Caucasus Barometer 2010 Sample Design

Lucy Flynn, CRRC Statistical Consultant

Table of Contents

Sampling

Sample Design

The target population for the 2010 Caucasus Barometer was all non-foreign adults residing in Armenia, Azerbaijan, and Georgia outside of occupied territories (Abkhazia, South Ossetia and Nagorno Karabagh) and the Nakhchivan Autonomous Republic of Azerbaijan during the period of November-December 2010.

Primary sampling units (PSUs) were electoral precincts. The sampling frame was divided into three "macro-strata" by settlement type: capital, urban and rural.

Necessary sample size calculations were made using data from the 2009 Caucasus Barometer which had the same sample design as the 2010 Caucasus Barometer. A set of core questions was identified based on knowledge of the consistency of responses to these questions from year to year. All values utilized in necessary sample size calculations were calculated from each core question (and each possible response where applicable) and averaged.

Necessary sample size calculations were made in multiple stages: First, the intra-cluster correlation coefficient (ρ_s) was calculated for each settlement type in each country. The intra-

cluster correlation coefficient is a measure of intra-cluster homogeneity and is essentially the proportion of the variability between members of the population that can be attributed to the voting precinct within which an individual resides:

$$\rho_s = 1 - \frac{M_s}{(M_s - 1)} \frac{SSW_s}{SSTO_s},$$

where M_s is the average cluster size in settlement type *s*, SSW_s is the sum of the squared differences between observations within voting precincts, and $SSTO_s$ is the sum of squared differences between all observations in the data set.

Second, the optimal number of respondents per PSU was estimated in each macro-stratum using the formula:

$$b_s = \sqrt{\frac{c_{1s}}{c_{2s}} \frac{1 - \rho_s}{\rho_s}},$$

where the optimal number of interviews per precinct in macro-stratum m is a function of c_{1s}, the cost of sampling each additional PSU in macro-stratum *s*; c_{2s}, the cost of sampling each additional respondent in macro-stratum *s*; and ρ_s, the intra-cluster correlation coefficient. The cost of sampling an additional PSU (c_1) is the cost of the interviewer's transportation to the voting precinct and his/her communications costs. The cost of sampling an additional respondent within a PSU (c_2) is the cost of printing the questionnaire, the interviewer's honorarium, and the cost of double data entry of the completed questionnaire. The optimal number of respondents per precinct was below the number logistically feasible in all settlement types of all three countries. Thus, the numbers were adjusted upward to the minimum numbers judged acceptable by staff members supervising fieldwork in each country.

Third, design effects (DEFFs)--the factor by which the variance of the sampling distributions and thus the necessary sample sizes are increased by the structure of the survey design--were estimated using the ρ_s values from the 2009 survey (CRRC 2009) and the number of respondents per precinct planned for the 2010 survey (M_s) according to the formula:

$$DEFF_s = 1 + \rho_s (M_s - 1).$$

Fourth, necessary sample size calculations were made according to the formula for simple random samples:

$$n_s^* = \frac{z_{1-a/2}^2 \sigma_s^2}{e^2 + \frac{z_{1-a/2}^2 \sigma_s^2}{N_s}},$$

where e is the desired margin of error, $1-\alpha$ is the desired level of confidence, σ_s^2 is the variance in stratum *s*, and N_s is the total population size in stratum *s*. The values of σ_s^2 were estimated from the 2009 survey data (CRRC 2009).

Fifth, the necessary sample sizes given the actual survey design were estimated by multiplying the values of n_s^* by the DEFFs, so that

$$n_s = DEFF_s\left(n_s^*\right).$$

The necessary sample sizes were divided by the desired number of interviews per cluster to calculate the number of PSUs to be sampled. The urban and rural macro-strata were each further divided into geographic sub-strata: northeast, northwest, southeast and southwest. The capitals were not sub-divided in any way, resulting in a total of nine strata per country. The number of PSUs to be sampled in each urban and rural macro-stratum was allocated amongst the four geographic strata in proportion to the total population size of each stratum.

The number of target respondents per PSU was calculated by multiplying the desired number of respondents per PSU by inverse of the response rate in each country and macro-stratum estimated using the 2009 Caucasus Barometer (CRRC 2009):

$$T_s = M_s \frac{1}{r_s},$$

so that the number of target respondents per PSU in stratum s (T_s) is the desired number of respondents per PSU in stratum s (M_s) multiplied by the inverse of the 2009 response rate in stratum s (r_s).

Sample Selection

Within each stratum, PSUs were sampled with probability proportional to size; size being the number of registered voters. Therefore, ψ_i, the probability of any PSU *i* being selected on a given draw was:

$$\psi_{hi} = \frac{N_{hi}}{\sum_i N_{hi}},$$

where N_{ih} is the number of registered voters in precinct *i* of stratum *h*, and $\sum_i N_{ih}$ is the sum of the number of voters across all precincts in stratum *h*.

Secondary sampling units (SSUs) were households and were selected via random walk. Random walks were begun at precinct polling stations and the walking pattern was determined by CRRC's random walk protocol (available upon request). Step sizes were calculated according to the following criteria:

1. For each sampled voting precinct, the number of registered voters was divided by the average number of adult household members per household in both that country and settlement type in order to estimate the total number of households in the precinct.
2. The estimated total number of households in the precinct was divided by the target sample size in order to estimate the appropriate step size to give each household in the precinct an equal chance of being targeted for interview.
3. The step size was multiplied by 75% in order to account for uncertainty in the actual number of households in the precinct.
4. If the resulting step size was less than three, it was set to the minimum value of three. This minimum value is set because small rural settlements where a minimum value is relevant have a high degree of homogeneity of responses. Resources would thus be wasted by interviewing every second household in such a settlement.
5. If the resulting step size was more than the country and settlement type-specific maximum (determined by staff members supervising fieldwork in each country), then the step size was set to the maximum value. These maximum values were set in order to create a reasonable and fair task for interviewers while conducting their random walks.

For household-level questions (the minority of questions in the survey) households were both SSUs and observation units. However, for individual-level questions (the majority of questions in the survey), the observation units were the tertiary sampling units (TSUs)--individuals. Within selected households, the adult household member targeted for interview was randomly selected using the Kish table (Kish 1949). In the event that contact was not made with the household or that the selected household member was not available, a total of three contact attempts were made before classifying the attempted interview as non-response.

Weighting

Interview Disposition Codes

The proportion of applicable questions that the respondent answered was calculated for all fully and partially completed interviews. Disposition codes were assigned according to AAPOR standards so that interviews wherein the respondent answered fewer than 50% of the applicable questions were assigned a disposition code of zero. Those wherein the respondent answered at least 50% but fewer than 80% of the applicable questions were assigned a disposition code of

0.5, and those wherein the respondent answered at least 80% of the questions applicable to him or her were assigned a disposition code of one. Interviews with a disposition code of zero were classified as non-response and were not assigned sampling weights; interviews with a disposition code of greater than zero were classified as response and assigned sampling weights.

Household weights

Population weights for households were calculated as the inverse of selection probability so that each household's weight is equivalent to the number of households that it represents in the entire population of households in the country. Although precincts were selected without replacement, selection probabilities were calculated as though they had been selected with replacement. The resulting selection probabilities are not different in any meaningful way since each precinct comprises such a small proportion of the total population of each stratum. Additionally, the process of computing weights is much more computationally efficient. Thus, the population weight for each household *j* of precinct *i* of stratum *h* is:

$$w_{hij} = \frac{1}{n_h \psi_{hi}} \frac{M_{hi}}{m_{hi}}.$$

The first term of the equation is the inverse of the precinct's selection probability. The precinct's selection probability is the product of n_h (i.e. the number of precincts sampled in stratum *h)* and ψ_{hi} (i.e. precinct *i*'s selection probability with each draw). The second term is the inverse of the household's selection probability within the precinct: M_{hi} (i.e. the total number of households in precinct *i* of stratum *h)* divided by m_{hi} (i.e. the number of households in precinct *i* of stratum *h* in which interviews were completed).

Individual Weights

Individual population weights were calculated as follows:

$$w_{hij} = \frac{1}{n_h \psi_{hi}} \frac{M_{hi}}{m_{hi}} \frac{Q_{hij}}{1} \frac{P_{sex,age}}{p_{sex,age}}.$$

The first additional term, Q_{hij}, is the number of adult household members in household *j* of precinct *i* of stratum *h*. The second additional term is the non-response factor, where $P_{sex,age}$ is the proportion of the country's population in the respondent's gender and age group and $p_{sex,age}$ is the proportion of the sample (nationwide) in the respondent's gender and age group.

Age groups were 18-29, 30-39, 40-49, 50-59, 60-69 and 70 and older.

References

Caucasus Research Resource Centers (CRRC). 2009. "Caucasus Barometer." [dataset].

Kish, L. 1949. A Procedure for Objective Respondent Selection within the Household. Journal of the American Statistical Association 44(247): 380–387.

Appendix A. Core questions used in the sample design

Number	Question	Responses
1	Gender	Male Female
2	Level of education	No primary education Primary education Incomplete secondary education Completed secondary education Secondary technical education Incomplete higher education Completed higher education Post-graduate degree
3	Employed	No Yes
4	Rating of own health	Very poor Poor Fair Good Very good
5	Main source of information about current events	Colleagues Family members Neighbors, friends Internet Newspapers, news magazines Radio TV Other
6	Type of unemployment	Unemployed and looking for a job Unemployed and interested in a job, but NOT currently looking for a job Unemployed and not interested in looking for a job Student Housewife Retired and looking for a job Retired and interested in a job, but NOT currently looking for one Retired and NOT interested in looking for a job Disabled

		Other
7	Level of trust in the United Nations	Fully distrust Rather distrust Neither trust nor distrust Rather trust Fully trust
8	Frequency of attendance of religious services	Never Less often Only on special holidays At least once a month Once a week More than once a week Every day
9	Ownership status of respondent's dwelling	Own it Rent it Live free of charge with the permission of the owner The dwelling is owned by state / by a company
10	Is the respondent's household connected to pipeline tap water?	No Yes
11	Means of daily transportation	Bike Bus Minibus Personal car Taxi Subway / Metro Walk Horse / Donkey Other
12	Does the respondent's household own a car?	No Yes
13	Interviewer's assessment of the respondent's level of intelligence	Not intelligent at all Not very intelligent Average Intelligent Very intelligent