

Appendix Weighting

1. Introduction

The size of the SILC sample is limited in comparison to the population to be analysed. To compensate for these imperfections, an adequate weighting has to be used during the analyses of survey data. In fact, this weighting takes into account the probability of a household being included in the sample and therefore also the fact that we are dealing with a stratified sample. Although the samples are representative of the population living in Switzerland, the same cannot be said for the people who actually respond to the survey. Certain types of households and persons are more willing to respond than others. If data were not weighted, the results would therefore be biased towards the characteristics of the households who are more willing to respond.

The extent of variability in sampling can be estimated by variance, the coefficient of variation or by the confidence intervals of an estimator. The analytic procedures of statistical software are based on the assumption that the sample was the result of simple random sampling. This is not the case for the SILC survey (proportional stratified sample). Furthermore, these procedures take into account neither the corrections made for non-response nor the marginal calibration, giving them the tendency to underestimate variance and thereby also underestimating confidence intervals. For this reason weights must be used in order to correctly estimate confidence intervals during analysis.

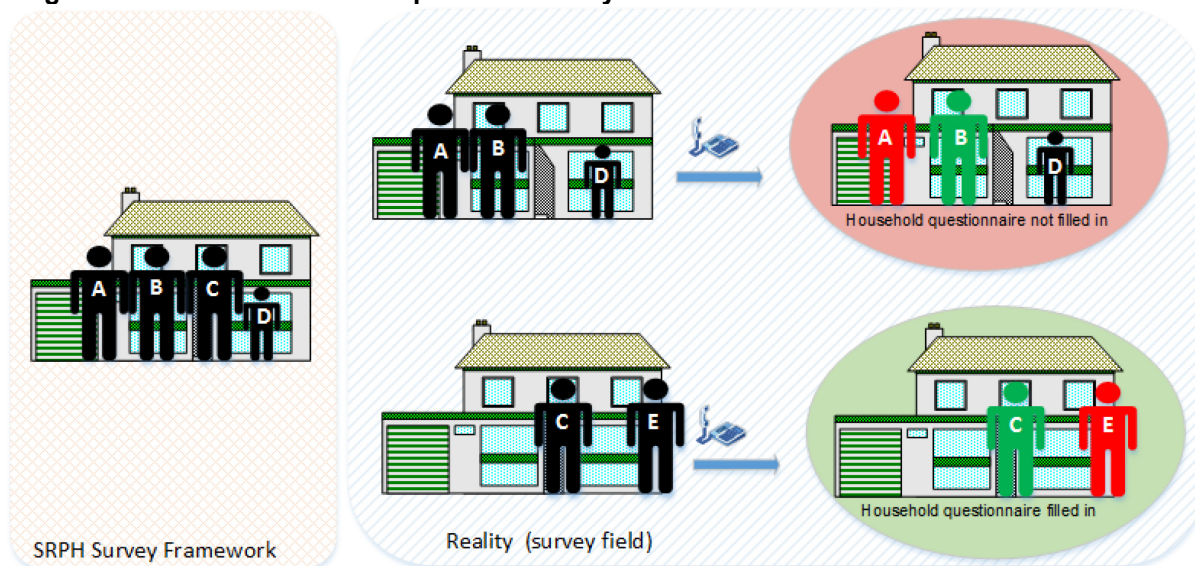
The probability of responding cannot be separated from the characteristics of households or individuals. There is also a sizeable risk that this probability is not independent of the variables of interest (income, risk of poverty). The whole point of weightings, therefore, is to determine the characteristics of persons/households that do not respond and to increase the weights of persons/households who most resemble them. The same approach is taken by reducing the weights of households/persons most like the profiles that are most willing to respond. The last stage, called calibration, enables the sample's weight to be balanced so that the totals of the socio-economic characteristics of the weighted sample coincide as far as possible with the known totals of these characteristics in Switzerland's permanent resident population.

2. Cross-sectional weightings

2.1. Correction for non-response

As the SRPH survey framework is register-based, there may be a slight discrepancy between the structure of households at the time the sample is drawn for wave 1 and the real situation at the moment the survey institute calls households (see diagram 1). This can cause problems, for example if a household member drawn on the basis of SRPH has recently moved and at the time of the first telephone contact is living in a new household (person C in the example below). As the sampling units are persons living in households that have been drawn from the sample, both "field" households have to be followed and their members are all considered as being longitudinal. In this example, if person C lives with a new person (E), not included in the initial sample because they were not present in the household ABCD that was drawn, this person is called "cohabitant of wave 1". This person is treated in the weighting process as longitudinal.

This sampling is followed by a phase of non-response after the initial telephone contact. After this stage, households that are complete in their "field" composition are considered as responding households. A household is complete when it has replied to the grid questionnaire, to the household questionnaire (house on a green background below) and at least one (longitudinal) member has replied to the individual questionnaire (green person). In the above example, household CE is complete but household ABD is not because it did not respond to the household questionnaire (house on red background).

Diagram 1 Illustration of non-response in survey-framework and field households

One problem is that we are departing from the classic schema of two-phase direct sampling because the composition of the households observed in the field does not necessarily correspond to that of the framework. It is difficult in such cases to establish a clear-cut response status for certain drawn households, as in the example above. Some individuals can also belong, in the field, to a responding household although they are not a member of one of the households selected in the framework (person E). Such individuals are selected indirectly.

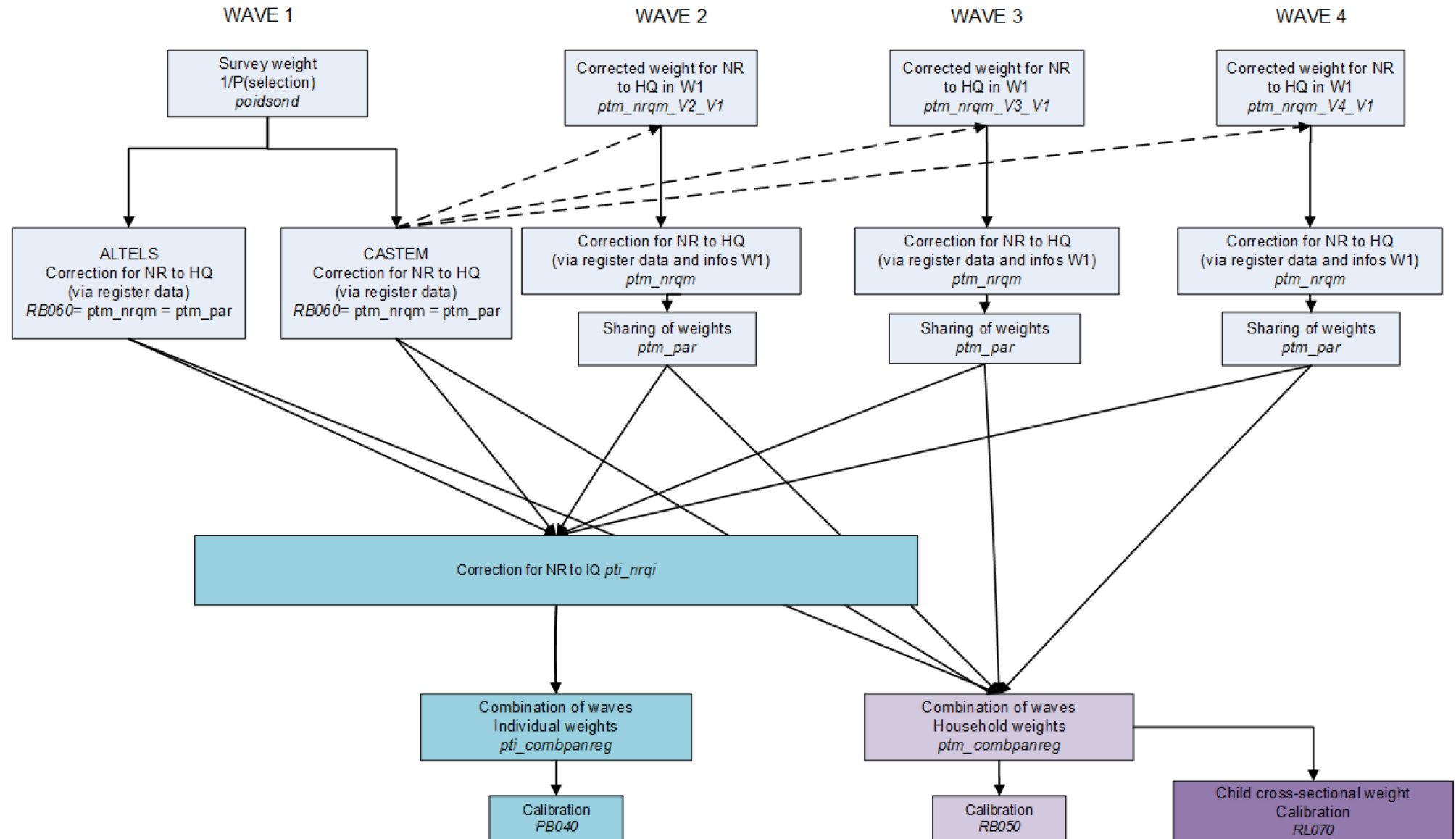
Although the notion of household may vary between the framework and the field, this is not the case for individuals. For individuals who belong to one of the households selected in the framework, it is possible to establish an unequivocal response status (respondent or not). This prompted us to formalise the selection procedure into a direct, two-phase survey of individuals belonging to one of the households in the framework, through which (indirect) access could be obtained to households in their “field” composition.

Initially the weighting process will correct non-responses to the household questionnaire. A model is created to establish whether or not an individual belongs to a complete household. This does not take into account the fact that an individual may have replied or not to the individual questionnaire (this would be done in the correction for individual non-response). Modelling at individual level enables the use of individual and household variables, leading to more precise results than could be obtained with modelling at household level. We should point out that although the response status is defined at individual level, we ensure that when estimating response probabilities, individuals belonging to the same “field” household have the same estimated response probability (i.e. the same ptm_nrqm weight), since all individuals from the same “field” household always have the same response status to the household questionnaire.

The correction process for household non-response is different for the sample of wave 1 than for waves 2, 3 and 4. The initial weight or the survey weight from wave 1 has to be corrected for non-response in the current wave, but does not require weight sharing with cohabitants (2.1.2). For waves 2 to 4, the survey weight has already been corrected for non-response in wave 1 but has to be corrected for non-response in the current wave, then shared with the new cohabitants. The weighting process is shown in diagram 2 below.

Subsequently, the probability of response to the individual questionnaire will have to be modelled on the basis of this household weight for persons living in complete households.

Diagram 2. Schema of weighting process IQ = individual questionnaire, HQ = household questionnaire, NR non-response



2.1.1. Correction process for household non-response in wave 1

The solution chosen here is to calibrate the net sample (respondents) to the drawn gross sample (SRPH) and then to inverse the g-weights (ratio between the calibrated weight and the survey weight) as an estimate of the probabilities of response. So that the probabilities of response are the same for individuals in the same “field” household, the calibration is included at the level “field” household. The survey weight is the opposite of the probability of an individual being selected, which is given to all individuals in the sampled households.

To do this, we start by establishing explanatory auxiliary variables for non-response. As non-response is highly dependent upon whether a household has a known phone number or not, the sample was divided into two and different variables were retained for ALTELS (no known phone number) and CASTEMS (with known phone number). More details on the differences between ALTELS and CASTEM can be found under 6.3.3 *Appendix Minimizing non-response error* or in the [2014 Quality Report](#).

For reasons of stability in the weighting process, the variables selected in 2014 are used to correct for non-response, both individual and household. These are presented in table 1. Selection process is detailed in Appendix Weighting, ESQRS 2014 or in the [2014 Quality Report](#).

Once the variables were selected the integrated calibration was carried out. The probability of responding was the opposite of the g-weight, which has to be greater than 1 for the response rate to be less than 1. The calibration was therefore, conducted using the logit method, enabling limits to the g-weight to be selected in order to avoid this problem. For wave 1, the limits used for response probabilities were 0.1 and 0.95.

CASTEM

When choosing the explanatory variables by segmentation, we decided to freeze the first two branches of the segmentation tree and to keep a fixed intersection of two variables (Married family with child(ren)* and Family with child(ren)* composition of household by nationality). The calibration converged during 10 repetitions with a concordance rate of 67.1%.

ALTEL

The calibration converged during 8 repetitions with a concordance rate of 65.9%.

The concordance rate can assess the model by measuring the degree of similarity between the ranked values observed and those predicted by the model. It enables assessment of the model by indicating the percentage of cases in which the response status it predicted is the same as the actual response status. The concordance rate was calculated using the [SAS procedure](#) “Rank Correlation of Observed Responses and Predicted Probabilities”.

Table 1. Variables retained to correct for non-response. Information used to fill in the variable is indicated in Source (CATI, SRPH, CCO¹ or GWS² registers). Household is abbreviated HH.

Variable	Codes used	Source	Reference period	Household		Ind.
				W1 castem	W234 altel	
Age group of the oldest person in hh	1 : Up to age 34 2 : Age 35 - 44 3 : Age 45 - 54	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x
Age groups	1 : Age 0-15 2 : Age 16-20 3 : Age 21-34 4 : Age 35-44	SRPH	09.T-1			x
Age groups	1 : Age 0-15 2 : Age 16-20 3 : Age 21-34 4 : Age 35-44	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	
Civil status	1 : Single 2 : Married	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x
Nationality group (2 groups)	1 : Switzerland / Northern and Western Europe	SRPH	09.T-1	x		
Nationality group (4 groups)	1 : Switzerland 2 : Northern and Western Europe	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x
hh composition by nationality	0 : Only Swiss 1 : Foreign and Swiss mixed	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x
hh composition by sex	0 : Male and female 1 : Only male	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x
Type of family	110 : Single person aged under 65 130 : Single person aged over 65 210 : 2 adults aged under 65, without other hh members 230 : 2 adults aged under 65, without other hh members	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x
Type of family and number of children	301 : 2 adults with 1 child * 302 : 2 adults with 2 children *	SRPH	09.T-4 09.T-3 09.T-2 09.T-1		x	x
hh size according to SRPH	1 : 1 person hh 2 : 2 person hh 3 : 3 person hh	SRPH	09.T-1	x		
Maximum h level of education	0 : Other 1 : Professional education and training	CATI	T-3 T-2 T-1 T		x	x
Maximum hh level of education	0 : Other 1 : Advanced professional education and training	CATI	T-3 T-2 T-1 T		x	x
Maximum hh level of education	0 : Other 1 : No training	CATI	T-3 T-2 T-1 T		x	x
Interested in politics	1: 0-6 with (0= no interest / 10 = maximum interest)	CATI	T-3 T-2 T-1 T		x	x
Employment status in 4 groups	1 : full-time paid work (min. 37 hours/week) / unpaid work in family business/farm 2 : part-time paid work (1 - 36 hours/week) / work in sheltered workshop 3 : In education / domestic tasks (max. age 64/65) / other pensioner / unemployed / other situation (continuing education, unpaid leave, ...) / Military or civil compulsory service / Apprentice 4 : retired (pensioner) AVS/AHV, pension fund, early retirement / child not at school	CATI	T-3 T-2 T-1 T		x	x
Presence of supplementary benefits in hh	0 : No supplementary benefits 1 : One or more in hh	CCO	09.T-1	x		
Presence of unemployment allowances in hh	0 : No unemployment allowance 1 : One or more unemployment allowances	CCO	09.T-1	x	x	x
Presence of disability pensions in hh	0 : No AI/IA pension 1 : One or more AI/IA pensions	CCO	09.T-1	x	x	x
Number of old-age pensions in the hh	0 : No old-age pension 1 : One old-age pension	CCO	09.T-1	x		
Number of incomes from employment in hh	0 : No income from employment 1 : 1 income from employment 2 : 2 incomes from employment	CCO	09.T-1	x	x	x
Group of total equivalent incomes CCO	1 : <=P50 2 : >P50	CCO	09.T-1	x		
Group of total equivalent incomes CCO	1 : [P0-P20] 2 : [P20 - P40] 3 : [P40-P60]	CCO	09.T-1	x	x	x
Material deprivation 3 out of 9 items	0 : No deprivation 1 : Deprivation	CATI	T-3 T-2 T-1 T		x	x
At risk of poverty status at 60% of median total equivalent hh income CCO	0 : Not at risk of poverty 1 : At risk of poverty	CATI	T-3 T-2 T-1		x	
At risk of poverty status at 60% of median total equivalent hh income CCO	0 : Not at risk of poverty 1 : At risk of poverty	CCO	09.T-1			x
Major region	1 : Lake Geneva Region VD, VS, GE 2 : Espace Mitteland BE, FR, SO, NE, JU 3 : North-West Switzerland, BS, BL, AG 4 : Zurich ZH	SRPH	09.T-4 09.T-3 09.T-2 09.T-1		x	x
8 categories of commune typology	1 : Centres 2 : Suburban municipalities 3 : High income municipalities 4 : Semi-urban municipalities	SRPH	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x
Size of hh's commune	1 : 100 000 inhabitants and more 2 : 50 000 - 99 999 inhabitants 3 : 20 000 - 49 999 inhabitants 4 : 10 000 - 19 999 inhabitants	SRPH	T-3 T-2 T-1 T		x	x
Moved house (change of building) in past 2 years	0 : No move 1 : Change of building	GWS	09.T-1 12.T-1	x	x	x
Rent and accommodation costs	1 : 0-1000 2 : 1000 - 1500	CATI	T			x
Living space per hh member	1 : <= 20m2/pers 2 : > 20m2/pers	GWS	09.T-4 09.T-3 09.T-2 09.T-1	x	x	x

¹ Central Compensation Office register. See 2.4 *Statistical concepts and definitions* of the main part.² GWS : Buildings and Dwellings statistic

2.1.2. Correction process for household non-response in waves 2, 3 and 4

The principle is the same as for correction for non-response in wave 1, except that the initial population is persons drawn from the CASTEM framework and whose household was complete in wave 1. The initial weights are those that their household had after correction for non-response to the household questionnaire in wave 1 (see diagram 2).

The auxiliary variables retained for correcting non-response between wave 1 and the current wave are not the same as those retained to correct non-response in wave 1, because the two response mechanisms are different, especially due to the fact that the balance between refusal and unreachable is very different in wave 1 to that in waves 2, 3 and 4. Firstly, from this point on we have more auxiliary information since the information collected in wave 1 can be used in addition to the information gathered from the registers. The set of variables under consideration as auxiliary variables is thus composed of variables from registers that were already available for the correction of non-response in wave 1 (with the same groups of levels), as well as information collected in wave 1 such as interest in politics, level of education or the at-risk-of-poverty-status. Secondly, there is no longer a distinction between altel / non-altel for the correction of non-response between wave 1 and the current wave, since we consider that as persons have already been contacted in wave 1 (i.e. there is no altel) that they have accepted to participate.

The same auxiliary variables are retained for the correction of non-response in waves 2,3 and 4. These were selected in 2014 (see table 1).

The reference population and consequently the relevant information from registers vary depending on the wave that we are addressing. For

- Wave 2 we use the SPRH of September T-2
- Wave 3 we use the SPRH of September T-3
- Wave 4 we use the SPRH of September T-4

with T the year of the survey (DB010). The sum of each of these weights before correction for non-response is therefore representative of various targeted reference populations. In wave 3 for example we begin with the weight `ptm_nrqmW3_W1` (calculated in N-2) and we use the SRPH of September T-3 (date sample was drawn in w3).

Modelling for non-response (calibration) then took place wave by wave, but with the same variables. The limits used were 0.3 and 0.999999999 for respondents. For non-respondents, the lower limit was 0.25 for wave 2 (no upper limit). In fact, the limit for wave 2 had to be lowered so that the calibration could converge with the result. It should be noted that the estimate of response probabilities for non-respondents is only useful for calculating the rate of matches/non-matches which can be used as diagnostic. Modifying the limits for non-respondents had no influence on the response probabilities of respondents.

The following results were obtained:

- Wave 2: 5 repetitions, 69.1% concordance (see definition p.4)
- Wave 3: 6 repetitions, 68.8% concordance
- Wave 4: 5 repetitions, 67.0% concordance

Weight sharing:

For wave 1, weight sharing is not necessary as the cohabitants of wave 1 inherited the weight of their household during the correction for non-response.

The weight `ptm_nrqm` of waves 2 to 4 obtained by modelling (calibration) above were given to all household longitudinals. The weight sharing stage allows a part of these weights to be attributed to cohabitants who joined longitudinal households since the first wave. The weight after sharing is the shared transversal household weight: `ptm_par`.

The shared household weight is the same as the sum of the weight of household longitudinals divided by the number of longitudinals and initially present cohabitants in the household. In our case, we considered that all cohabitants were initially present in the survey base.

$$ptm_par = \frac{\sum_{i=1}^L ptm_nrqm_i}{L + P}$$

With i: individual

L: number of longitudinals in the household

P: number of initially present cohabitants in the household

2.1.3. Correction for non-response to the individual questionnaire

As mentioned above, individual weight is calculated from household weight. Another correction for non-response with regard to the individual questionnaire this time, has to be carried out first.

To correct for non-response to the individual questionnaire, the initial weight is the household weight adjusted for complete /incomplete non-response and shared between cohabitants, *ptm_par*. It is positive for both longitudinals and cohabitants who responded to the individual questionnaire and who belong to a complete household. This weight represents the populations from wave 1 from each of the panels before being merged. Their sum total among all individuals from the current wave therefore represents roughly 4 times the size of the population.

The correction for non-response to the individual questionnaire is carried out in the same way as that for the household questionnaire, but the entire process is done for all waves at the same time.

The variables (table 1) were tested in 2014 and then selected by segmentation and by logistic regression. These are used for the correction for individual non-response in subsequent years in order to guarantee continuity in the process.

The calibration is then conducted on the basis of the variables selected.

2.2. Combination of waves

As the household weights were corrected for non-response to the household questionnaire and shared between the cohabitants of waves 2 to 4, the next stage, at household level, will be to merge the waves. The process of wave merging is the same as in previous years. The weights adjusted for non-response to both the individual and household level, are combined for all waves by major geographic region.

The weights used for merging waves were all calculated during wave 1 of each of the panels. They therefore represent the population in wave 1 of each of the panels and their sum corresponded therefore to the number of individuals in Switzerland in wave 1. By grouping together the 4 waves and therefore the 4 corresponding sets of weights, the weights' total is close to 29.5 million, i.e. four times the Swiss population. The adjustment factors enable us to reduce this number, by major region, to approximately 7.7 million individuals. The value of these factors is calculated using the method developed by Merkouris (will be adjusted later in the final calibration to correspond to the exact total of the Swiss population).

For individual weights, adjustment is done simply by counting the number of individuals per major region and per wave and by looking at the percentage this number represents in relation to the total number of individuals in the major region concerned for all waves. This percentage (allocation factor) defined by wave and by region is then multiplied by the weight adjusted for the non-response (*ptm_par*) of each individual in the wave and region concerned. The number of individuals concerned in total and per wave is presented in table 2.

Table 2. Allocation factors (AF) when merging waves

Major region	n	W1		W2		W3		W4	
		n	AF	n	AF	n	AF	n	AF
Lake Geneva region	2647	738	0.28	712	0.27	575	0.22	622	0.23
Espace Mittelland	3753	1032	0.27	932	0.25	834	0.22	955	0.25
Northwest Switzerland	2173	612	0.28	542	0.25	518	0.24	501	0.23
Zurich	2701	805	0.30	690	0.26	675	0.25	531	0.20
Eastern Switzerland	1926	624	0.32	442	0.23	419	0.22	441	0.23
Central Switzerland	1374	407	0.30	336	0.24	337	0.25	294	0.21
Ticino	626	200	0.32	124	0.20	154	0.25	148	0.24

For households, the merging of four waves is done according to the same method, and by replacing individuals by households.

2.3. Final calibration

The aim of this calibration is to adjust the weights so that the totals according to certain calibration variables are identical in the sample to those of the population of reference (December 2017).

The individuals retained in the calibration framework are selected from the framework of 31.12.2017. The calibration framework contains all individuals (even those belonging to the non-permanent population) from households that could potentially be selected in the sample (at least one person in the permanent resident population in a private household at their main place of residence).

The target population is all persons who belong, in the field, on the day of the survey, to one of the households from the selection framework. Therefore, children born after 31.12.2017, as well as foreigners who arrived after this date, or non-permanent residents, belong to the target population if they belong to a framework household.

This definition enables us to ensure consistency between the household composition in the field and at the time of interviews and income recorded in the field during the survey. It does however lead to technical problems during the calibration, as certain responding individuals are not linked with the calibration framework meaning that some of the information necessary for the calibration is not available for them.

When this is the case, the auxiliary calibration variables are imputed to such persons and the weights are then calibrated as if all respondents were actually a sample from the calibration framework. The calibration is integrated so that all persons from the same field household have the same final weight RB050. By calibrating in this way to the calibration framework we can ensure that the total of the final weights is the same as that of the 31.12.2017 framework and that it is consistent from one year to the next.

2.3.1. Selection of calibration variables

Variable selection was made in 2014. The list of variables retained for the household and individual calibration can be found in table 3. Further explanations are available in [2014 Quality Report](#).

Table 3. Variables used for the household and individual calibrations. Information used to fill in the variable is indicated in Source (SRPH or CCO registers).

Variable	Codes used	Source	Household	Individual
At risk of poverty status at 60% of median total equivalent household income	0 : Not at risk of poverty 1 : At risk of poverty	CCO	X	X
Intersection between ARP60 and age group for calibration	0 : if ARP60 = 0 1 : if ARP60 = 1 and age group = 1 2 : if ARP60 = 1 and age group = 2	CCO	X	
Age groups	1: age 0-17 2 : age 18-24 3 : age 25-49	SRPH	X	X
Intersection between S20 and median total equivalent household	Continue		X	
Type of family	110 : Single person aged under 65 130 : Single person aged over 65 210 : 2 adults aged under 65, without other hh members 230 : 2 adults aged over 65, without other hh members	SRPH	X	X
Major region	1: Lake Geneva Region VD, VS, GE 2 : Espace Mittelland BE, FR, SO, NE, JU 3 : North-West Switzerland, BS, BL, AG 4 : Zurich ZH	SRPH	X	X
Household size according to SRPH	1 : 1 person household 2 : 2 person household 3 : 3 person household	SRPH	X	X
Linearised with Gini framework index	Continue	CCO	X	
Civil status	1: Single 2: Married	SRPH	X	X
Nationality group	1: Switzerland 2 : Northern and western Europe	SRPH	X	X
Intersection between S80 and total equivalent household income	Continue		X	X
Indicative that the total equivalent household income by cco source is < P10	0 : no 1 : yes	CCO	X	X
Indicative that the total equivalent household income by cco source is < P50	0 : no 1 : yes	CCO	X	X
Indicative that the total equivalent household income by cco source is < P20	0 : no 1 : yes	CCO	X	X
Indicative that the total equivalent household income by cco source is < P80	0 : no 1 : yes	CCO	X	X
Sex	1 : man 2 : women	SRPH	X	X

As is the case for the correction for non-response, the variables selected will be used in the calibration process over the next few years.

2.3.2. Cross-sectional weighting for children

The weight for children is calculated so that specific variables such as childcare in structures in or outside of school can be weighted.

It is calculated on the basis of the household weight. Correction for total individual non-response to the child proxy* is not necessary as the non-response rate is zero. Children born after 31.12.2017 must be excluded from the weightings. Children aged 13 to 16 are not processed.

Eurostat recommends starting with variable RB050 and calibrating it on the total of individuals for each age between 0 and 12 inclusive. Nevertheless, weights adjusted for non-response to the household questionnaire, `ptm_combpan_reg`, have already been calibrated to the age groups by means of the integrated calibration to obtain RB050, which Eurostat does not recommend for the household weight. A second calibration to the age groups alone does not appear appropriate. Therefore the sex * age are used for the calibration, using the raking ratio method of CALMAR2, as previously.

Table 4. Frequency of children by age and by sex

Age	Sample								Sampling frame			
	unweighted				weighted with ptm_combpan_reg							
	Boys		Girls		Boys		Girls		Boys		Girls	
0	88	4.1%	80	3.8%	36 847	3.4%	38 840	3.6%	43 134	3.9%	40 898	3.7%
1	90	4.2%	80	3.8%	53 418	5.0%	43 794	4.1%	44 887	4.1%	42 920	3.9%
2	83	3.9%	72	3.4%	46 261	4.3%	39 027	3.6%	44 951	4.1%	42 257	3.8%
3	59	2.8%	77	3.6%	28 567	2.6%	45 044	4.2%	44 601	4.1%	42 196	3.8%
4	77	3.6%	87	4.1%	34 190	3.2%	48 697	4.5%	43 720	4.0%	41 255	3.7%
5	83	3.9%	70	3.3%	46 110	4.3%	33 701	3.1%	44 204	4.0%	41 433	3.8%
6	76	3.6%	80	3.8%	43 062	4.0%	44 313	4.1%	43 615	4.0%	41 176	3.7%
7	92	4.3%	79	3.7%	42 079	3.9%	39 588	3.7%	43 864	4.0%	42 070	3.8%
8	84	4.0%	95	4.5%	40 673	3.8%	42 197	3.9%	43 488	3.9%	41 104	3.7%
9	83	3.9%	90	4.2%	40 254	3.7%	44 173	4.1%	43 333	3.9%	40 684	3.7%
10	71	3.3%	100	4.7%	34 640	3.2%	45 000	4.2%	42 241	3.8%	40 172	3.6%
11	84	4.0%	77	3.6%	43 105	4.0%	37 212	3.5%	41 977	3.8%	39 676	3.6%
12	78	3.7%	90	4.2%	41 103	3.8%	46 401	4.3%	41 810	3.8%	39 514	3.6%
Total	1 048	49.3%	1 077	50.7%	530 310	49.2%	547 987	50.8%	565 825	51.4%	535 355	48.6%
	2 125				1 078 297				1 101 180			

3. Longitudinal weightings

3.1. Revision of the weightings

Since 2014, the sample has been drawn in the FSO's SRPH new sampling frame. This change led to a revision of the cross-sectional weighting on the SILC14 data (see [2014 Quality Report](#)). The calculation method for the longitudinal weightings enabling an analysis of the transitions over two, three or four years was not affected by this revision. Data are only composed of four panels drawn from the SRPH as of SILC17 onwards, i.e. the panels 2014 to 2017. It has thus been possible to revise the longitudinal weighting model while integrating new data from administration registers as well as other methodological improvements. Although the revision of the longitudinal weights is therefore possible from SILC17, it has only been implemented from SILC18. For this year, a first weighting was carried out using the old method and then delivered to Eurostat. In a second phase, a revised weighting was developed. This resulted in several analyses which are presented below, that made it possible to validate the method and assess its quality.

The SILC19 and subsequent longitudinal weights are produced only using the revised method. The revised SILC18 longitudinal weights were delivered to Eurostat, and the quality report here was adapted to the new method. The SILC17 longitudinal weights were then also recalculated according to the revised weighting, and the quality report adapted to the new method.

These changes imply a break in series between the longitudinal results prior (SILC16) to and following the revision (revised SILC17), as was the case between the cross-sectional results SILC13 and SILC14.

Prior to SILC14, persons living in a household who had replied to the grid questionnaire in wave 1 were followed for four years, even if the household was incomplete. From SILC14, this rule changed and individuals had to be in a complete household in wave 1 to be followed. This change aligned the rules for being followed with those of Eurostat and enabled an increase in the number of auxiliary variables for correction of TNR in waves 2, 3 and 4 - both longitudinal and cross-sectional. These variables come from data surveyed in wave 1, available only for complete households, such as the risk of poverty, cost of housing, and interest in politics, etc.

Before revision, adjustment for TNR in the longitudinal weighting was modelled using segmentation: this is an asymmetrical tree diagram of explanatory factors for TNR, in rising order of importance. This modelling was carried out at individual level, which resulted in different weights between individual members of the same household. This did not correspond to the actual process of non-response, which is carried out first of all at household level. The most common longitudinal attrition is observed in refusal of the grid questionnaire (household level). With the revision, correction for TNR is done at household level but on the basis of an individual data set using a calibration algorithm integrated at household level³. This was not possible with segmentation. This method enables an equal weight to be obtained for all persons in the same household. This makes it possible to be closer to the actual response process.

Thanks to matching, which uses AHV/AVS numbers, the use of the SRPH survey frame makes it possible to obtain basic demographic information from the SRPH on the type of household as well as information from other registers for the entire population and thus also for individuals in TNR (e.g. compensation funds with certain income components). This information, which allowed the cross-sectional weighting to be improved, were used in the same way as for the revision of the longitudinal weighting.

As for cross-sectional weighting, the final calibration of longitudinal weights was revised by including new data from registers. As all of these variables were known for the entire sample as well as for the Swiss population, the final calibration can be carried out more efficiently than before. In this way, the large amount of information available in the SRPH or other registers also containing AHV/AVS numbers has made it possible to improve the quality of the weighting by reducing the bias caused by TNR.

³ Calibration integrated at household level is a calibration to which a constraint has been added at household level. This requires the weights of the TNR correction to be the same for all members of the same household.

3.1.1. Assessment of the improvements made to longitudinal weights

Distribution

Table 5. Distribution of longitudinal weights using the previous and new method

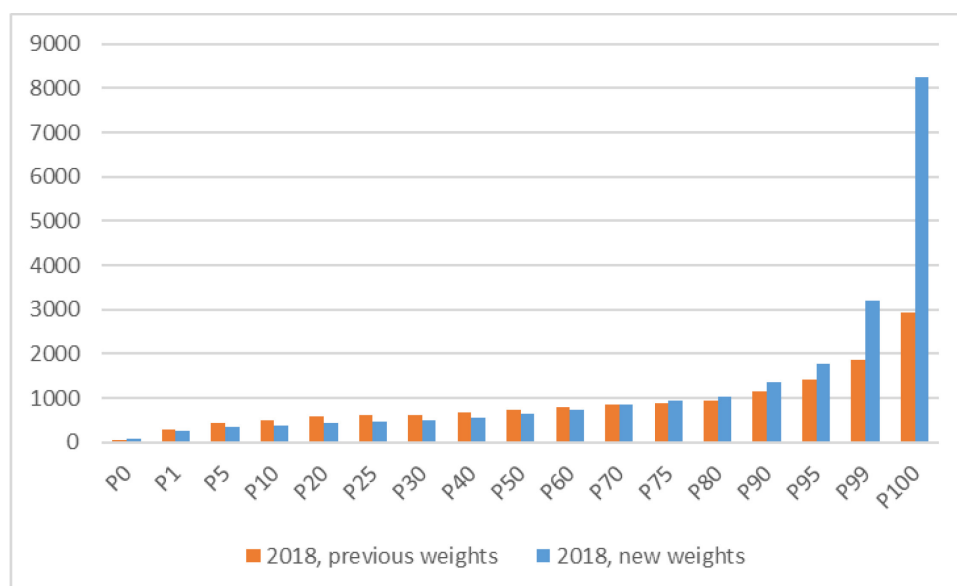
	RB062		RB063		RB064	
	previous weighting	new weighting	previous weighting	new weighting	previous weighting	new weighting
Nobs	10273	10272	6563	6563	3246	3246
mean	794	806	1229	1249	2458	2498
stddev	305	574	437	908	992	1587
max	2922	8242	3719	16220	8775	16273
P95	1429	1762	2110	2787	4522	5428
Q3	892	934	1390	1448	2757	3039
median	728	648	1106	1006	2258	2125
Q1	607	476	946	718	1839	1426
P5	441	346	750	505	1412	960
min	57	95	148	127	515	513
relative increase of standard deviations with the new method	88%		108%		60%	

Source: FSO - Statistics on Income and Living Conditions (SILC), longitudinal data 2015-2018, excluding imputed rent

Note: The difference in the number of observations for the weight RB062 is due to a household considered complete during the previous weighting and which is no longer complete in the new weighting.

The variability of the longitudinal weights revised is between 1.6 and 2 times greater than that of the previous weights. The addition of new auxiliary variables in the modelling of the response process enabled its improvement by means of a more detailed differentiation of the underlying characteristics, which, of course, leads to greater variability in the final weights (Table 5). We thus hope to reduce the TNR bias, with a risk of increasing the variance of the estimators.

Diagram 3. Distribution of longitudinal weight RB062 over two years using the previous and new weighting



Source: FSO - Statistics on Income and Living Conditions (SILC), longitudinal data 2015-2018, excluding imputed rent

For the three longitudinal weights RB062, RB063 and RB064, the distributions are similar with both the previous and new method. Up to the P80 percentile, the two methods produce weights whose

distribution is close (Diag. 3). Only after P90, i.e. for large weights, does the difference in distribution become more pronounced. This supports the hypothesis that, thanks to the new auxiliary variables, the new weighting takes better account of the lower probabilities of response (either due to better correction for non-response or better calibration).

Structural effect

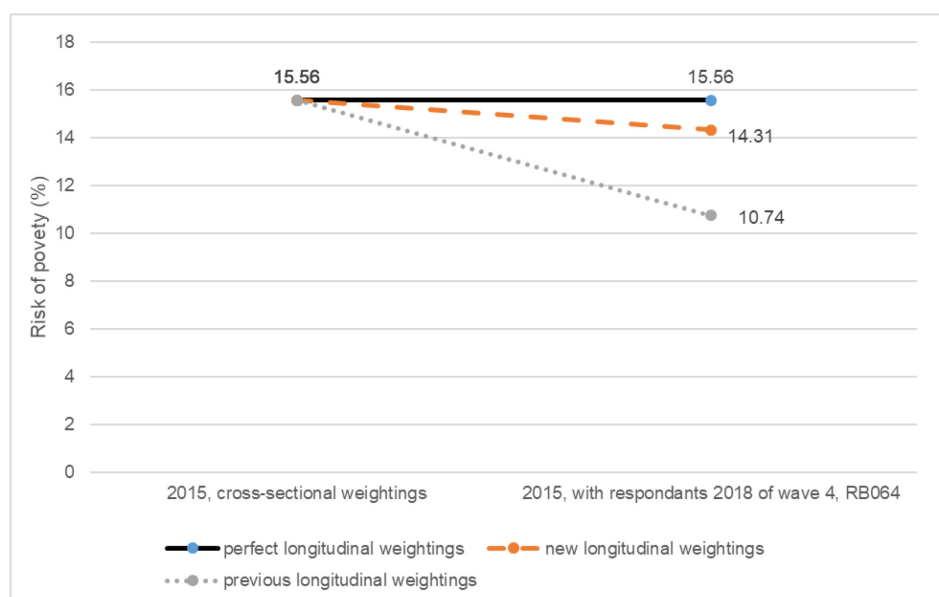
The most pronounced structural effect is an increase in the size of the permanent resident population at the main place of residence estimated by SILC of 125 518 persons for 2017, when considering the changeover between 2017 and 2018 (RB062), of 129 641 for that between 2016 and 2018 (RB063) and of 128 332 for the transition between 2015 and 2018 (RB064). With the previous weighting method, the final calibration was made on the permanent resident population at the main place of residence from the Population and household statistics (STATPOP) of 31 December of the year prior to the start of the transition, whereas with the new method, the final calibration was made on the SRPH which also includes non-permanent residents living in a household with at least one permanent resident.

Attrition and socio-demographic breakdowns

To assess the quality of the longitudinal weighting, we suggest a re-estimation of an indicator in wave 1 by using respondents from wave 4 with the corresponding longitudinal weight and by freezing the variable of interest in wave 1. In the case of a weighting that fully corrects for the attrition correlated to our variables of interest, the result should give a similar value to that given with the cross-sectional weight of wave 1 (before longitudinal attrition). For example, the at-risk-of-poverty rate of 2015 calculated with the cross-sectional weight RB050 is 15.6%. With a perfect longitudinal weighting, this rate should be similar by calculating it based on the individuals in the complete households of wave 4 in 2018 with the “at risk of poverty” characteristic of 2015 fixed and the longitudinal weight RB064. If this is not the case, it shows that the longitudinal weight does not fully correct the bias due to attrition. With the new longitudinal weighting, the bias not fully corrected by the weight is greatly diminished. The at-risk-of-poverty rate of 2015 (15.6%) was recalculated at 10.7% with the previous longitudinal weighting on wave 4 and at 14.3% with the new weighting.

Diagram 4 shows that the new weighting is not perfect but that it is considerably better at correcting for the lower probability of response in wave 4 of people at risk of poverty in wave 1 compared with those who were not at risk of poverty.

Diagram 4. At-risk-of-poverty rate of 2015 in wave 1, estimated by cross-sectional weighting, by the previous and by the new longitudinal weighting



Source: FSO - Statistics on Income and Living Conditions (SILC), longitudinal data 2015-2018 and cross-sectional data 2015, excluding imputed rent

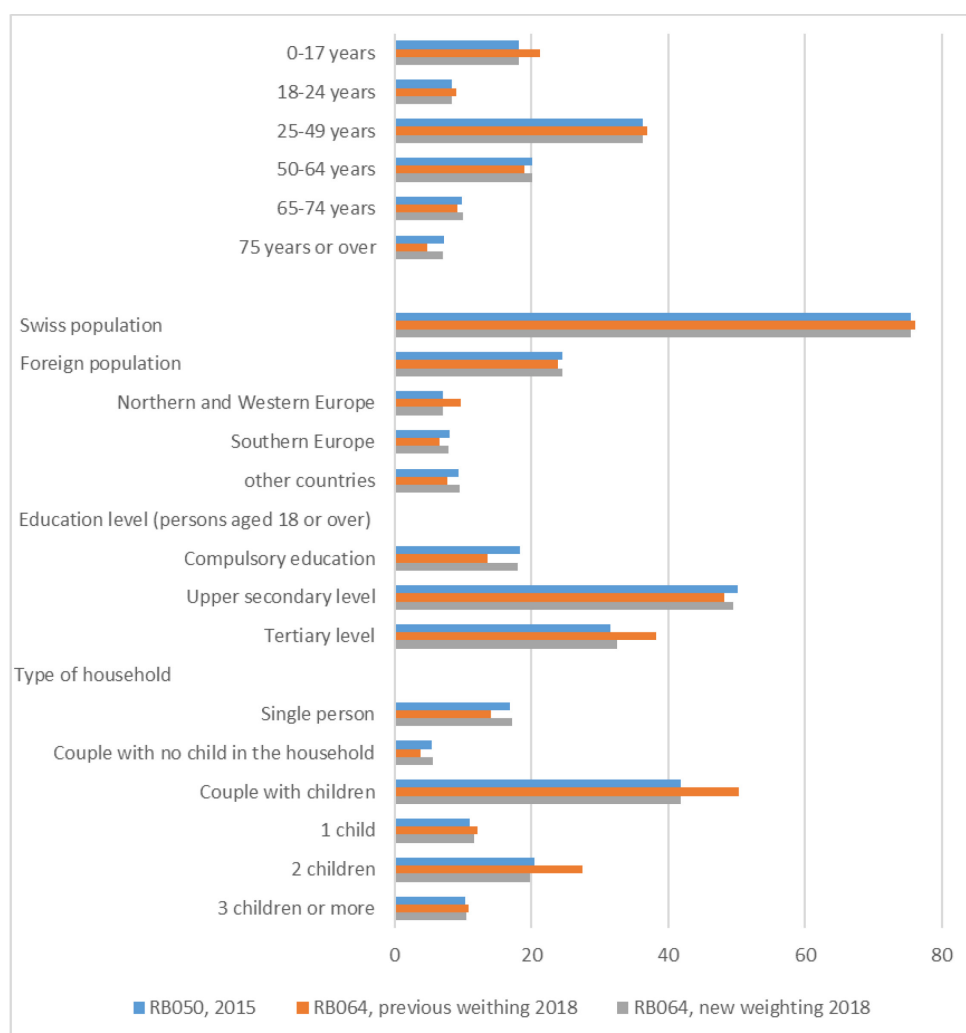
In the same way as for the at-risk-of-poverty rate, attrition is analysed on certain socio-demographic variables survey with SILC15. The percentage is calculated on the population responding to SILC15 by using the cross-sectional weight RB050 of 2015. This percentage is also calculated on the same socio-demographic variables of SILC15 but only for respondents to SILC18, using the previous and the new weight RB064.

The previous longitudinal weighting under-corrected for the attrition of 50-64 year-olds and of 75 year-olds and over (including deaths occurring between SILC15 and SILC18), particularly in favour of 0-17 year-olds. This is no longer the case with the new weighting (Diag. 5).

Regarding people's education, the new weighting corrects better for the under-representation of lower education levels. The level of education is only used in the algorithm of correction for TNR. The level of education is not available for final calibration but certain variables taken from the registers are strongly correlated with it.

Overall, in all the socio-demographic variables used in the standard published tables, an improvement has been observed with the new weighting.

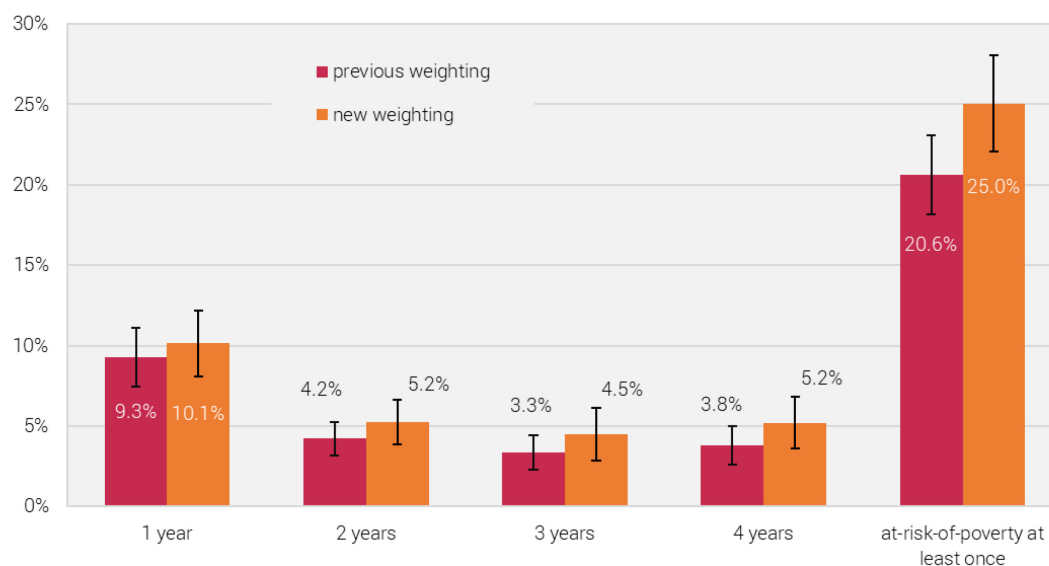
Diagram 5. Weighted percentage of individuals in the population, with the cross-sectional weight RB050 of 2015 and the longitudinal weights RB064 previous and new method. By socio-demographic breakdown of SILC15



Source: FSO - Statistics on Income and Living Conditions (SILC), longitudinal data 2015-2018 and cross-sectional data 2015, excluding imputed rent

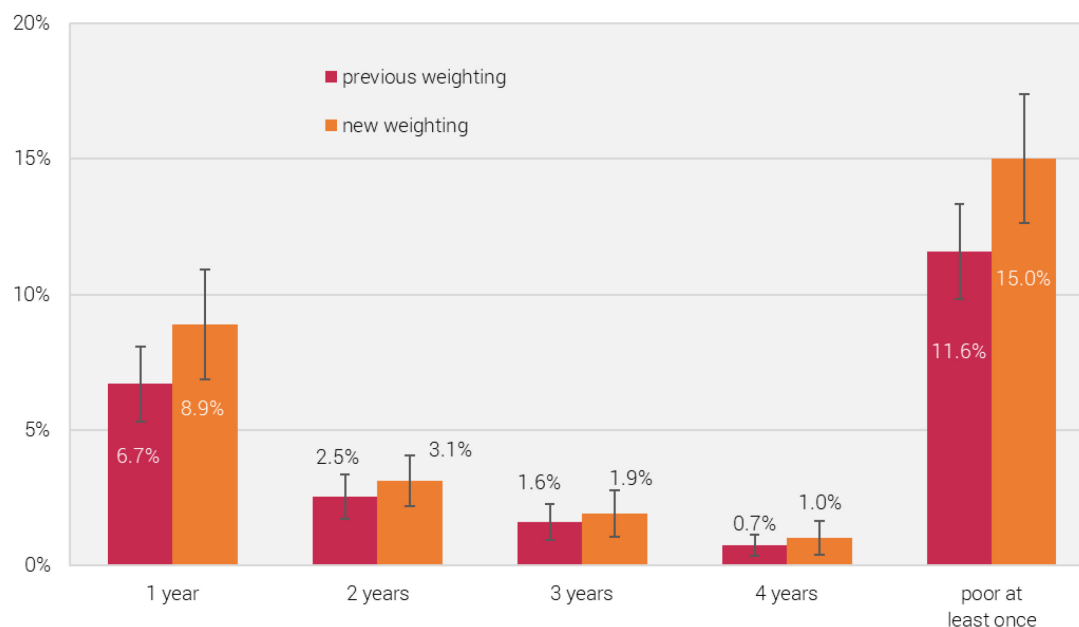
3.1.2. Consequences for some longitudinal indicators

Diagram 6. Persons affected by poverty over a four-year period. By number of years, in % of the population



Source: FSO - Statistics on Income and Living Conditions (SILC), longitudinal data 2015-2018, excluding imputed rent.

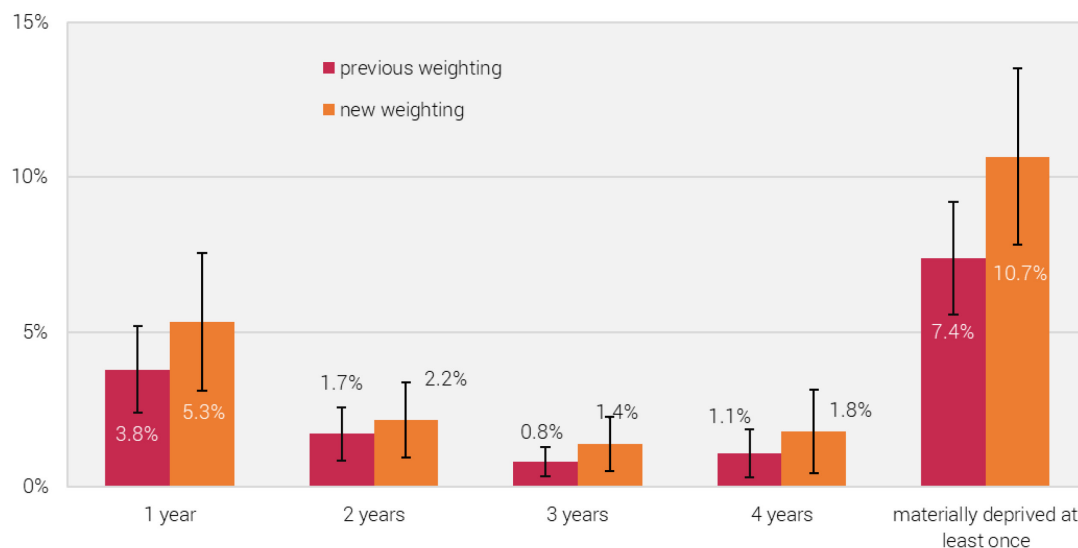
Diagram 7. Persons at risk of poverty at 60% of the median over a four-year period. By number of years, in % of the population



Source: FSO - Statistics on Income and Living Conditions (SILC), longitudinal data 2015-2018, excluding imputed rent.

Interpretation example: With the previous weighting, 2.5% of the population were affected by poverty according to the absolute concept during two of the four years considered and 0.7% were affected during four years.

Diagram 8. Persons materially deprived over a four-year period. By number of years, in % of the population



Source: FSO - Statistics on Income and Living Conditions (SILC), longitudinal data 2015-2018, excluding imputed rent

For the three indicators⁴, there is an undeniable increase in rates with the new weighting, but this is never significant.

The at risk of persistent poverty rate with SILC18 rose by 2.2 percentage points, rising from 6.6% with the previous weighting to 8.8% with the new one. The most pronounced increase (3.5 percentage points) concerns persons aged 18-24, whose rate rose from 3.8% with the previous weighting to 7.3% with the new one, followed by the under 18s (from 15.0% to 18.0%). An undeniable increase was also observed among people aged over 65, whose rate rose from 7.4% to 10.9%.

3.1.3. Conclusion of the analysis

The change in the rule for following households made it possible to use variables from data surveyed in wave 1 available only for complete households in the adjustment for household total non-response. The new weighting thus models better the probabilities of response. The SRPH survey frame, by offering a much more complete coverage of the reference population and access to a greater amount of data on the population, has led to an improved final calibration. The result is a fundamental revision of the methods of longitudinal weighting and consequently a marked improvement in the quality of longitudinal estimates produced from SILC 2018. The dispersion of the revised weights is wider, resulting in an upward trend in confidence intervals.

Analysis of the impact of the revision on the main indicators shows that it is essential to indicate a break in the series between the longitudinal results before and after the revision.

⁴ The results of these three indicators are available at [Dynamics of poverty | Federal Statistical Office \(admin.ch\)](#)

3.2. Revised method: construction of the weightings RB062, RB063 and RB064

Regardless of weight, only persons living in a complete household from start to finish of the transition will be awarded a longitudinal weight. The main steps are the following:

3.2.1. Correction for non-response

The aim is to correct for non-response in incomplete households at the end of transition (NRT, died or moved out of scope) although the household was complete at the start of transition. Non-response is modelled by a calibration algorithm (CALMAR2⁵), with a constraint at household level in order to obtain the same non-response correction weightings for the members of a single household. The respondents at the start and end of transition (net sample, including cohabitants) are calibrated to the gross sample (respondents at the start of transition regardless of the response status at the end of transition). A second step aims to model the response status of the gross sample and to calculate a concordance rate assessing the quality of the model. The adjustments provide g-weights (inverse of the response probability). This g-weight is multiplied by the cross-sectional weights *ptm_par* (cross-sectional weight of the start of the transition after NR correction and weight sharing, see 2.1) of each wave and each year concerned. Since the *ptm_par* weight has already been shared to include the cohabitants, and the correction is made at household level and all the individuals it contains, a new sharing of weights is not necessary. Rotational groups are dealt with separately for each of the various weights.

The auxiliary variables are the same as those selected for the NR correction of waves 2-3-4 at cross-sectional level, plus the following 3 variables (see table 6 below):

- Household composition by sex of the SRPH;
- Presence of supplementary benefits of the Central Compensation Office (CCO);
- Household size according to SRPH.

The reference periods are detailed in table 5 and are also very similar to those of the cross-sectional weighting. The main difference concerns the SRPH data, taken from September T-x for the cross-sectional NR correction and December T-x for the longitudinal NR correction. This difference is explained by the fact that the wave 1 survey framework dates from September T-1.

Before using auxiliary variables in the calibration model for NR correction, missing values have to be treated because the CALMAR2 macro rejects them. Part of the missing values in the SRPH variables are imputed in a deterministic way using the CATI variables. The rest is imputed randomly.

The results of the models for NR correction are presented below for the various weights.

RB062

Wave 1: The algorithm converged during 5 repetitions with a concordance rate of 69.31

Wave 2: The algorithm converged during 6 repetitions with a concordance rate of 69.59

Wave 3: The algorithm converged during 6 repetitions with a concordance rate of 70.72

RB063

Wave 1: The algorithm converged during 6 repetitions with a concordance rate of 69.15

Wave 2: The algorithm converged during 5 repetitions with a concordance rate of 69.84

RB064

Wave 1: The algorithm converged during 6 repetitions with a concordance rate of 69.29

The concordance rate can assess the model by measuring the degree of similarity between the ranked values observed and those predicted by the model. It enables assessment of the model by indicating the percentage of cases in which the response status it predicted is the same as the actual response status.

⁵The SAS macro CALMAR2 (CALMage sur MARges) is used to adjust a sample by reweighting individuals using auxiliary information available on a number of variables, called calibration variables.

Table 6 List of variables used to correct for non-response. Information used to fill in the variable is indicated in Source. Household is abbreviated HH.

Variable	Codelist	Source	Reference period T = 2018
Age group of the oldest person in hh	1 : Up to age 34 2 : age 35 - 44 3 : age 45 - 54 4 : age 55 - 64 5 : age 65 - 74 6 : 75 and more	SRPH	12.T-4 12.T-3 12.T-2
At risk of poverty status at 60% of median total equivalent hh income	0: Not at risk of poverty 1: At risk of poverty	CATI	T-3 T-2 T-1
hh composition by nationality	0 : Only Swiss 1 : Foreign and Swiss mixed 2 : Only foreigners but at least one neighbouring country 3 : Only foreigners but no-one from neighbouring country	SRPH	12.T-4 12.T-3 12.T-2
Presence of supplementary benefits in household	0 : No 1 : At least one in household	CdC	12.T-1
Age group	1 : age 0-15 2 : age 16-20 3 : age 21-34 4 : age 35-44 5 : age 45-54 6 : age 55-64 7 : age 65-74 8 : age 75 and more	SRPH	09.T-1 12.T-1
Rent and accommodation costs	1 : 0-1000.-] 2 : [1000.- - 1500.-] 3 :]1500.- and more	CATI	T-3 T-2 T-1
Material deprivation 3 out of 9 items	0: Not deprived 1: Deprived	CATI	T-3 T-2 T-1
Type of family	110 : Single person aged under 65 130 : Single person aged over 65 210 : 2 adults aged under 65, without other hh members 230 : 2 adults aged under 65, without other hh members 300 : Single adult with at least one child* 400 : 2 adults with one child* or more 910 : Other households *(<18) or 18-24 (min 20y. age diff. with adult)	SRPH	12.T-4 12.T-3 12.T-2
Type of family and number of children	401 : 2 adults with 1 child * 402 : 2 adults with 2 children* 403 : 2 adults with 3 children* or more 910 : Other households *(<18) or 18-24 (min 20y. age diff. with adult)	SRPH	12.T-4 12.T-3 12.T-2
Maximum hh level of education	1: Professional education and training 2: Advanced professional education and training 3: no training	CATI	T-3 T-2 T-1
hh composition by sex	0 : Male and female 1 : Only male 2 : Only female	SRPH	12.T-4 12.T-3 12.T-2
8 categories of commune typology	1: Centres (CEN) 2: Suburban municipalities (SUB) 3: High income municipalities (RE) 4: Semi-urban municipalities (PERI) 5: Tourist municipalities (TOUR) 6: Industrial and tertiary municipalities (IND) 7: Rural commuter municipalities (PEND) 8: Mixed rural municipalities (MIX) and Agricultural municipalities (AGR)	CATI	T-3 T-2 T-1
Major region	1: Lake Geneva Region VD, VS, GE 2: Espace Mittelland BE, FR, SO, NE, JU 3: North-West Switzerland, BS, BL, AG 4: Zurich ZH 5: Eastern Switzerland, GL, SH, AR, AI, SG, GR, TG 6: Central Switzerland, LU, UR, SZ, OW, NW, ZG 7: Ticino TI	CATI	T-3 T-2 T-1
hh size according to SRPH	1 : 1 person household 2 : 2 person household 3 : 3 person household 4 : 4 person household 5 : 5-person household and more	SRPH	12.T-4 12.T-3 12.T-2
Interested in politics	1: 0-6 with (0= no interest / 10 = maximum interest) 2: 7-10 with (0= no interest / 10 = maximum interest)	CATI	T-3 T-2 T-1
Civil status	1: Single 2: Married 3: Widowed 4 : Divorced -9 : No information	SRPH	12.T-4 12.T-3 12.T-2
Groupe de nationalité - 4 classes	1: Switzerland 2: Northern and Western Europe 3: Southern Europe 4: Other countries	SRPH	12.T-4 12.T-3 12.T-2
Presence of unemployment allowances in hh	0 : No unemployment allowance 1 : One or more unemployment allowances	CdC	12.T-1
Presence of disability pensions in hh	0 : No A/I/A pension 1 : One or more A/I/A pensions	CdC	12.T-1
Number of old-age pensions in the hh	0 : No old-age pension 1 : One old-age pension 2 : Several old-age pension	CdC	12.T-1
Number of incomes from employment in hh	0: No income from employment 1: 1 income from employment 3: 3 incomes from employment 4: 4 or more incomes from employment	CdC	12.T-1
Employment status in 4 groups	1: occupa in (1,5) full-time paid work (min. 37 hours/week) / unpaid work in family business/farm 2: occupa in (2, 3, 6) part-time paid work (1 - 36 hours/week) / work in sheltered workshop 3: occupa in (4, 7, 9, 10, 11, 12, 13) In education / domestic tasks (max. age 64/65) / other pensioner / unemployed / other situation (continuing education, unpaid leave, ...) / Military or civil compulsory service / Apprentice 4: occupa in (8, 14) retired (pensioner) AVS/AHV, pension fund, early	CATI	T-3 T-2 T-1
Group of total equivalent incomes	1 : [P0-P20] 2 :]P20 - P40] 3 :]P40-P60] 4 :]P60-P80] 5 :]P80-P100]	CdC	12.T-1
Size of hh's commune	1: 100 000 inhabitants and more 2: 50 000 - 99 999 inhabitants 3: 20 000 - 49 999 inhabitants 4: 10 000 - 19 999 inhabitants 5: 5 000 - 9 999 inhabitants 6: 2 000 - 4 999 inhabitants 7: 1 000 - 1 999 inhabitants 8: < 1 000 inhabitants	CATI	T-3 T-2 T-1
Moved house (change of building) in past 2 years	0 : No move 1 : Change of building	GWS	09.T-1 12.T-1
Living space per hh member	1 : <= 20m2/pers 2 : > 20m2/pers	GWS	12.T-4 12.T-3 12.T-2

3.2.2. Combination of waves

The benefit of this was explained in 2.2. It is only applied for the longitudinal if several rotational groups are concerned, for either RB062 or RB063. Longitudinal waves are combined in the same way as cross-sectional waves.

3.2.3. Final calibration

The final calibration for longitudinal weights is carried out in the same way as for cross-sectional weights with slightly fewer variables (table 7) and slightly different reference periods⁶. This is an individual calibration, without household constraint, carried out on the initial population of the transition and making it possible to obtain different weights between individuals of the same household. The longitudinal weights thus represent the population at the start of the transition. They therefore allow analyses determining the evolution of the population from T-x to T.

Table 7 List of variables for the final calibration

Nom	Label	Codelist	Source	Reference period T = 2018
ARP60_ci1_CAL ARP60_ci2_CAL ARP60_ci3_CAL ARP60_ci4_CAL ARP60_ci5_CAL	Intersection between ARP60 and age group for calibration	0 : if ARP60 = 0 1 : if ARP60 = 1 and age group = 1 2 : if ARP60 = 1 and age group = 2 3 : if ARP60 = 1 and age group = 3 4 : if ARP60 = 1 and age group = 4 5 : if ARP60 = 1 and age group = 5	CdC/ SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1
cl_age_pondmen_CAL	Age groups for calibration	1 : age 0-17 2 : age 18-24 3 : age 25-49 4 : age 50-64 5 : age 65 and more	SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1
FamTyp19_CAL	Type of family for calibration	110 : Single person aged under 65 130 : Single person aged over 65 210 : 2 adults aged under 65, without other hh members 230 : 2 adults aged under 65, without other hh members 300 : Single adult with at least one child* 400 : 2 adults with one child* or more 910 : Other households *(<18) or 18-24 (min 20y. age diff. with adult)	SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1
HH_RES_REGCH_2011_2_CAL	Major region	1 : Lake Geneva Region VD, VS, GE 2 : Espace Mitteland BE, FR, SO, NE, JU 3 : North-West Switzerland, BS, BL, AG 4 : Zurich ZH 5 : Eastern Switzerland, GL, SH, AR, AI, SG, GR, TG 6 : Central Switzerland, LU, UR, SZ, OW, NW, ZG 7 : Ticino TI	SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1
HHsize_ci5_CAL	Household size according to SRPH for calibration	1 : 1 person household 2 : 2 person household 3 : 3 person household 4 : 4 person household 5 : 5-person household and more	SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1
MaritalSt5_CAL	Civil status for calibration	1 : Single 2 : Married 3 : Widowed 4 : Divorced	SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1
Natio4_CAL	Nationality group (4 groups) for calibration	1 : Switzerland 2 : Northern and Western Europe 3 : Southern Europe 4 : Other countries (regroupement avec les < 0)	SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1
sex_CAL	Sex for calibration	1 : man 2 : woman	SRPH CATI	12.T-4 12.T-3 12.T-2 T-3 T-2 T-1

The RB060 weight, an intermediate weight not intended for analyses, is constructed on the basis of the longitudinal weights after correction for non-response (see 3.2.1). This weight does not exist for all individuals, but only those living in a complete household at the start and end of the transition. Newborns and cohabitants who arrived in the household after the start of the transition do not have one.

⁶ The reference periods are indicated by the month of year T (DB010 survey year) minus 1, 2, or 3 depending on the weight concerned (RB062, RB063 or RB064 respectively).

Cohabitants do not need to have an RB060 unlike newborns. Part of the weight must therefore be allocated to them via a weight sharing process.

The initial weights - after correction for non-response - Plm_nr_RB062, Plm_nr_RB063 and Plm_nr_RB064, each of which were based on the gross sample of the arrival transition, were therefore taken over, prioritising the weight RB062, then RB063, and then RB064. The sum of the weights was indeed much greater in this order than in the reverse order. For wave 1, the weight is naturally the ptm_par (see 2.1.1).

```
if filter = 1 ==> RB060_avpart = ptm_par
```

```
Otherwise if a person has a weighting RB062 ==> RB060_avpart = plm_nr_RB062
```

```
Otherwise if a person has a weighting RB063 ==> RB060_avpart = plm_nr_RB063
```

```
Otherwise if a person has a weighting RB064 ==> RB060_avpart = plm_nr_RB064
```

According to Eurostat guidelines, the weight of the mother is attributed to newborns. If the mother is absent from the household, the weight of the oldest woman in the household or the oldest man is used, in this order.

3.4. Construction of the weighting DB095

This weight, which is not intended for analysis, should be assigned to complete households (DB135 = 1), which are not in w1. Unlike the other longitudinal weights, which exist only for the end of transition year (SILC18 here), the DB095 exists for each of the four years considered in which the household was complete.

The starting weight used is DB090. However, the sum of the DB095 weights per year must correspond to the total households in the population, which is not the case since, for example for SILC15 (w1), only one panel must have a DB095 weight, while four panels have a DB090 weight. A corrective factor must therefore be applied to DB090 so that the sum of the weights for each of the panels is equal to that of DB090, representing the population of private households.

It is then necessary to correct DB095_int, and divide it by the number of rotational groups comprising this weight, i.e. 1 for t-1, 2 for t-3 and 3 for t-1 and t, to obtain a final weight DB090.

4. Analysis of weight differentials

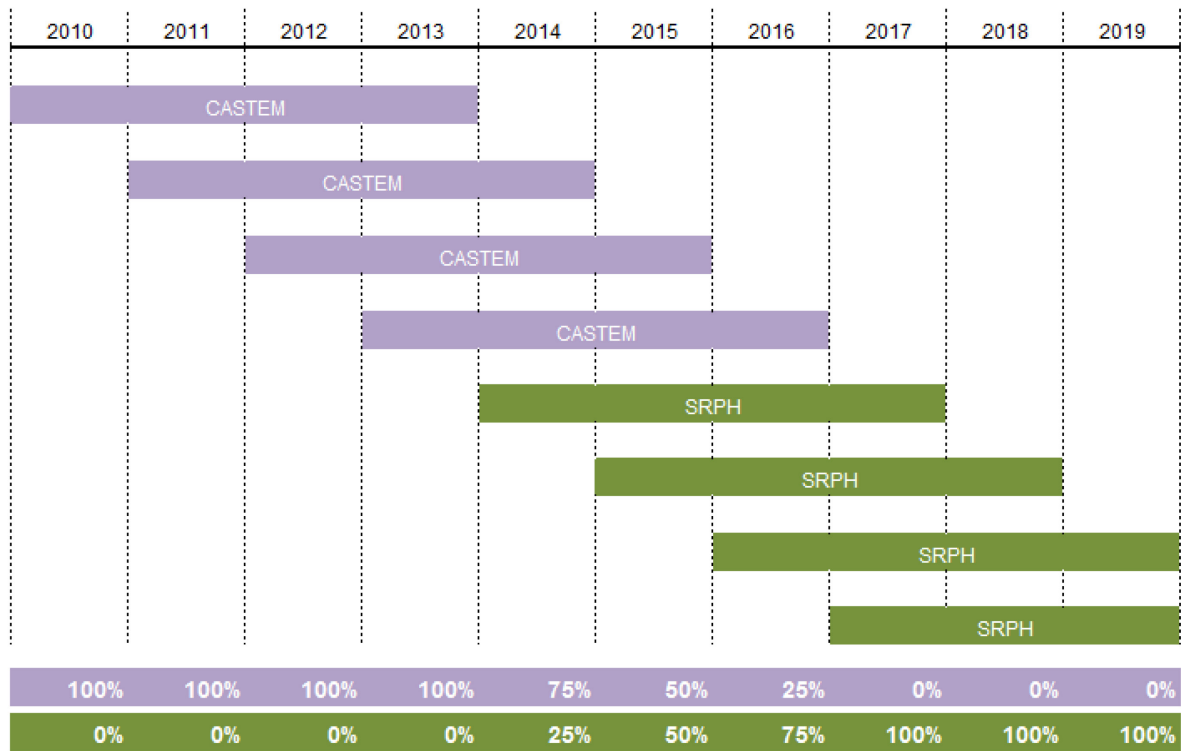
The final household weights RB050 were analysed over several years in order to test the continuity of the response process modelled by weighting, to detect any errors and to assess the impact of changing the weighting method.

The graphics below show the differential of the probability of responding modelled by weighting ($1/(\text{average weight of sub-group}/\text{total average weight})$) for some socio-demographic categories. Values above than 1 indicate that the sub-group's probability of responding, as modelled by the weights, is higher than average and that therefore this sub-group tends to respond better than average. In contrast, values below 1 indicate that the sub-group's probability of responding, as modelled by the weights, is lower than average and that therefore this sub-group tends to participate in the survey less well than average.

As well as identifying the sub-groups that have a greater/smaller probability of responding, these values also allow us to observe changes in the weights of sub-groups with the gradual introduction of ALTELS. In fact, the introduction of the altel population increases the coverage of profiles of persons in this group (detailed below). We ought, therefore, to see a decrease in the variations in weight, with a slight increase in the weight (decrease of the differential of response probability) of elderly people, very rarely ALTELS, and a decrease in the weight (increase of the differential of response probability, diagram 10) of profiles of the altel type since their representation among respondents is now similar to their proportion in the population. This transition phase is observed until SILC2017, and should then stabilize, as the entire sample is now drawn from SRPH (see diagram 9 below).

As ALTELS are not in fact representative of the population, some analyses were conducted during the first sampling in SRPH in 2014 to establish their profile and to measure the impact of their introduction on the main indicators. Some of the results calculated on the basis of wave 1 showed that the ALTELS represented a population that tended to be young (50% are younger than 44), who often lived alone or in a couple and was more likely to contain foreigners from Southern Europe and other countries ([see 2014 Quality Report](#) for more details).

Diagram 9 Share of both sampling frameworks represented in the total sample, by survey year.



Elderly persons were more willing to respond than working-age adults and 25-49 year-olds were the least well-represented. Until recently the latter were also less well-represented in the sample as they

were most often ALTELS. Furthermore, the weight of persons aged over 65 regularly declined since 2014. As the weighting process was the same since 2014, is likely that the gradual decline of the weight of persons aged over 65, and the increase of those aged 18-49, are related to the gradually improving coverage of ALTELS (diagram 10).

Diagram 10 Change in the differential of response probability by age, as modelled by the weighting method, with the introduction of ALTELS and changes to the weighting (from 2014)

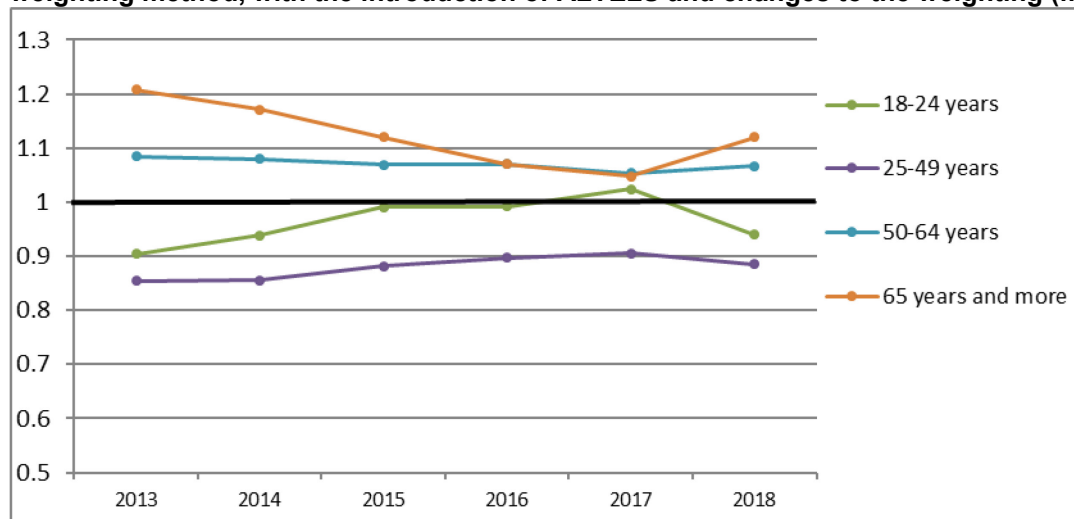


Diagram 11 Change in the differential of response probability by nationality type, as modelled by the weighting method, with the introduction of ALTELS and changes to the weighting (from 2014)

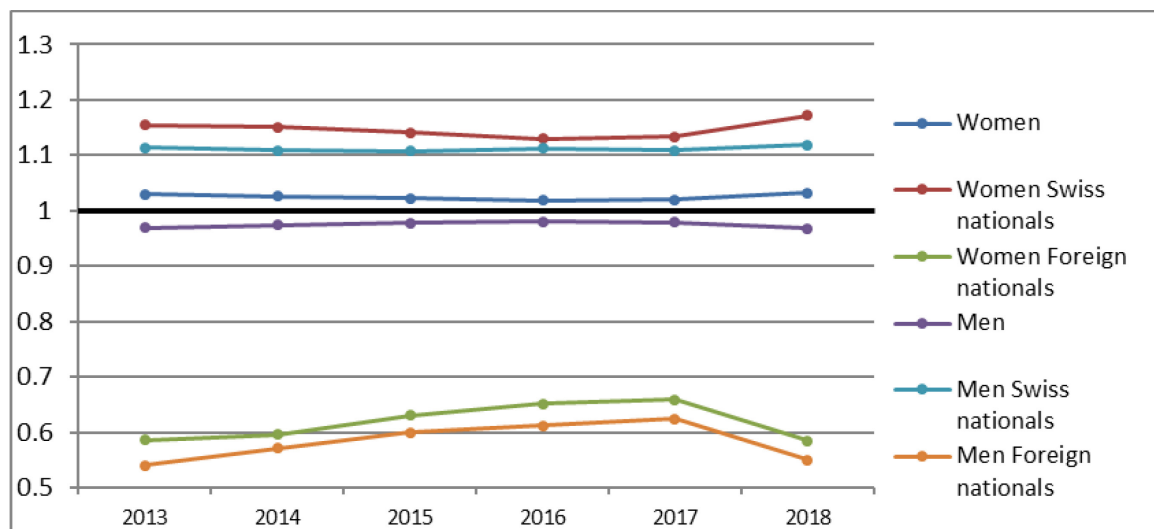


Diagram 11 shows that the response differential for Swiss nationals remains stable, whereas that of foreign nationals is much less so. It grew almost each year for foreign nationals from Northern and Western Europe, whereas it remained stable since 2015 for those from non-European countries. The differential of the response probability of foreign nationals from Southern Europe has also increased slightly every year since the introduction of the ALTELS. It should also be noted that until 2013, correction for non-response and the calibration were made without distinguishing between the sub-groups of foreign nationals. The availability of register data enabled us, from 2014 onward, to reuse these same categories of foreign nationals in the correction for non-response and the final calibration.

Whereas the change-over to SRPH and the new weighting reduced weight dispersion by age categories, the reverse effect can be seen by quintiles of equivalent disposable income (dia.12), although the order

of weights in relation to the quintile remained the same. Since 2014, the response probability modelled by weights according to quintile have remained relatively stable over time. Thus, from 2014, the new weighting method attributes a bigger weight to small incomes and a proportionately smaller weight to large incomes. In other words, the new weighting method models a smaller response probability for smaller incomes and a larger one for big incomes. This could be due to the introduction of income variables taken from registers in the weighting process. However, households that are financially better off are more willing to respond, with a gradual decline by income quintile.

Diagram 12 Change in the differential of response probability by equivalent disposable income, as modelled by the weighting method, with the introduction of ALTELS and changes to the weighting (from 2014)

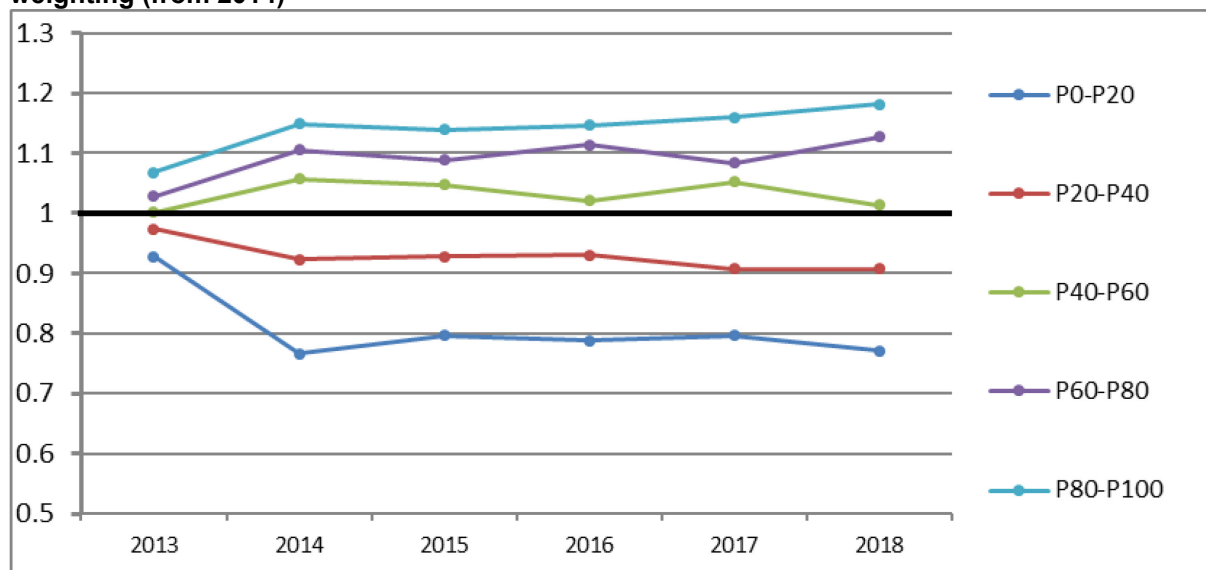
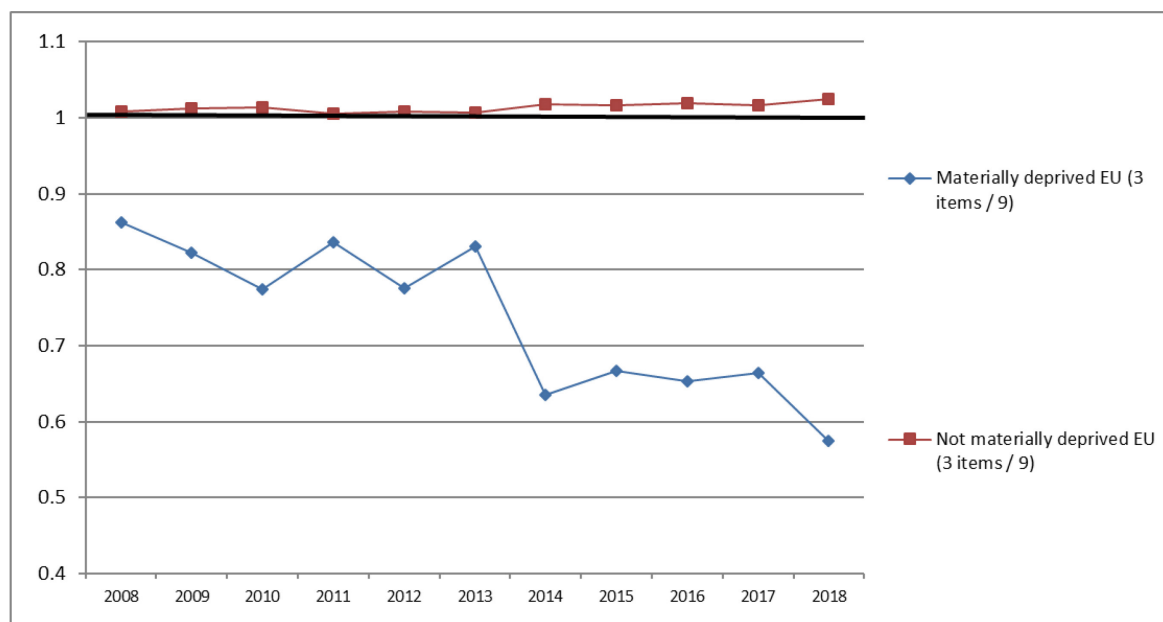


Diagram 13 Change in the differential of response probability by “materially deprived” or “not materially deprived”, as modelled by the weighting method, with the introduction of ALTELS and changes to the weighting (from 2014)



5. Weight variance

Certain intermediate weights were analysed in relation to their final weights in order to establish the share of the variation coefficient of the final weight created at each stage of weighting. This entailed evaluating which proportion of the non-response process, as modelled by the weights, could be attributed to the stage of correction for non-response or to the stage of final calibration. The diagram 14 below shows that in wave 2, the initial weight (poidsond = survey weight) presents a rather low level of variance. With a proportional stratified sample, a low coefficient of variation of the survey weights is normal. Still in wave 1, a large part of the total variance in the final weights is created at the stage of correction for non-response, and to a lesser extent, during the final calibration (RB050). For subsequent waves, the initial variance is already substantial with weight having been gained after correction for non-response in wave 1 (ptm_nrqmvX_w1) and accounts for almost half of the total variance. The remainder is due to correction for non-response in the current wave and during the final calibration. For waves 2 and 3, the variability added by the final calibration is larger than that added by correction for non-response. In wave 4, these two stages contribute in a fairly similar manner to total variance in the final weight.

It should be noted that not all stages are represented in the graphic below and that some percentages are missing from the total of waves 2 to 4, in particular those of weight sharing and the merging of waves.

