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Lausanne, March 2013

FORS Working Papers 2013-1

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How to cite this document:
Roberts, C., Lipps, O., & Kissau, K. (2013). Using the Swiss population register for research into survey methodology. *FORS Working Paper Series,* paper 2013-1. Lausanne: FORS.

Acknowledgements
The authors wish to thank Georg Lutz and Peter Farago for their comments on an earlier draft of this paper, and their helpful suggestions for revisions.
ISSN 1663-523x (online)

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Summary

Until relatively recently, social surveys in Switzerland were predominantly conducted by telephone. Dramatically decreasing coverage rates now make samples drawn from the previously suitable telephone directory increasingly inadequate. Meanwhile, a growing problem of non-participation in all survey modes threatens data quality via selection biases. The introduction of a new register-based sampling frame by the Swiss Federal Statistical Office (SFSO), available for use also for selected surveys conducted by the Swiss Centre of Expertise in the Social Sciences FORS, offers new opportunities for new methodological research. In this document, we discuss what we consider to be the most important priorities for such research and present ideas for a number of different research activities aimed at evaluating 1) the impact of the switch to the new sample frame to the continuity of survey estimates; 2) the extent of coverage errors associated with using the sampling base for telephone surveys; and 3) nonresponse errors. All activities are driven by both survey cost and data quality considerations.

Using the Swiss population register for research into survey methodology

Caroline Roberts[1], Oliver Lipps[2], Kathrin Kissau[3]

1. Introduction

The new register-based individual sampling frame (the Stichprobenrahmen für Personen- und Haushaltserhebungen - SRPH) of the Swiss Federal Statistical Office (SFSO) came into being as a result of a new system for conducting the Swiss census on an annual basis as opposed to decennially, based on smaller-scale surveys to supplement data from population registers maintained by cantons and communes (or municipalities). The SFSO centralises these registers, which consist of a list of persons registered as resident in municipalities, to form the SRPH, and updates it regularly four times per year. Aside from the possibility it offers of drawing samples of individuals for nationwide surveys (advantageous for several reasons described further below), the other major advantage of the register as a sampling base is that it provides auxiliary data about the sample drawn. These include the individual's residential address (permitting analyses at the regional level) and a number of socio-demographic variables including sex, year of birth, marital status, nationality, linguistic region, type of residence permit, country of birth, and (more recently) household size. Though the frame itself contains no telephone numbers, the SFSO is able to match samples drawn from the register with a register of names, addresses, and telephone numbers, which since 2007, telephone service providers have been required by law to supply to the SFSO. This register of phone numbers, CASTEM (Cadre de Sondage pour le Tirage d'Echantillons de Ménages), along with the SRPH, together provide the basis for sampling for SFSO surveys.

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Since October 2010, the Swiss Centre of Expertise in the Social Sciences (FORS) has been granted access to the SRPH under a restricted legal agreement4 for the purposes of sampling for its national and international periodic surveys, financed (or co-financed) by the Swiss National Science Foundation (SNSF). All such surveys conducted by FORS will switch to using the new sampling base, and most have already done so in their most recent rounds of data collection. This includes rounds 5 and 6 of the European Social Survey (ESS), the MOSAiCH-/ International Social Survey Programme (ISSP) 2011 and 2013, a refresher sample for the Survey of Health, Ageing and Retirement in Europe (SHARE) 2011, the Swiss Electoral Studies (SELECTS) 2011, and the new sample for the Swiss Household Panel (SHP), planned for 2013. Samples drawn from the SRPH for FORS are provided with the auxiliary data described above. They may also be matched to CASTEM, but under data protection laws, only numbers listed in the national telephone directory can be supplied with the sample. Thus, in addition to the variables mentioned, it is possible to identify individuals with and without fixed-line telephones from the sample data provided, but not to have access to unlisted numbers.

This new resource provides unprecedented opportunities for methodological research at FORS5 into the challenges involved in conducting surveys in Switzerland and the best methods for doing so. Over the course of the coming years, a large quantity of data will be generated for probability samples of the Swiss population, providing an unusually rich source of information from which to learn about different types of survey error, and for informing future decisions about how to handle these errors in new and improved survey designs. In the following, we discuss three areas for research that provide opportunities to learn about how to improve the design of surveys in Switzerland, and to contribute to a growing international field of survey methodology research into Total Survey Error (Groves, 2010). These include: 1) evaluating the impact of the switch to the new sample frame on the continuity of time series estimates in repeated cross-sectional and longitudinal surveys; 2) evaluating sampling frame coverage and methods to reduce coverage bias; and 3) evaluating survey nonresponse and methods to reduce nonresponse bias. Finally, we consider directions in which future related research might be taken. To set this discussion in context, however, we begin with a brief overview of the significance of research into survey errors and its increasing value as a guiding principle in survey research design.

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[4]Application of article 13c, paragraph. 2, letter. d, of the ruling concerning the conduct of federal statistical surveys (RS 431.012.1).

[5] For data protection reasons, the sampling data cannot be made available to outside researchers.

2. Understanding survey errors and their implications for survey design

Surveys are affected by error from a range of different sources. These include errors associated with only surveying a sample of the population of interest (sampling errors), and errors associated with different aspects of a survey's design and how it is implemented (non-sampling errors). Sampling errors are routinely quantified and reported in a survey's methodological report for users of the data wishing to assess the quality of survey statistics. Non-sampling errors include error associated with the sampling frame and the extent to which it provides coverage of the population of interest (coverage error), errors associated with nonparticipation in the survey by certain sample members (nonresponse error), and errors of measurement arising from the design of the questionnaire (including any translations used), the mode in which it is administered, the way in which respondents answer, and errors introduced after fieldwork. Importantly, while sampling errors generally affect the precision of an estimate only, which can be improved by increasing the sample size, non-sampling errors usually cause biased survey estimates. These errors can be hard to identify, quantify and evaluate, in terms of their overall impact on the data.

In seeking to enhance the accuracy of survey data, survey designers face difficult choices about how best to minimize error from different sources. In practice, the process of designing a survey inevitably involves trade-offs between different forms of error, as decisions are made about what aspects of quality should be prioritized given the survey's objectives and the available time and monetary resources. These decisions have become increasingly challenging in recent years as changes in the survey-taking climate (Lyberg and Dean, 1992) have enhanced the threat to quality from certain sources of non-sampling error, in particular from coverage errors associated with sampling methods traditionally used for telephone surveys, and from nonresponse errors associated with the widespread decline in survey participation. Survey methodologists have had to become more and more innovative in tackling these problems, and the result has been the development of increasingly complex survey designs, rising survey costs and often, unavoidable compromises regarding different aspects of survey quality.

Partly in response to such developments, a new paradigm has become dominant in the field of survey methodology emphasizing the significance of Total Survey Error (TSE)

(Anderson et al., 1979) and the cost/error trade-off in survey design (Groves, 1989). This paradigm stresses the importance of acknowledging survey error from different sources, of attempting to quantify and document it, and of equipping data users with the skills they need to take account of different types of error in their analyses. More importantly, however, the TSE approach implies that the process of designing a survey (whether from scratch, or when re-evaluating the design of existing studies) should be guided by the need to balance competing priorities (of which the need to minimize errors to maximize survey accuracy is just one) alongside estimated costs. These principles are particularly relevant in the Swiss context, where the climate for conducting high quality surveys has become increasingly challenging in recent years. Two developments in particular form the focus of our attention here: (1) the declining proportion of households with fixed-line telephones or listed fixed-line numbers; and (2) the difficulty and related costs of obtaining acceptable response rates.

3. Conducting surveys in Switzerland

Telephone interviewing has long been the most popular mode of data collection for Swiss surveys, partly due to cost considerations, but also because up until only relatively recently, fixed-line penetration was close to 100% and the national telephone directory provided coverage of around 97% of the population, making it very suitable for survey sampling (Jann, 2007; Ernst Staehli, 2012). As a result, the directory was used as the frame for drawing household samples for both telephone and face-to-face surveys. However, the growing proportion of households without a fixed-line telephone connection and the decline in the number of households agreeing to list their telephone number in the directory (which was compulsory until the early 1990s) mean that this frame no longer provides an adequate level of coverage for drawing probability samples of the Swiss population. According to Ernst Staehli (ibid.), only about 80%6 of Swiss households had their fixed-line number listed in the directory in 2008, a further ≈7% had an unlisted fixed-line number, 11% had only mobile telephones and 2% had no telephone at all. Since 2008, the proportion of households with listed fixed line numbers has continued to decline.

Compounding this problem, there is evidence that households with a fixed-line telephone, and further, those with a listed fixed-line number differ from those without a

[6] This figure is probably too high as it is based on respondents of a survey only.

number on socio-demographic and attitudinal variables, and that these variables also relate to survey participation. For example, compared to respondents to a nonresponse follow-up of the ESS 2010, respondents to the main survey were more likely to have a fixed line telephone, to register their number in the public directory, and at the same time, were more interested in politics and convinced of the usefulness of participating in surveys (Joye et al., 2011). This means that declining penetration of fixed-line telephones and registration of telephone numbers is leading to problematic undercoverage and associated bias in telephone surveys. Independent of the problem of coverage, telephone surveys in Switzerland, as elsewhere, frequently suffer from low response rates (though this, of course, varies by survey topic), which can lead to an increased risk of non-response bias on variables of interest to data users. However, given that having a fixed-line telephone appears to be related to survey participation, coverage errors may be exacerbated by nonresponse errors associated with the overrepresentation of people with telephones (see Lipps, Pekari and Roberts (forthcoming), for an analysis of coverage and nonresponse errors in the telephone survey, SELECTS 2011).

Though telephone interviewing has been the most popular mode of data collection in Switzerland, a number of studies do use face-to-face interviewing (including, since around 2000, the FORS-run European Social Survey, ISSP (MOSAiCH), and the European Values Survey (EVS). Face-to-face surveys (without access to the SRPH) can overcome the coverage challenges associated with using the telephone directory as a sampling frame by using a list of addresses provided by the Post Office, which includes the number of letterboxes at each address – a method used by FORS for round 4 of the ESS (in 20087). However, other difficulties associated with using face-to-face interviews to carry out surveys in Switzerland have perpetuated the demand for telephone surveys. For one, the cost of face-to-face interviewing is usually prohibitively high for most small-scale surveys. For another, the cost effectiveness of the mode is not always justified by the response rates typically obtained. In a culture where telephone interviewing has been used most frequently for surveys, it is possible that potential respondents feel more reluctant to invite interviewers into their home for a personal interview. In fact, survey participation in face-to-face surveys of households in Switzerland rarely exceeds 50%, meaning that in common with other Western European countries, survey methodologists are having to invest more and more in

[7] In that survey, an interviewer first collected a number of names following a pre-specified rule to select letterboxes. Next, a random sample of these names was drawn by the survey firm, and handed to (another) interviewer, constituting his/her sampling point. Then the target respondent had to be selected within the household, introducing an additional step susceptible to nonresponse (Lipps and Pollien, 2011).

response enhancement measures, as well as in methods of post-survey adjustment, to address the resultant threat to data quality, and typically, with only partial success.

Both these trends have implications for the design of future surveys in Switzerland, as well as for the adequacy of the design of existing surveys. Innovative methods need to be developed to investigate and mitigate errors from both coverage problems and nonresponse. In this context, the possibility of using the new register-based sampling frame for FORS surveys provides some promise. For one, it provides (close to) full coverage of individuals resident in Switzerland, resolving the problems associated with using the telephone directory as a sampling frame, at least for face-to-face or postal surveys. For another, by making it possible to draw probability samples of individuals, the register allows researchers to address the sample member personally in the advance letter, which may help to increase response rates. Furthermore, the socio-demographic information included in the register will make it easier to draw samples for special population surveys, such as the Survey of Health, Ageing and Retirement in Europe (SHARE), which covers residents aged 50 years and over. This can help eliminate or reduce the need for expensive screening procedures, which themselves are susceptible to nonresponse and coverage biases (Eckman, Kreuter and Tourangeau, 2012). Last but not least, the register provides new opportunities to fully evaluate the extent of coverage and nonresponse bias in previous and new survey samples, providing essential information for assessing survey quality, and for guiding future survey design and implementation.

Despite the various benefits of the SRPH, it does not entirely resolve the problems facing telephone surveys in Switzerland, however. Undercoverage from the decline in the number of households with fixed-line telephones means that telephone numbers are not available for the whole sample drawn from the register. Samples drawn from the SRPH that are matched with CASTEM generally obtain telephone numbers for around 75% of persons listed. As mentioned, this undercoverage is compounded in samples drawn for FORS, however, because only publicly-listed numbers can be made available by the SFSO. In fact, telephone numbers were made available to FORS for only 61% of the general population sample drawn for MOSAiCH (2011), 65% for the sample of Swiss citizens drawn for SELECTS (2011), 69% for the refresher sample of older adults drawn for SHARE (2011), and 75% for a general population sample in the canton of Lucerne (Lipps and Kissau 2012). This highlights the fact that under-coverage from households with no fixed-line telephone may be exacerbated by under-coverage from households not listing their phone numbers in the directory, and that

levels of coverage vary among different socio-demographic groups (Borrat-Besson, Ernst Staehli, and Lutz, 2012). This means that the SRPH may not be the best solution for CATI surveys, (depending on how successful efforts are to obtain unavailable numbers - see below), and that other registers, or a dual-frame sampling approach may be more suitable.

Further limitations of the SRPH concern the nature of its coverage. Notably, the frame is made up of people registered as resident in a communes, which means any residents in the commune who are not officially registered (or who are without an official residence permit) will simply be missing from the frame. This could lead to non-coverage of specific sub-groups (e.g. illegal immigrants), which could be an important source of survey error, depending on the population of interest, or the nature of the survey topic. Furthermore, and perhaps more concerning, is that it is not known how many people are not actually resident where they are registered as living. This would affect the contactability of some sample members, and could affect samples that are stratified by commune. These factors, together with the fact that the SRPH is only updated four times a year, increases the potential for coverage errors, though the effects may be more or less problematic, depending on the type of survey.

In summary, the switch to the population register for sampling purposes is likely to have a significant impact on the quality of existing surveys conducted by FORS, and the design of its future data collection activities. Despite a number of specific limitations, it offers great potential for learning about the best practices for conducting surveys in the Swiss context. Here we argue the need to assess this impact, and discuss ways to exploit the potential for improving current practice. In the next sections, we focus on the three areas mentioned in the introduction offering opportunities for new research into Swiss survey practice. These include an assessment of the impact of this wholesale change in sampling methodology across surveys that have started to use the register, and two uses of the new sampling base for research on survey error. The first of these is focused on evaluating under-coverage in telephone surveys resulting from the failure to match individuals sampled from the register to listed telephone numbers, and on methods to reduce associated coverage bias. The second is focused on evaluating survey nonresponse and on methods to reduce nonresponse bias. For each, we identify a number of interesting research questions that we feel should be addressed in new research, provide examples of studies relating to these being conducted by researchers at FORS and the University of Lausanne, and finally, present ideas for extending this research in future.

3.1. Evaluating the impact of using the new sampling register

Any change in survey design can influence survey estimates. In the context of a time series, such an influence could affect the comparability of estimates over time. Given the potential of the new sampling base to improve survey response rates (e.g., through targeted advance letters, or through eliminating the need for screening procedures), it is important that any effect this might have on estimates from substantive variables be evaluated. One way to carry out such an assessment would be to conduct an experiment (e.g., comparing two independent samples drawn using the old and the new sampling method) to control for the effect of time of data collection on survey estimates (and any other variables confounded with the introduction of the new sampling frame). In the absence of such a design, however, much could still be learned through a comparison between data from previous survey rounds and new data based on samples drawn from the register. The first step would be to conduct a review of data from previous rounds of surveys that have switched or will switch to sampling from the register, to compile information about response rates, achieved sample composition and where possible, bias in key survey estimates (e.g., through comparisons with available external benchmarks to assess the extent of coverage or nonresponse errors). These data could then be compared with data from the new round of each survey to assess the extent of any effect the introduction of the new sampling method may have had on survey quality. Such an evaluation could be combined with a more detailed evaluation of the costs involved in using different methods, to enable a full assessment of the relative advantages and disadvantages offered by different approaches.

Some initial results based on data from the European Social Survey (round 5, 2010) presented at the 2011 ESRA conference point to the value of such an exercise (Ernst Staehli, et al. 2011). In particular, important improvements as a result of using the new sampling frame in round 5 were reported, including a marked reduction in the ineligibility rate and in the number of refusals by a household proxy. Sample selection effects were reduced by abandoning the telephone directory used as a sampling base in ESS until round 3 (probably due to reduced non-coverage bias), and the individual register offered considerable cost advantages over the list of addresses provided by the Post Office, which was used for sampling on the ESS in round 4. However, the non-contact rate increased, highlighting one of the challenges of reaching samples of individuals. It remains unclear, however, what implications these varied patterns of nonresponse may have for nonresponse bias compared to previous rounds, and for the

continuity of time series (although see Roberts, Vandenplas and Ernst Staehli (forthcoming), for an assessment of bias in ESS round 5). There remains considerable scope for building on analyses of this kind, and extending them to other surveys conducted on the basis of samples drawn from the register.

3.2. Evaluating coverage problems in telephone surveys and methods to reduce coverage bias

Using the new register-based sampling frame for nationwide surveys resolves the problems of increasing under-coverage associated with using the telephone directory for sampling. From now on, for the FORS surveys mentioned, samples of individuals can be drawn from the SRPH, which, as has been discussed, provides close-to-complete coverage of the registered resident population. However, for telephone surveys (or face-to-face surveys that use telephone as the initial mode of contact), the problem of including sample members without a listed telephone number remains a significant challenge. Because (fixed-line) telephone interviewing alone can no longer provide an acceptable level of coverage for population surveys in Switzerland, surveys that have previously relied on CATI will need to consider alternative methods for addressing the resulting error. To decide the most appropriate courses of action a full evaluation is needed of the extent of under-coverage in telephone surveys and of available methods to address the under-coverage. Notably for FORS, this concerns SELECTS and potentially, the Swiss Household Panel III, if the new sample is to be surveyed by telephone, while for the SFSO, this concerns all its surveys, including the Labour Force Survey, the annual Thematic surveys and the Omnibus survey that form part of the new census (though the SFSO has access to unlisted numbers in CASTEM, the mobile-only households remain uncovered). We discuss two important research questions that we believe such an evaluation should address.

1) *What is the effectiveness of alternative methods used to obtain telephone numbers for samples of individuals drawn from the SRPH?*

As described earlier, for CATI surveys drawing samples from the new register-based sampling frame, the SFSO undertakes a procedure to match individual names and addresses with entries in CASTEM to obtain the telephone number listed for that individual or address. Given that CASTEM only provides around 75% coverage, and the proportion of listed numbers that can be made available to FORS is lower still, additional procedures are needed in order to maximize the number of telephone numbers available for samples of individuals drawn from the register. Such procedures include postal contacts with sample members requesting they provide their telephone

number so that they can be contacted for the purposes of the survey, manual searches for contact numbers by Internet, and automated searches in commercial databases. Given that data protection restrictions apply to the latter, the opportunities for researchers outside the SFSO to boost the number of telephone numbers available for CATI surveys are limited, meaning that alternative ways to address undercoverage need to be found (e.g., mixed mode data collection, or dual-frame sampling methods incorporating Random Digit Dialling). Research is needed to assess the success of different procedures for matching telephone numbers to the sample (as well as alternative ways to correct undercoverage) and to investigate the 'cost-error' trade-off each procedure entails.

An example of such research is provided by a recent study by Lipps and Kissau (2012). This examined the success rate of attempts to match register data provided by the canton of Lucerne with telephone numbers for a CATI survey on citizens' opinions about their living conditions and environment, funded by the Lucerne cantonal statistical office. Three methods were used to obtain (fixed line or mobile) telephone numbers for sample members drawn from the individual registers of citizens. The first was an automated attempt to match records to numbers listed in the telephone directory, which found telephone numbers for 75.2% of the sample. The second method was an attempt to match sample members with unlisted or unmatched numbers 'manually' from other available information (e.g., obtained through internet searches and contacts with other household members for whom a match was successful), which obtained numbers for a further 5.8% of the sample. Finally, remaining sample members for whom no number was obtained using the first two procedures were sent a postcard asking them to provide their telephone numbers by return post (adding numbers for an extra 4.7% of the sample). The authors examined the extent to which under-coverage was reduced by each matching procedure and found significant gains in the representativeness of the sample through the use of additional matching efforts (the final step, in particular, proved most useful with respect to improving representation of the population with respect to the available frame variables).

While Lipps and Kissau's (2012) study demonstrates the value of obtaining unlisted or otherwise unmatched numbers for sampled individuals to reduce coverage bias, the authors did not explicitly evaluate the costs of each procedure used, and did not conduct a thorough analysis of the effects of each method on bias in estimates from substantive survey variables (preliminary analyses found no such effects).

Furthermore, it is not clear to what extent their findings apply to the whole of Switzerland or to surveys that have a scientific funder (as is the case for FORS surveys), compared with a cantonal or federal one8. Thus, research is needed to replicate their analysis on one or more national samples to explore the usefulness of alternative methods of obtaining unlisted numbers for telephone surveys, but also to supplement their approach by undertaking an assessment of the costs and benefits involved with each procedure. Such an assessment could be used to inform later decisions about cost-error trade-offs involved in more complex research designs. For example, if an alternative mode were necessary to survey sample members for whom no telephone number can be obtained, it would be valuable to know whether the potential gains in survey quality through the reduction of coverage bias justify the costs involved9. Specifically, the following questions are of interest:

a. To what extent is coverage improved (in terms of the reduction of bias in the socio-demographic composition of samples that can be surveyed by telephone) through the use of additional efforts to obtain unlisted telephone numbers in addition to those delivered by the SFSO?
b. How do different methods of obtaining unlisted numbers compare in terms of costs and success rates?
c. To what extent are substantive survey variable estimates (distribution parameters such as means and variances) stable through the use of additional efforts?

Post-hoc descriptive analyses of procedures used and their impact on coverage bias, along similar lines to the research by Lipps and Kissau (2012) could shed light on some of these questions. Such an analysis could also be complemented by experimental studies to explicitly compare different procedures on a range of cost-related variables.. In the 2011 SELECTS survey, for example, an embedded mode experiment was carried out to explore the value of using web interviewing as an alternative to CATI interviewing, and a possible way to include sample members with no listed numbers. Preliminary analyses of the results of this experiment (Lutz and Pekari, 2012) suggest that a web supplement may be more effective for addressing undercoverage than

[8] The administrative funder might have affected the willingness to return the postcard in the final step of the Lucerne study.

[9] One option for mixing modes could be to supplement telephone surveys with face-to-face interviews. This could be effective not only for addressing under-coverage, but also related bias in substantive variables – e.g., due to the exclusion of groups that are typically more socially excluded (see Buelens and Van den Brakel, 2010).

efforts to obtain supplementary telephone numbers, however further analysis is needed in order to draw firm conclusions about the relative benefits of different approaches to correcting undercoverage (although see Lipps, Pekari, and Roberts (forthcoming), for an analysis of the telephone number matching methods used on SELECTS). Coordinating future research in collaboration with the SFSO's CASTEM work would considerably enrich the research FORS can do with the data available to them, broaden the scope of the work and of any inferences that can be can drawn from its conclusions.

2) *What is the extent of coverage error in telephone surveys based on register-based samples, and what is the nature of bias resulting from undercoverage?*

Having obtained telephone numbers (whether listed or unlisted) for sampled individuals with fixed-line telephones, there remains a significant portion of the population with no fixed-line telephone, that cannot be contacted directly to take part in a CATI study (except if mobile phone numbers can be obtained through alternative matching procedures or by using an alternative mode as the first contact). Having access to a register of individuals for sampling purposes makes it possible, for the first time, to properly quantify the level of coverage provided for telephone surveys and the extent of bias from under-coverage. Using auxiliary data available on the sampling frame, it is possible to analyse the key demographic characteristics of individuals for whom no telephone number is available. Researchers responsible for conducting telephone surveys should conduct a full assessment of the composition of the sample for which listed telephone numbers are available, the sample for which unlisted telephone numbers are available (either in CASTEM or via other methods) and the sample for which no telephone numbers are available, in order to quantify the extent of coverage error. As an extension to this, efforts should be made to evaluate whether, and if so, how undercoverage results in bias on key substantive estimates from the survey. Key characteristics of interest include the sex, age, regional context, and nationality of sample members – variables that are readily available on the register, and which, arguably, may also relate to the propensity to respond to surveys.

Learning more about the types of people who are excluded from participating in telephone surveys could provide the basis for decisions about how best to include them. Offering an alternative data collection mode (as in SELECTS 2011) is only one alternative to efforts to obtain unavailable numbers. For example, short nonresponse follow-up surveys using different modes could also be used as a way to obtain data from non-covered or otherwise hard-to-reach groups. Evaluating existing surveys in

such a way can play an important role in planning the design of new Swiss surveys based on telephone interviews.

3.3. Evaluating survey nonresponse and methods to reduce nonresponse bias

The second way in which the new sampling register can be put to effective use is as a tool for carrying out an extensive evaluation of nonresponse in FORS surveys and of methods currently used to reduce nonresponse bias. Before considering specific ideas for research, we first discuss the significance of nonresponse in relation to survey quality.

Survey response rates have been declining in most Western countries (de Leeuw and de Heer, 2002) and while few studies have explicitly documented trends in response rates for surveys conducted in Switzerland (except in survey-specific documentation), the challenges involved in persuading people to take part appear to be the same as elsewhere. Survey nonresponse arises from three principal sources (Groves et al., 2004): 1) from failure to make contact with sample members; 2) from sample members being unable to participate in the survey (e.g. as a result of illness or disability, or due to a language barrier); and 3) from sample members refusing to participate in surveys. There are reasons to assume that the contribution to declining response rates from all three sources of nonresponse is on the increase. Focusing on telephone and face-to-face surveys, interviewers are finding it harder to gain access to households – e.g. because of the use of answer phones, caller ID systems or because entry to apartment blocks is frequently by access code only and entry phones are relatively uncommon. A growing immigrant population means that non-response bias resulting from language barriers is likely to be an ongoing concern for survey designers in Switzerland (Lipps et al. 2011), although a number of surveys have started to address this by including foreign language questionnaires for the largest immigrant groups (e.g. the Swiss Labor Force Survey has included English, Serbo-Croatian, and Albanian since 2003; the above cited Lucerne population survey used 6 languages). Finally, in common with experiences of survey agencies elsewhere, the proportion of sample members refusing to participate in surveys appears to be rising. Recent research by Joye et al. (2010) suggests this may in part be due to a perception among the Swiss population that survey requests themselves are becoming more frequent (“over-surveying”), and a recent analysis by Ernst Staehli (2012) of data from members of the Verband Schweizer Markt- und Sozialforscher (VSMS) suggests that this perception is based on reality. While studies conducted by FORS in the context of the Swiss implementation of

the European Social Survey (ESS 2002, 2004, 2006, 2008, 2010) have shown significant success with response enhancement procedures (e.g. increased incentives, additional efforts to increase contact rates), and data are available from follow-up nonresponse surveys to learn more about the difference between non-respondents and respondents (Joye et al., 2011; Stoop et al., 2010), there is still much to learn about the problems presented by nonresponse in Swiss surveys and about the best ways to manage it.

The distinction between different sources of nonresponse is critical when deciding whether and how to try to reduce it when designing a survey. Yet a prior question that is frequently overlooked is whether or not a high nonresponse rate is necessarily problematic for a survey in terms of bias. Obtaining the highest possible response rate has traditionally underpinned decisions about survey design. Survey practitioners and survey funders alike have focused on the importance of response enhancement procedures, and in the face of a general decline in survey participation, have invested more and more in extra-ordinary efforts designed to incentivize participation, and, thereby, mitigate the possible threat to data quality from nonresponse bias. However, the relationship between bias and nonparticipation is not as clear-cut as this common practice would suggest. Bias is a function of both response rate and the difference between respondents and non-respondents. So while there may be differences in the socio-demographic composition of the responding sample compared to the non-responding sample (because different groups may be more or less likely to refuse to participate, or more or less easy to contact), this alone does not necessarily imply that other survey estimates will be affected (Peytcheva and Groves, 2009). Instead, bias in individual survey estimates occurs where there is a correlation between variables influencing a person's propensity to participate in the survey and a given substantive variable (e.g., interest in politics in an electoral survey). If no such correlation exists, there is no reason to assume that nonresponse per se will predict the likelihood of nonresponse bias (Groves and Peytcheva, 2008). The implication of this is that striving to obtain high response rates provides no guarantee that survey data will be bias-free.

Growing awareness of this paradox concerning response rates and bias is leading survey designers to develop more dynamic approaches to survey design. For example, so-called responsive (Groves and Heeringa, 2006) or adaptive survey designs (Wagner, 2008) involve monitoring indicators of both fieldwork cost and data quality during the data collection phase, in order to inform decisions about whether additional efforts are justified in terms of the likely reduction in bias. At the same time, survey

methodologists have begun to explore alternatives to response rates as indicators of survey quality and the risk of bias, including R-indicators/indexes (van der Grijn, Cobben and Schouten, 2006; Schouten and Cobben, 2007), which measure the variability of the probabilities of response of the sampling units and provide a measure of the 'representativeness' of the achieved sample with respect to available auxiliary variables, and the 'fraction of missing information' (Wagner, 2008). Both approaches have grown out of the TSE framework, and rest on the premise that different aspects of survey quality must be balanced against the costs of survey fieldwork. In designing new surveys and evaluating the design of existing ones, there is a growing need to address questions about how cost-effective different methods are in terms of their contribution to the reduction of total survey error. For example, if costly incentives increase response rates, but have no effect on bias – or worse still, exacerbate bias by increasing participation only among certain groups – then it is essential to query their value.

Based on these recent developments in the field of nonresponse research, several research questions concerning nonresponse in Swiss surveys arise:

a) What distinguishes respondents from non-respondents and what are the characteristics of different types of non-respondents ?
b) To what extent do differences between different types of non-respondents and respondents translate into bias on variables of interest?
c) To what extent do efforts to reduce nonresponse affect the sample composition and bias observed on variables of interest?
d) To what extent does the response rate provide a useful indicator of survey quality compared with other available metrics (notably, R-indicators, which can make use of the auxiliary variables on the frame)?

The availability of the new individual register, alongside other sources of data available at FORS, e.g., paradata such as contact records, data from non-response research that has been carried out in the context of the ESS, the European Value Survey (EVS) and MOSAiCH, makes it possible to address these questions properly for the first time, as well as many others besides. For example, given the growing need to consider using mixed modes, whether as a solution to the problem of under-coverage in telephone surveys, a possible way to reduce nonresponse itself, or simply for cost reasons, comparing nonresponse across modes could play an important part in the development of new survey designs. Thus, an additional question of interest here is:

e) Do we observe differences in patterns of nonresponse and the effectiveness of response enhancement techniques by modes of data collection?

To the extent that descriptive analyses using auxiliary data on the sampling frame to address many of the above questions play a necessary role in the development of appropriate methods for post-survey adjustment, much of this analysis may already form part of planned activities linked to specific surveys. However, considerable added-value could be gained by a more coordinated evaluation of nonresponse across large-scale surveys conducted in Switzerland - for example, by analysing paradata from multiple surveys to identify the characteristics of different types of respondent and non-respondent and to investigate nonresponse bias. Combining paradata from multiple surveys – specifically, case-by-case records of contact attempts in face-to-face and telephone surveys, and individual-level auxiliary data from the sampling frame – would permit an extensive analysis of the characteristics of different types of non-respondent (non-contacts, refusals, and e.g. language barrier) and respondent (the hardest and easiest to contact, and the most and least reluctant to participate) (see e.g. Lipps, 2012). The aim would be to build up a clear picture of non-response patterns in Swiss surveys and the differences between respondents and non-respondents, with a view to assessing the extent to which non-response poses a threat to survey quality. This could be done, for example, by comparing estimates on key statistics for the cases requiring the least and the most fieldwork effort to bring them into the responding sample, on the assumption that the latter most resemble non-respondents (the so-called “continuum of resistance” (Lin and Schaeffer, 1995) hypothesis that could be tested empirically using these data). Similarly, frame data could also provide insight into the extent of attrition bias affecting panel surveys and how this affects estimates – for example, if a key reason for non-participation in a given wave of the panel turns out to be change in personal circumstances (e.g. moving home, a change in marital status, a new child in the household) then estimates of such changes from panel data would be biased (see Voorpostel and Lipps, 2011). In this way, data from the register could also be used to assess the extent of bias in survey estimates.

Organisations responsible for the collection of survey data have an interest in evaluating the costs and benefits associated with different methods of response enhancement used on their surveys. Such an evaluation could include an assessment of the per unit costs associated with different types of fieldwork effort, including repeated callbacks to non-responding sample members, incentives, refusal conversion attempts, follow-up surveys of non-respondents, mode switches and so on. Note that

costs here may be quantified financially, in terms of fieldwork time, and in terms of the effect increasing fieldwork effort has on nonresponse bias. To assess the impact on survey errors, change in key survey estimates across different phases of fieldwork on different surveys could be analysed, focusing particularly on the effect of introducing protocol changes to increase response rate, and possibly other indicators of survey quality, such as the R-indicators referred to earlier. Research of this kind would enable a comparison of the effectiveness of different procedures for enhancing survey response and for developing recommendations regarding which techniques are most effective. Some work at FORS on this topic has already been carried out using data from the European Social Survey 2010 (see Roberts, Vandenplas, and Ernst Staehli, forthcoming), and shows considerable promise as a way to potentially improve cost-efficiency in future rounds of the survey.

3.4. Directions for future research

So far, we have discussed potential uses of the new sampling base for methodological research, and argued that analysing data from the sampling frame, alongside existing sources of data (available at FORS or via the SFSO), would provide invaluable insight into a range of questions essential to the design of future surveys in Switzerland and to the evaluation of existing survey designs. We have proposed that this research be approached from a Total Survey Error perspective, with a view to assessing the extent to which different types of error arise from existing features of survey design, alongside the costs associated with those features. Our discussion is based in part on what we consider to be the most pressing questions for research, as well as on practical and resource-based considerations (for the most part the analyses involve the use of existing data sources, rather than the collection of new data). Nevertheless, the introduction of the new sampling base provides many more opportunities for extending this programme of research in future. Below we provide some further suggestions that could be developed into proposals for new methodological research, but which would benefit from the prior completion of work to address the research questions already discussed:

- *Experimental studies of the effectiveness of targeting modes of data collection and tailoring other fieldwork approaches to specific population groups.* The more that can be learned about the characteristics of respondents and non-respondents in surveys conducted in different modes and the effectiveness of different methods designed to enhance response rates, the more information will be available for tackling the problem of non-participation. For example,

response propensity models could be used to predict participation of sampled individuals based on their known characteristics, which could lead to the development of targeted strategies for encouraging them to take part.

- *An investigation of the nexus between different types of survey error – such as nonresponse and measurement errors, or coverage and nonresponse errors.* Researchers are only just beginning to explore how different types of survey error inter-relate. Attempts to address one kind of error (e.g., the use of mixed modes to reduce nonresponse bias) can affect the amount of error from other sources (e.g., mode effects on measurement). The more information there is available about non-respondents, and the more supplemental data there is available to validate survey reports, the better equipped researchers in Switzerland will be to contribute to this growing field of research.
- *An exploration of the possibilities of enriching FORS survey data with data from other sources (e.g. contextual and administrative data).*[10] Aside from the opportunities this could provide substantive researchers with, data enrichment would provide additional opportunities for survey methods research. The addition of contextual data, for example, would make it possible to extend the analysis of coverage bias and the characteristics of respondents and non-respondents, and help to build up a more detailed picture of survey response propensities across different parts of the country. Linking to administrative records could open up possibilities for validating survey reports against benchmarks, presenting more robust methods of assessing nonresponse bias and measurement error and the inter-connection between the two. Data protection laws are likely to substantially restrict such activities, and a preliminary exploration of what, if any, opportunities are available would need to be conducted in collaboration with the SFSO. However, these issues should not be seen as a barrier to exploring what might be possible in future and to keeping abreast of international developments in this area of research.

Relatively few countries are fortunate enough to have access to register-based sampling frames, and those that do have been able to offer unique insight into the research areas we have discussed in this paper. Switzerland is now in a position to make a valuable contribution to this work.

[10] Currently, data from the SHP are being matched with data from the Swiss National Cohort (SNC) to register death of sample members and modelling complete life trajectories and proximity to death.

4. Conclusion

In this document, we have discussed some of the opportunities for methodological research presented by the use of the SFSO's new individual sampling register, the SRPH. In particular, we have discussed ideas for research aimed at evaluating and improving survey data quality across both the longitudinal and the repeated cross-sectional surveys that are now using (or will use) the register, as well as establishing a knowledge base about best practice for surveys in Switzerland. We have highlighted three areas in particular, that we feel should be prioritised in future methodological research in Switzerland. These include 1) an evaluation of the impact of using the new sampling register on data quality and the continuity of estimates across repeated waves of a single survey; 2) an evaluation of under-coverage in telephone surveys and of alternative methods to reduce coverage bias, and 3) an evaluation of survey nonresponse and methods to reduce nonresponse bias. Specifically, in relation to (2), we discussed the evaluation of procedures to supplement available fixed-line telephone numbers, and the assessment of coverage bias, while in relation to (3), we discussed the analysis of register data alongside survey paradata to identify the characteristics of different types of respondent and non-respondent and to investigate nonresponse bias, as well as a cost/benefit analysis of response enhancement measures. We have also suggested some possible directions for extending such research in future. An initial wave of research activities at FORS based on early experiences of using the new sampling register is already underway, stimulated in part by internal discussions around an earlier draft of this document. The aim is to develop and extend this valuable research in future in the directions described, to maximise the value of the new sampling register as a methodological research resource, not only for the surveys based on samples drawn from it, but for Swiss survey research more generally.

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