

Chapter XII

An analysis of cost issues for surveys in developing and transition countries

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Abstract

The present chapter discusses, in general terms, the key issues related to the cost of designing and implementing household surveys in developing and transition countries. The overall cost of a survey is decomposed into more detailed components associated with various aspects of its design and implementation. The cost factors are considered separately for countries with extensive survey infrastructure and those with little or no survey infrastructure. The issue of comparability of costs across countries is also examined.

Key terms. Survey infrastructure, incremental cost per interview, efficiency, cost comparability, cost factors.

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A. Introduction

1. Criteria for efficient sample designs

1. In general, an efficient sample design has to satisfy one of two criteria: it must provide reasonably precise estimates under the constraint of a fixed budget, or minimize the cost of implementation for a specified level of precision. The present chapter focuses on the first criterion, which is concerned with the task of developing the most efficient design that can be implemented with costs that are consistent with available budgets and make reasonably efficient use of resources. In developing and transition countries, the cost of the surveys is one of the biggest constraints on the formulation of critical decisions about design and implementation. Designing a survey in developing and transition countries, as in developed countries, involves the usual trade-offs between the precision of survey estimates and the cost of implementation. Precision is generally measured in terms of the variances of the estimators of selected population quantities that are considered to be of principal interest. Other related measures of precision include mean squared error or total survey error, which also incorporates the bias component of error.
2. Formal mathematical development of the trade-offs between precision and cost typically involves optimization of well-behaved variance or cost functions subject to relatively simple constraints. However, owing to limitations in available cost and variance information, this optimization approach often should be viewed as providing only rough approximations towards the preferred design, or for the precision and cost values that will actually be achieved in implementation. These issues have been considered in depth for surveys carried out in developed countries. See, for example, Andersen , Kasper and Frankel (1979), Cochran (1977), Groves (1989), Kish (1965; 1976) and Linacre and Trewin (1993), and the references cited therein. In addition, for a broader discussion of cost and precision as two of many criteria for evaluation of national statistical systems, see de Vries (1999, p. 70) and the references cited therein. For empirical analyses of the costs of selected surveys in developing and transition countries, and a more detailed discussion of the cost/error trade-offs in the design of surveys in developing and transition countries, see chaps. XIII and XIV, and the introduction to Section D (Survey costs).
3. One major limitation in the design of surveys in developing and transition countries is the lack or insufficiency of information on costs associated with various aspects of survey implementation. Despite the above-mentioned limitations, one often finds some amount of common structure in costs across surveys that can be useful in the design of a new survey. In some cases, this common structure is limited to qualitative indications of the relative magnitudes of several cost components or sources. In other cases, actual costs are available that can be seen to be fairly homogeneous across a set of countries, particularly countries with similar population distributions and levels of survey infrastructure.
4. This chapter presents an analysis of issues of cost in the context of surveys in developing and transition countries and investigates the extent to which survey costs or related components for one country can be used to improve the design for a similar survey in another country. In other words, the chapter attempts to address the issue of the portability of survey costs across

countries. The utility of such an analysis is twofold: First, it has the potential of providing a partial solution to the problem of scarcity of information on cost of surveys in developing and transition countries. Second, to the extent that there are similarities across countries in terms of sample designs, survey infrastructure, and population distributions, one might expect similarities in at least some components of the cost of surveys across these countries. Such cost information can be extracted from one survey in one country and used to design a new survey in a different country, or to improve the efficiency of the design of the same survey in the same country. In doing this, the survey designer must recognize the wide variability in survey cost structures across countries. Variable cost components are typically country-specific, whereas some fixed costs are likely to be comparable across countries.

2. Components of cost structures for surveys in developing and transition countries

5. In this chapter, we focus on the first criterion for an efficient survey design, that is to say, a design that generates reasonably precise survey estimates for a given budget allocation. Many surveys conducted in developing and transition countries are commissioned by international financial and development agencies that need the data for decision-making on developmental assistance projects or to support decision makers and policy makers in the beneficiary countries. Three prominent examples of developing country surveys are the Demographic and Health Surveys (DHS), conducted by ORC Macro for the United States Agency for International Development; the Living Standards Measurement Study (LSMS) surveys, conducted by the World Bank; and the Multiple Indicator Cluster Surveys (MICS), conducted by the United Nations Children's Fund (UNICEF). In addition, many other surveys are conducted on a regular basis by national statistical offices and other agencies within national statistical systems. There is also a large number of smaller-scale surveys commissioned by donors and carried out by small, local organizations (for example, non-governmental organizations). Needless to say, the issue of cost is critical in the design work for these surveys as well.

6. In dealing with cost issues, it is important to recognize the fact that developing-country survey designs share many common features. For instance, most surveys are based on a multistage stratified area probability design. The primary sampling units (PSUs) are frequently constructed from enumeration areas identified and used in a preceding national population census. Secondary sampling units are typically dwelling units or households, and the ultimate sampling units are usually either households or persons. The strata and analytical domains are typically formed from the intersection of administrative regions and urban/rural sub-domains of these regions. Because of these similarities, and in keeping with the literature mentioned above in paragraph 2, it is of interest to study the extent to which one may identify common cost structures within groups of developing-country surveys. For some general background on the design and implementation of surveys carried out in developing and transition countries, see Section A of Part one (Section design) and the case studies in part two of this publication. For a more detailed treatment of cost components for a specific survey in a developing country, see chapter XIII. Empirical comparisons of the cost components of surveys conducted in selected developing and transition countries are presented in chapter XIV.

7. In this chapter, we shall restrict our attention to major national household surveys carried out by national statistics offices or other government agencies in the national statistical system.

These include household budget surveys, income and expenditure surveys, and demographic and health surveys. Even though market surveys and other smaller-scale household surveys carried out by various organizations on an ad hoc basis provide a useful source of information and feed into national policy decisions and developmental plans, they are excluded from this discussion. However, the key issues raised in the discussion apply to these types of surveys as well. Most examples are based on the DHS and LSMS surveys, but the key issues are broadly applicable to all household surveys.

3. Overview of the chapter

8. The chapter is organized as follows: section B discusses the classical decomposition of the overall cost of a survey into more detailed components. The next three sections provide a qualitative description of some factors that influence the overall costs of surveys conducted in developing and transition countries. Section C reviews cost factors that may be important for cases in which a considerable amount of survey infrastructure is already in place. Section D considers cases in which there is limited or no prior survey infrastructure. Section E discusses changes in the cost structure that may result from modifications in survey goals. Section F provides some related cautionary remarks regarding interpretation of reported survey costs. Section G provides some concluding remarks, and a summary of some salient points that were not fully developed in the discussion. An example of a framework used in budgeting for the UNICEF multiple indicator cluster surveys (MICS) carried out in developing and transition countries, is given in the annex, as provided by Ajayi (2002).

B. Components of the cost of a survey

9. The mathematical underpinnings of survey costs generally postulate an overall cost, C , as a linear function of the numbers of selected primary sampling units and selected elements. An example of such a function is

$$C = c_0 + \sum_{h=1}^L n_h c_h + \sum_{h=1}^L \sum_{i=1}^{n_h} n_{hi} c_{hi} \quad (1)$$

where c_0 represents the fixed costs of initiating the survey; c_h equals the incremental cost of collecting information from an additional primary sampling unit (PSU) within stratum h ; n_h is the number of sampled PSUs; c_{hi} equals the incremental cost of interviewing an additional household within PSU i in stratum h ; and n_{hi} is the number of sampled households in PSU i . See, for example, Cochran (1977, sects. 5.5 and 11.13-11.14) and Groves (1989, chap. 2). In general, the cost coefficients c_0 , c_h and c_{hi} will depend on a large number of factors that may vary across countries and across surveys within countries. These factors are discussed in detail in the sections that follow.

10. Note that expression (1) is one of many possible cost functions that could be considered. For example, Cochran (1977, p. 313) discusses inclusion of a separate cost component associated with listing of secondary sampling units (as an intermediate stage prior to subsampling households for interview) within selected primary units, where that component depends on the

number of secondary units in each primary unit. Also, for a three-stage design, that is to say, a design in which persons are randomly selected for interview from within households, there will be an extra term in (1) above, denoting the incremental cost associated with interviewing an additional person within a selected household.

11. Furthermore, a more realistic cost function is frequently a stepwise function rather than a linear function. For example, if 10 interviews can be conducted in a single day, then the addition of an eleventh interview requires an extra day of work and thus substantial cost, whereas the addition of a twelfth interview may add little to the overall cost. Also, it is important to note that decisions on such issues as the number of sample PSUs are sometimes influenced by practical considerations other than considerations of cost and precision. For example, it may be that one would want to spend a full week interviewing in a PSU. In that case, less than a week's workload would not be feasible, although a double workload equivalent to two weeks of work might be possible. Thus, in such a situation, the number of sample PSUs would not be directly determined by consideration of costs and design effects, but by practical constraints on implementation.

12. In the next section, we discuss costs of surveys depending on the level of survey infrastructure in the country in question. The central message of that section is that there is a huge disparity in the overall costs of surveys between countries with substantive survey infrastructure and those with little or no infrastructure. However, it must be remembered that in developing and transition countries, one would have to assess the degree of infrastructure at the planning stage of a survey, rather than rely on the historical record. It is not uncommon for a country with superb survey infrastructure at some point to suffer a steady decline in infrastructure over time, to the point of migrating from the first group of countries (considered in sect. C) to the second (considered in sect. D).

C. Costs for surveys with extensive infrastructure available

1. Factors related to preparatory activities

13. Much of the cost of a one-time survey goes to the financing of preparatory activities [see, for example Grosh and Muñoz (1996, p. 199)], hence the funds for such activities are disbursed early in the survey process. Preparatory activities with relatively fixed costs include coordination of survey planning by multiple government agencies, frame development, sample design, questionnaire design, printing of questionnaires and other survey materials, and publicity directed towards potential respondents. Preparatory activity costs that depend on sample size (either at the primary unit or at the household level) include the hiring and training of field staff (for example, listers, interviewers, supervisors and translators).

14. The costs of preparatory activities depend on local factors such as the size of the survey staff and compensation rates, the type and amount of equipment, the prices of items such as stationery and other supplies and modes of transportation and communication. In addition, costs are heavily influenced by whether the survey is a cross-sectional study being done for the first time - where unit costs are comparatively higher - or part of a continuing survey - where the unit costs are lower.

2. Factors related to data collection and processing

15. The costs of data collection and processing also involve both fixed and variable components; but for the most part, the costs of data collection are variable, that is to say, dependent on the number of primary sampling units and households selected. These costs include the costs of the listing of households within selected primary units or the listing of persons within selected households, interviewing and field supervision. The cost of data collection also includes the cost of travel both between and within PSUs. These data-collection costs depend on the organization of the interview operations, the length of the questionnaire, whether or not interpreters are used, and the number of units to be interviewed.

16. One option for reducing travel costs is to create national survey teams consisting of supervisors and interviewers and to move the teams around from region to region, as opposed to establishing regional teams. It is important to note that this option also improves the quality of the data. This approach can also be useful in situations where data collection is carried out on a rolling basis, or when survey operations involve the use of expensive equipment. The model of multiple survey teams has been used in many surveys in developing and transition countries, such as the LSMS series (Grosh and Muñoz, 1996, chap. 5). In developing and transition countries where languages change from region to region, it may be more efficient to have survey teams based on proficiency in the language spoken in each region.

17. A significant part of the costs of data collection and processing is related to the costs of coordination of field activities and survey materials. In a centralized data-collection and processing system, the costs associated with retrieving completed questionnaires and transmitting them to the headquarters could be substantial. Furthermore, the budget must take into account the potentially significant costs associated with monitoring survey activities and results, for example, listing and subsampling procedures carried out in the field, the response rates for key domains of interest against pre-specified levels, etc. Effective monitoring of such activities enables survey implementers to take corrective measures, if necessary, during data collection, instead of discovering deficiencies after data collection, when it might be too prohibitively expensive to compensate for them.

18. As part of data processing, data entry, edit and imputation work may involve a mixture of fixed and variable costs, depending on the degree of automation used in this process. The other principal costs of data processing are arguably fixed, and include the costs of computing equipment and software; and the development of weights, and variance estimators and other data analysis work. For instance, weights would be computed regardless of the number of PSUs or households sampled; and after a weighting procedure has been developed and programmed, the incremental cost of computing a weight for an additional household would be negligible.

19. The cost of data processing depends on how many levels of analysis are included in the budget. For some surveys, only preliminary analysis is carried out on the collected data in the form of tables. For other surveys like the DHS and LSMS, more detailed statistical analyses are conducted as a basis for policy recommendations for beneficiary Governments and donor agencies. For instance, both the DHS and the LSMS conduct various types of detailed analyses on their survey microdata, and publish their findings in a series of analytical and methodological

reports (in the case of the DHS), and working papers (in the case of the LSMS). Some examples are included in certain of the reference cited below. Considerable costs are also incurred in report production and dissemination of results, as well as for various services to other analysts, which may include preparation of metadata and the organization of training workshops.

D. Costs for surveys with limited or no prior survey infrastructure available

20. In a country with relatively little previous survey infrastructure, it is likely that the sponsoring agency will need to devote a substantial quantity of resources to capacity-building efforts that would not be required in a country with substantial survey infrastructure (Grosh and Muñoz, 1996, chap. 8). The costs of preparatory activities, field operations and data processing can all be substantially increased by a lack of infrastructure.

21. Capacity-building generally involves extensive initial training of personnel. In a country with limited or no prior survey infrastructure, compared with a country with well-developed infrastructure, there are usually substantial costs associated with the use of external expertise needed to develop the survey. In addition, the time of field personnel tends to be used more efficiently as a survey organization gains experience. Also, in countries with substantial previous survey experience, the need for travel is much lower because the statistical agencies in such countries are likely to have experienced regional data-collection teams, or to provide the means of transportation for survey field staff. These advantages result in savings in the cost of transportation, training and other personnel costs. Countries with no history of previous surveys usually include vehicles in the survey budget and this item may become a major part of the overall cost of the survey (Grosh and Muñoz, 1996, chap. 8). Other examples of budget items where the existence of some survey infrastructure or history of previous surveys has a substantial impact are computer equipment and maps for identification of households.

E. Factors related to modifications in survey goals

22. As noted above, many cost factors are linked to features of the survey design, including the sample size; the length of the questionnaire; the number of modules; and specific methods employed in sample selection and listing, pilot testing, and questionnaire design and translation. For a given design, some of the resulting costs are approximately constant across countries.

23. However, survey designs in developing and transition countries often have to be modified to accommodate ad hoc specifications by beneficiary governments or other stakeholders. For instance, a government may decide to broaden the objectives of the survey to include other national priorities. This in turn may lead to: (a) the inclusion of additional modules in the questionnaire; or (b) an increase in the number of reporting domains if estimates of key variables for subnational groups are desired at the same precision level as that for the national-level estimates.

24. These modifications can affect trade-offs between cost and data quality in several ways. First, they can lead directly to significant increases in the total amount of interviewer time

required for data collection because of an increased mean length of an interview owing to the inclusion of additional questionnaire modules [para. 23 (a)] or because of an increase, by orders of magnitude, in the number of interviews owing to an increase in the number of reporting domains [para. 23 (b)]. Second, if a survey organization has available a relatively fixed number of well-trained interviewers and field supervisors, then modifications may lead to increased costs owing to the need to train additional interviewers plus the greater amount of supervisory time required per minute of interview time. Alternatively, the number of well-trained field staff may be held constant with the dual consequence of an elongated period of data collection and thus increased costs. Third, the above-mentioned increases can lead to an increase in the magnitude of non-sampling error relative to sampling error. For example, inclusion of extra modules in a questionnaire may inflate non-sampling error owing to inadequate question testing or respondent fatigue. Non-sampling error may also increase owing to the use of a larger number of relatively inexperienced interviewers, necessitated by an increase in the number of interviews or in the mean length of an interview.

F. Some caveats regarding the reporting of survey costs

25. Several factors need to be considered to ensure that comparisons of costs across surveys and countries are carried out on a reasonably common basis. First, surveys in developing and transition countries are sponsored by several different organizations, which often have different policies and accounting procedures. For instance, for some sponsoring agencies, it may be important to distinguish between the cost to the sponsoring agency and the overall cost of implementing the survey.

26. Second, it may be important to account comparably for survey support that is provided in kind, for example, vehicles for transportation of field personnel. In some cases, in-kind support may be provided by the national statistical office by, for instance, assigning its permanent field staff to an internationally sponsored survey. Although such costs may be considered in-kind and excluded from the itemized budget, they nevertheless represent an opportunity cost in so far as the survey exercise is an additional activity that takes time away from other potential work that could be performed by the national statistical office.

27. Similar comments apply to provision of external technical assistance. This item can be especially important in countries with no survey infrastructure or no history of conducting surveys. For many surveys, such technical assistance is provided in kind by international agencies that conduct or sponsor the surveys, and thus is not included directly in the survey budget. However, sometimes, such technical assistance is contracted out, and thus included in the budget. For instance, the 1998 Turkmenistan LSMS-type survey was conducted with technical assistance from the Research Triangle Institute (RTI), under contract to the World Bank.

28. Third, owing to the hierarchical cost structure (expression 1) given in section B, it is important to distinguish between the total cost for a survey and the cost per completed interview. For instance, owing to the availability of greater resources and a greater degree of interest in reliable estimates reported at a subnational level, larger developing and transition countries tend

to use larger sample sizes in their surveys (United Nations Children's Fund, 2000, chap. 4). Because of high costs associated with transportation and salaries of a larger number of survey staff, surveys in larger countries tend to have higher total costs than surveys in smaller countries. However, larger countries with higher overall costs may sometimes have lower costs per completed interview, because of economies of scale and the distribution of fixed costs over a larger sample.

29. Fourth, the evaluation of overall, and per-interview, costs may be complicated by special features of the sample design. For example, costs may be inflated by the use of oversampling or the use of screening samples to ensure achievement of precision goals for certain subpopulations that are small or difficult to identify from frame information (for example, households with children under age five). Finally, for surveys of populations with widely variable household sizes, it may also be important to distinguish between costs per contacted household and costs per completed interview.

G. Summary and concluding remarks

30. Most surveys in developing and transition countries are conducted in an environment of severe budget constraints and of uncertainties about the delivery of even the approved budget. Thus, the analysis of factors that influence the cost of surveys is one of the most important aspects of the survey design and planning process for developing and transition countries. This chapter has presented a framework for such an analysis and has also examined the extent to which survey costs and related components are portable across countries that are similar with respect to the design of the survey and the population distribution of households, and other factors.

31. Large-scale national surveys have been used to illustrate the key issues, but the discussion is applicable to the numerous other types of smaller-scale surveys carried out within the national statistical systems in developing and transition countries. To the extent that one is able to identify common cost structures in these surveys, one can use information on cost components for one survey in one country to provide useful guidelines for the design of a similar survey in another country, or to improve the efficiency of the design of a new survey in the same country. It has been pointed out that there is a large disparity in the costs of surveys between countries with extensive survey infrastructure at the time of the survey under consideration, and those with little or no infrastructure. Also given emphasis have been some caveats that should be taken into consideration in comparisons of overall costs of surveys across countries.

32. We conclude by reiterating points connected with some important issues related to the cost of surveys in developing and transition countries, namely, that:

(a) Even though a careful analysis of cost components can reveal common cost structures across groups of countries or surveys, it should be recognized that survey budgets are often not only country-specific, but also time-specific. It is therefore important to compile cost data and prepare an administrative report documenting the various components of the cost of each stage of the survey process for each household survey. The same type of information should be

documented for variances and components thereof. Such information on costs and variances can be useful in two ways: first, in making important budgetary and management decisions, and second, in demonstrating how various sample design decisions were influenced by different cost and variance components. In general, the documentation of costs and variances and their components, for each stage of the survey process, should be an integral part of the standard operating procedures for national statistical offices in developing and transition countries;

(b) Even though overall survey cost incorporates both fixed and variable costs, it is the variable costs in the survey budget that need to be carefully controlled and manipulated in the process of designing a survey. Some fixed costs, such as those for coordination of survey planning by multiple government agencies, and for publicity directed towards potential respondents are often beyond the control of the survey designer and, in any case, too specific to the country, time and survey under consideration;

(c) As discussed in chapter XIV, there is a difference in budgeting considerations between user-paid surveys and country-budgeted surveys. Whereas the former are well designed and are implemented comparatively smoothly and with all critical components paid for in advance, the latter are usually subject to the budget constraints and allocations of a country. For this type of survey, there is often a large disparity between the planned budget and the actual budget, which is determined not by precision considerations but by availability of funds for the survey vis-à-vis the other budgetary priorities in the country;

(d) Owing to the very stringent budgetary environment in which most surveys in developing and transition countries are carried out, it is important for a survey designer to explore non-monetary ways of budgeting for a survey, or of implementing aspects of a survey without budgeting for them. For instance, it may be possible to share infrastructure with an existing survey; to use a subsample of units already selected for another survey; or to have one interviewer collect data for multiple surveys. Consideration should also be given to budgeting for certain aspects of a survey in terms of the amount of time required for them;

(e) In the foregoing, we have argued that the cost of a survey can be increased significantly by the lack of survey infrastructure and general statistical capacity in a country. Building and strengthening survey infrastructure are therefore a worthwhile investment that could lead to lower budgets for surveys in the long term in developing and transition countries. One of the most effective approaches to building such survey infrastructure and for promoting general statistical development is through technical cooperation between national statistical offices in developing and transition countries and those of more developed statistical systems, in collaboration with international statistical and funding agencies and other stakeholders. However, in order to yield positive results for beneficiary countries, such technical cooperation efforts must be well conceived and well implemented. Practical guidelines for good practices for technical cooperation in statistics were outlined by the United Nations (1998, annex) and endorsed by the United Nations Statistical Commission at its thirtieth session on 4 March 1999.

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Annex

Budgeting framework for the United Nations Children's Fund (UNICEF) Multiple Indicator Cluster Surveys (MICS)

Cost categories	Total costs	Activity categories								
		Preparation/ sensitization	Pilot survey	Survey design and sample preparation	Training	Main survey implementation	Data input	Data processing and analysis	Report writing	Dissemination and further analysis
Personnel										
Per diem										
Transportation										
Consumables										
Equipment										
Other costs										
TOTAL COSTS										
Implementing agencies (names)										

Supplementary details

1. Sample size: number of households: _____ number of clusters: _____
2. Duration of enumeration: number of days: _____
3. Duration of training for enumerators: number of days: _____
4. Numbers of field enumerator/supervisors: enumerators: _____ supervisors: _____
5. Data entry: key strokes per questionnaire: number: _____
6. UNICEF contribution: \$ _____

Cost categories	Costing framework	
	Items included in cost and activity categories	Activity categories
Personnel (salaries)		
Consultants fees	Preparation/sensitization	
Field supervisors	Preparation of questionnaire	
Interviewers/enumerators	Preparation of dummy tables	
Drivers	Translation and back translation	
Translators	Pre-testing of questionnaire	
Local guides	Publicity pre and post enumeration	
Data entry clerks		
Computer programmers		
Overtime payments		
Incentive allowance		
Coordinating committee		
Per diem (room and board)	Pilot survey	
Field supervisors	Training	
Interviewers/enumerators	Data collection	
Drivers	Data analysis	
Translators	Report on the pilot survey	
Local guides (meal allowance)		
Consultants/monitors		
Transportation	Survey design and sample preparation	
Vehicle rental	Planning	
Public transportation allowance	Sample preparation	
Fuel		
Maintenance costs	Training	
Consultant visits	Preparation of training materials	
	Translation into training language	
	Implementation of training	
Consumables	Main survey implementation	
Stationery (papers, pencils, pens, etc.)	Implementation	
Identification cards	Monitoring and supervision	
Envelopes for filing	Data retrieval	
Computing; supplies (paper, diskettes, ribbons, cartridges)		
Equipment	Data input	
Anthropometric equipment (weighing scales, length meters, etc.)	Data entry	
	Error checking	
Other costs	Data processing and analysis	
Printing (questionnaire, etc.)	Data processing	
Photocopies of maps, listings and instruction manuals	Data cleaning	
Equipment maintenance	Indicator production	
Communications (phone, fax, postage, etc.)	Tables of analysis	
Contracts (data processing, report writing)		
	Report writing	
	Dissemination and further analysis	
	Report printing	
	Distribution	
	Feedback meetings	
	Further analysis	

