot. This variable, quite important for transport planning, could not be analyzed ex post.

The Main Innovations of the 1994 Microcensus

The above-mentioned problems had to be solved in the 1994 microcensus. Further to an extensive conceptual study, three innovations were introduced with regard to the contents and the methodology:

1. "Trips" were divided into several "stages",
2. The computer-assisted telephone interview method was applied, and
3. The observation period was extended to a whole year.

The example in Figure 2 shows that the trips were divided into stages.

The following description has been used in the interviewers' training:

A trip always starts when someone gets mobile for a certain purpose. A trip always ends when that purpose is met, when it changes or when the person remains an hour or more at the same place.

Every trip consists of one or more stages. A stage is the part of the trip that is done in the same transport mode. Walking is also considered a transport mode. When the transport mode is changed (also between two transport modes of the same kind), a new stage begins, such as after a minimum break of 15 minutes. The distance for a stage is 25 meters.

With this concept, one gets much more precise data on the distances traveled, the time spent on the way, the modes chosen and their chronological order, and the combinations of different purposes in multipurpose trips. The “stages” concept delivers new information but still allows the data to be aggregated to conventional indicators such as “trips” and “exits”. Moreover, short trips, especially on foot, are now included. Another advantage is the possibility, to appraise the exact amount of time needed to switch from one transport mode to another, especially the waiting time when using several public transport modes in one trip.

The “stages” concept was no longer manageable on the basis of a written questionnaire. It was therefore necessary to switch to computer assisted telephone interviews, a method with two advantages method in that it raises the sample and the quality of information obtained.

The contact procedure includes several calls (more than 20 calls, if necessary) and making appointments for the interview. Such agreements considerably diminish the nonresponse quota and improve the sample quality. Thus, in 1994, about 75% of the chosen households could really be interviewed, compared with 63% in 1989 (such a comparison is possible, as both samples were drawn by the Federal Office for Statistics exactly in the same way). Unlike in 1984 and 1989, in 1994, not all members of a selected household were interviewed. From households with one to three members, one person was selected at random, and from households with four or more members, two persons were selected at random. These differences of selection were considered in the weighting procedure. Finally, from the contacted households, 93% of the selected target persons could be interviewed in 1994.

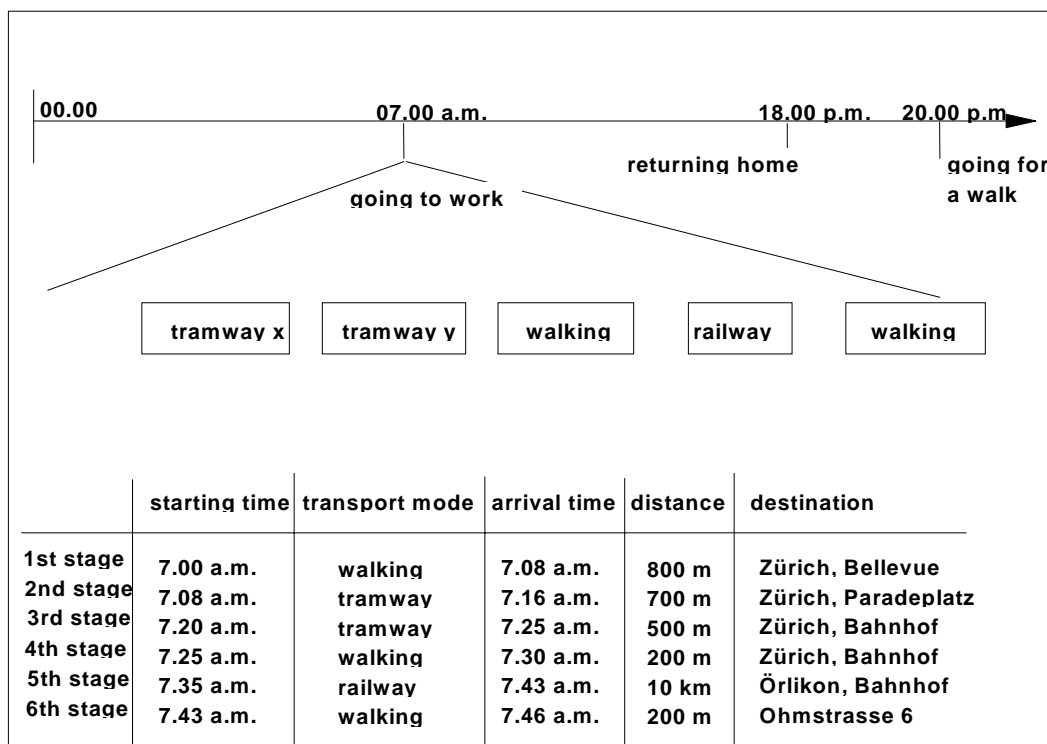


FIGURE 2 Trips and stages evaluation.

The telephone interview has several advantages: the interviewer knows exactly who is answering, and to which day and which behavior pattern the information refers. He can clear up misunderstandings immediately, and check plausibility during the dialogue. For example, this time, the six-year-olds could be asked about their travel behavior, always with one of their parents as a proxy.

Finally, the 1994 microcensus covered the whole year, in order to capture seasonal differences and differences in the days of the week.

Computer-Assisted Telephone Interview (CATI)

The computer-assisted telephone interviewing technique has considerably evolved in the last years. Here is the list of improvements that could be registered while applying CATI:

1. *Computer-assisted steering of the interview processing.* Specific questions to a subgroup of persons—e.g., questions on motorcycle use—are asked of only those really involved. On the other hand, the interviewer can make sure that no question has been forgotten.

2. *Equal distribution of the interviews on the whole calendar year.* Equal sample distribution is part of the progress made in the field of address management. As with any microcensus done by the governmental administration in various scientific fields (such as medical health care, living conditions, tourism, transport and others), the sample has been taken from the national Tercofile (telephone register: 97% of Swiss households are linked to the telephone network; source: population census 1980). Once having entered the address wave, sent by the Federal Office for Statistics to our subcontractor (LINK), the computer program steers the order in which households for which key-day appointments have to be made for the personal interview have to be contacted. CATI makes it therefore easier to control an equal interview distribution on every day of the week and on every day of the year.

3. *Improvement of the response rate and of information on the refusal reasons.* The much simpler “trips” concept already revealed the limits of the bearable size for a written questionnaire. The new “stages” concept would have implied a much larger one, thus decreasing the response quota. Besides, when meeting with a refusal, the interviewer tried to get as much information as possible on general mobility issues and on the reason for the refusal.

4. *Adequate explanations adapted to the real situation.* As mentioned above, on the phone, the interviewer can react immediately to uncertainties and questions and give further explanations about the real circumstances. Compared with CATI, the standardized questionnaire is too difficult to understand for some people, and too much of a banality for others.

5. *Item rotation.* The 1994 microcensus also contained a set of questions about attitudes toward some issues of today’s transport policy, or about the qualification of the current infrastructure and transport facilities. In order to avoid a systematic bias due to learning effects, the latter had to be controlled by item rotation. This was done by changing the order of attitudinal questions at random within this part of the questionnaire for every interviewed person.

6. *Using external databases.* The computer-assisted telephone interview is supported by a number of external databases that can be checked and used on-line during

the interview. For example, most people ignore the zip code of the place they visited on a Sunday afternoon's excursion. Upon registering the address, the destination's postal code can be codified simultaneously.

7. *The consequent evaluation of small trips.* The interviewer drew the attention of the interviewed to the very small trips or stages of trips. This was done in two ways: At the beginning of the interview part on trips, the interviewer pointed out that the very small trips also had to be reported. Secondly, when changes from one mode to another one were reported, the interviewer checked whether an intermediate stage had been done by walking, which had not been reported initially (e.g., between two different tramway lines). As mentioned above, the latter tended to be omitted in former surveys. Thanks to this change of method, a rise of mobile persons from 83% in 1989 to nearly 90% in 1994 could be observed.

8. *On-line plausibility checks.* The interview procedure can use external databases. Similarly, subroutines checking the plausibility of the answers may be fit into the program. The filter may even be set so strictly as to stop the questioning, as long as certain checks have not obtained a positive result. Thus, the interviewer receives an acoustic warning whenever he gets answers on the plurality of jobs, the simultaneous attending of different schools, unlikely distances, travel times and speeds, etc. For example, the interviewer has to check the answer's plausibility

- when someone says he/she has driven a car on the reporting day, but has no driver's license;
- when a car is reported to have more yearly vehicle-kilometers abroad than in Switzerland; or
- when someone describes a previous day's walk to the grocery store that, from the distance and reported starting and arrival times, would give a result of an average speed of 35 km/hour.

In such situations, the interviewer has to check whether there is a misunderstanding or a wrong answer.

The following list gives an overview of the main indicators registered in the 1994 microcensus.

Information on Every Trip Made During The Key Day

- Address of the departure and arrival spots
- Various trip stages
- Travel purposes
- Travel time (per stage)
- Distance (per stage)
- Transport mode (per stage)

Private Equipment

- Vehicles (number of cars, motorcycles, motorbikes, bicycles)
- Cylinder and age of cars and motorcycles
- Vehicle-kilometers for the previous year (1993), abroad and at home
- Driver's license
- Public transport passes

Parking Lot

- Available at work (free, paid)
- Available at home (free, paid)

Demographic and Socioeconomic Characteristics

- Household structure
- Quality of dwelling
- Gender/age/profession of the household members
- Professional position

Questions on Transport Policies

- Opinion on the existing infrastructure and its quality
- Opinion on the internalization measures of external costs
- Opinion on new infrastructure projects financing

Users of the 1994 Microcensus on Transport Behavior

The users of the 1994 microcensus on transport behavior may be divided into three groups, according to different criteria:

1. First, there are the “daily customers” of the Bureau for Transport Studies, i.e., students, politicians or journalists who want to use the data for a seminar, an article, a speech, etc. Most of the time, data material published in the official publications on the 1994 microcensus is precise enough. From time to time special calculations are also given on specific request—e.g., for the marketing division of an insurance company, etc.
2. The second group, to which the Bureau for Transport Studies belongs, as well, utilizes the microcensus data as input for further calculating planning bases; information on the number of people traveling in the same car is used for modeling the transport volumes (persons-kilometers).
3. A special group of customers are the data users of regions with a densified sample size (boost sample). As a result of the higher sample in these areas, it is possible to undertake evaluations of transport behavior on a regional level.

One also could divide the different ways of working with microcensus data according to thematic focal points:

1. Some projects focus primarily on *spatial patterns of travel behavior*. An example is a European research project of the fourth framework program. It is called SESAME (derivation of the relationship between land use, behavior patterns and travel demand for political and investment decisions) and analyzes structural characteristics of urban areas and their interrelation with travel patterns. Thus, a variety of structural, spatial and socioeconomical indicators are compared with the transport behavior in city centers, in central cities and in their wider suburban surrounding. The analysis is working with a harmonized database of a large number of European cities.

2. Other projects focus on the use of one or several *transport modes*. As an example, the Action Plan “Health and Environment” of the Federal Department of Internal Affairs may be cited. This research studies the promotion of bicycles.

3. Projects that focus on the different *transport purposes* are also quite frequent. Within the National Research Program No. 41, “Transport and Environment”, several projects utilize the microcensus data to analyze transport behavior during leisure time and for tourism.

4. Another field is the orientation toward *sociodemographic questions*. An example is a study on the so-called women’s service travels (i.e., bringing the children to school, doing purchases and other dealings for all other members of the household, etc.) (11). The research done in the Zurich area (with a densified sample size or booster sample) is a very nice example of the many possibilities to use microcensus data on transport behavior. The users have organized themselves in a loose working group, in order to coordinate data use whenever possible.

5. On a cantonal level, the *Canton of Zurich’s Statistic Bureau* published in 1996 two reports on the 1994 microcensus data. They presented a number of key indicators, characterizing the mobility in different geographic areas, e.g., the availability of vehicles in households, the use of passes for public transport modes, the modal split for different travel purposes, the average number of passengers traveling on the same car, and many others (12,13).

Most interesting is the transports’ interaction between the different subregions of this canton. As a result of the higher density of the sample, the distribution of the residential population in these areas is correctly represented by the sample. On the bases of the protocols, from each trip and each stage of a trip are registered the addresses of origin and destination, departure and arrival time as well as the transport mode used. These relations between origins and destinations can then be assigned to the corresponding links of the transport network. The aggregation of the assigned trips shows the interrelation between the regions, functioning either as origins, as destinations or as transit zones. The calculations of supply and demand and the assignment of the reported trips to the existing links have been done with a transport model (software: POLYDROM) (14).

6. The *Office of Civil Engineering of the city of Zurich* helped to coordinate the use of data by the administrations and university institutes of Zurich. In their own name, they also published a number of information leaflets meant for a broad public, describing the city’s travel patterns and the resulting challenge for transport planning. Here again, the origin-destination matrix divided by transport mode was assigned to the links, describing the interrelation between the subzones of the city.

7. *Zurich’s Public Transportation Company* also uses the 1994 microcensus. Since it gathers several public transport operators, the income has to be allocated according to each’s performance. But their single outputs can no longer be calculated on the bases of the tickets sold, since an undifferentiated unit ticket is used for the area covered by the whole company. The key for the allocation therefore comes from the origin-destination matrix of the trips done with public transport modes, evaluated in the 1994 microcensus.

8. Besides the assignment of revenue, the microcensus is also used for market research in the public transport field. The *Canton of Zurich’s Transports’ Association* uses the results for identifying customer segments and also for evaluating modal splits in their defined marketing regions.

9. Another user is the *Office of Technical Installations and Atmospheric Hygiene of the Canton of Zurich*. It is mainly interested in the transport behavior for leisure and

shopping purposes in connection to different facilities of the canton of Zurich.

As an example, a large shopping center wants to build an extensive parking facility. In Switzerland, such a project needs to undergo an environmental impact assessment. The microcensus now allows one to estimate the traffic volume on the feeder lines and to identify the customers' average traveling distance and their zone of origin. Such an analysis, of course, aims to estimate the quantified effects on the atmospheric hygiene.

10. One particularly interesting project is the work of the *Zurich Office for Equality Between Women and Men*. Men's and women's different living conditions lead to different patterns of behavior that also exist as far as transport is concerned. The office for equality uses this background, in order to control the organization of the public space, including transport, and prevent it from inducing any forms of discrimination. The Geographic Institute of the Technical University of Zurich studies this field on behalf of the Zurich Office for Equality, using the microcensus data together with data of qualitative interviews.

One subject is, for example, the safety of public transport facilities in the evening. The interviewed women did report to prefer, in the evening, traveling by private car for safety reasons.

Owning a private car is strongly related to income, which is still significantly lower for women than for men in Switzerland. The availability of a private car is therefore significantly lower for women. This relationship is clearly shown in the microcensus results. The two conditions—lack of safety on public transport facilities at night, and lower access to private cars—do discriminate against women, since their freedom of movement is reduced. Such subjects and others serve as bases for a set of recommendations formulated by the Office for Equality on behalf of the other public authorities (15).

Looking at the example of Zurich, one can see how manifold the use of the microcensus data may be. For the different groups of users, the Federal Office for Statistics and the Bureau for Transport Studies also have created various instruments for the transfer of information, as presented in the following list:

1. The Federal Office for Statistics and the Bureau for Transport Studies have published together the *main report on the microcensus results*. It is available in German and French and presents a detailed description of all major subjects (2).
2. For very specific questions, about 700 cross tables are available in the *electronic book VISTA*. It has a quite user-friendly interface and costs 160 Swiss francs, which is a fair price.
3. The Bureau for Transport Studies also published a *popular version of the results*, dedicated to a broad readership. The most important results are presented in a graphic form with easily understandable explanations. Where possible, comparisons with 1989 and 1984 are shown, as well. This publication is available in German and French (16).
4. A short report on methodological aspects, published by the Federal Office for Statistics, explains the main decisions and proceedings concerning the sampling method and the results weighting. It contains contributions in French and German (17).
5. A number of unpublished documents comment on the proceedings of the interviews. There are reports on the pretest, the computerized questionnaire screens, documents for the interviewer's training and monthly reports on the ongoing interviews. All these documents have been written by the LINK institute in Lucerne and may be consulted on request.

Whereas some users have just begun to work with the 1994 microcensus data, the Bureau for Transport Studies is already thinking about the next census in 2000. An interesting teamwork is planned with two private firms, working in the field of advertising media research. Having themselves carried out a time-budget pilot study on the media users in 1995, the CATI interview program of the 1994 microcensus was taken as the basis for the reporting of daily activities. For this purpose, it underwent some substantial enlargements, but still includes a set of mobility items (18). Since a similar time-budget study is planned for 2000 by the same team, there is the opportunity for a matched operation of microcensus on travel behavior and a time-budget study on the use of media, containing certain mobility aspects.

Meanwhile, the Bureau for Transport Studies develops a tool to estimate our customers' satisfaction with its products. Thereby, the specific needs of the user groups and the degree of detail in which items must be collected in the next travel survey have to be established (19). Independently from our customers' needs, there is a need for further analysis in a number of fields, e.g., the identification of the transport segments that are not sufficiently covered by the microcensus, such as long-distance travels; a clear separation between business travels with commercial vehicles and commuting, on the one hand, and freight transport, on the other; and the inclusion of special groups of people such as foreign language-speaking people or people living in collective homes.

It will be difficult to compare the CATI results recorded in 1994 with the microcensus results of 1984 and 1989. The main question is, Is the higher mobility rate registered in 1994 due to a better recording of the very short trips or to the extremely frequent calls made by the interviewers (if necessary, more than 20 times) in order to get ahold of the highly mobile persons?

Other fields that need a refinement are the on-line plausibility filters and the interviewer training. It is the interviewer's mistake to use "slang" when typing a city's name, but the program's error if it is accepted as such. In a similar direction, the stages of registering addresses and geographically codifying them also need to be refined. New plausibility filters, ensuring that the starting address of a stage is the arrival address of the previous one, and integration of GIS into the coding process are some of the issues that need to be addressed for the 2000 microcensus on travel behavior.

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