Statistical Consulting With Developing Countries on Labor Force Surveys
Edwin L. Robison, Bureau of Labor Statistics October 2010

Keywords: Developing Countries, Survey Sampling, Survey Weighting, Questionnaire Development, Labor Market information System

Abstract
Over the last decade, I have had the opportunity to consult with several Caribbean and African countries on statistical methods for government surveys, primarily household labor force surveys. All consulting missions were coordinated by the Division of International Technical Cooperation at the Bureau of Labor Statistics (BLS). Many challenges are posed when consulting with developing countries that are implementing new sample surveys. Experiences are summarized on the difficulties of developing viable probability-based household survey samples, developing questionnaires, and properly weighting the collected data. This paper highlights just a few of the problems, and contrasts the situation in those countries with the situation in developed nations. Recommendations are made regarding 1) upgrading the computer infrastructure in those countries and 2) providing university training in survey methodology.

The Caribbean Project
The Labor Market Information System Project for Anglophone Caribbean and Suriname was co-sponsored by the Department of Labor and the International Labor Organization. The project opened with a workshop in Washington D.C. (December 4-15, 2000) attended by statisticians from many statistical agencies in Caribbean countries. The workshop was a short course in sampling and survey methods that I taught using Cochran's classic text (1977); each participant was given a copy. Consulting trips were made by BLS statisticians to each participating country, and I traveled to Belize (March 19-23, 2001) and Guyana (April 23-27, 2001). A follow-up activity spawned by the project was a 2-week seminar presented to statisticians and economists working for the Jamaican government (July 10-14, 2006; co-presented by BLS economist Karen Kosanovich).

The African Project
The Word Bank sponsored the General Data Dissemination Project, Phase 2, Socio-Demographic Statistics Project for Anglophone Africa (GDDS2). I made 6 consulting trips in support of the project:

- Swaziland   November 18-29, 2007
- Uganda   December 3-14, 2007
- Malawi   August 4-15, 2008
- Uganda   November 3-14, 2008
- Liberia   April 1-15, 2009
- Sudan   May 24-38, 2009

Countries were also provided consulting services by BLS economists, primarily on developing a labor force questionnaire.

Improve Countries' Statistical Capabilities
During the various consultation trips I mainly worked on sampling frame development, probability sampling for surveys, weighting and nonresponse adjustment, and variance estimation. While the emphasis was on household surveys in general and labor force surveys in general, consulting on establishment surveys was usually needed also.

Although I was specifically assigned to work on statistical issues, work was frequently required on questionnaire development and testing. It proved very useful to give a presentation on Labor Market Information Systems, and then to have a directed discussion on a country's needs and the direction that the country should take in the coming years.

All of the consultation trips were short. A week or two is not enough to begin and complete a major sample design and estimation project. It was essential to quickly:

- Establish that the proper persons in a country were participating
- Identify decision-makers who were to be kept informed of progress and issues
- Inventory available resources
- Identify strengths and weaknesses
- Hone in on crucial needs or problems
- Discuss possible strategies
- Determine promising approaches
- Deliver customized help and training

The most important goal was to improve a country's own statistical capabilities. If needed, special training was given in lecture format. What I think was most fruitful was hands-on analysis of needs or problems and working through them with a country's statisticians.

The goal definitely was NOT to do all the work for a country. I assisted in developing sampling frames, I assisted in selecting samples, I assisted in specifying and implementing weighting and nonresponse adjustment methods, I assisted in developing variance estimation methods appropriate for a complex survey, and it was done in a way that gave the country ownership of the product. For example, I would not develop a spreadsheet myself and hand it over. Instead I would have a statistician from the country develop the spreadsheet with my help, then that statistician would train another person in the use of the spreadsheet.

As a side note, time and again I was asked to review work by consultants (on other projects) that the participating countries did not fully understand. Almost always the consultants worked nearly independently and then handed the programs, spreadsheets, results, and documentation over to a country. I could establish that the consultants' work was correct. However, the lack of full participation by the countries' statisticians led to gaps in being able to understand and use the material handed over by the consultants.

Contrasting the Situation in Developing Countries with the Situation in Developed countries

The material that follows is mostly aimed at contrasting the "situation" I found in the statistical agencies of developing countries to what is found in the statistical agencies in developed countries. Naturally, I am most familiar with the agencies in the United States that I worked for, the Census Bureau and The Bureau of Labor Statistics. But I have frequent contact with statisticians from abroad and am at least generally familiar with several agencies in countries that have advanced statistical systems. The developing-versus-developed contrast gets repetitious is often not always explicitly stated. The consulting trips spanned a decade, and all countries were actively working on improving their statistical systems, but no attempt has been made to update time-of-trip observations to reflect post-trip improvements.

Very interesting contrasts can be made are in regard to computer infrastructure, statistical infrastructure, communication, and the statisticians themselves. I also include some comments on the underlying data in the paragraphs discussing household frames (the need for households instead of housing units) and the Questionnaire Development section.

English Usage a Non-issue
The countries I consulted with had English as the official language (except Sudan). All persons that I met from those countries learned English as a second language. Interpersonal face-to-face verbal communication was very good. Written materials supplied by the countries had many lapses in grammar, but that presented no difficulty for technical understanding of the material. Twice I was asked to look at a document intended for submission to a journal. Substantial editing of both articles was needed to convert them to "standard" written English, but there were no problems with the technical information given or with the organization and flow of the papers.

Computer Infrastructure Compared to Statistical Agencies in Developed Nations
PCs and Basic Software – PCs/laptops used by statisticians in the countries were certainly adequate. Standard word processing and spreadsheet software (etc.) was available as well as some common statistical packages. Equipment was kept longer, the average age of equipment was older, so processing speeds tended to be slower and hard drives smaller. In a few countries it was necessary for some persons to share one PC.

Synchronization of Software – Needed software was usually available only on a limited number of PCs. Seldom was purchasing and updating of software centrally coordinated. As a result the "same" software on different equipment could be different versions or could be from different versions. Since the software was not fully synchronized files/programs that worked on one computer could be incompatible with another.

Servers – Servers were "weak'. There were relatively few systems support personnel, so persons with limited expertise in systems design and maintenance were responsible for the systems. I found data back-ups to be sporadic and data that I thought should be on a shared drive was often just on a single PC. There were situations where data that should have been readily available was either difficult to find or misplaced altogether. Sometimes statistical data that should have been saved, such as probabilities and weights, had to be re-created.

email – One upshot of weak servers was the fragmentation of email. Instead of an agency-wide email server, the norm was for persons to use personal email accounts. Compared to mu agency:
- Email was checked at infrequent intervals, perhaps two or three times a week
- Group names were usually not set up to facilitate internal email
- email was not a key vehicle for sharing technical or administrative information

Off-the-Shelf Software – There is a heavy reliance on off-the-shelf software. There are few support programmers. In general, it is not motivation or ability that limits custom programming, rather it is a lack of time caused by a relatively small staff size in conjunction with a large number of work assignments.

Difficulties Using Off-the-Shelf Software – With some regularity I was presented data sets with estimates or variances from a survey that turned out to be incorrect. The problem was seldom a fundamental error in methodology. Most often the problem was one of adapting off-the-shelf software to properly process complex survey data. I found that variances were often underestimated. For variance verification I tried to set up countries with a spreadsheet using the simplest replication technique, the method of random groups. This was a novel technique for the countries, and time being so limited in the short consultation trips, was a difficult undertaking. The difficulty being not so much one of obtaining example data and constructing the spreadsheet, but being a matter of ensuring adequate understanding so the method could be applied data from new surveys.

Statistical Infrastructure Compared to Statistical Agencies in Developed Countries
Establishment Frames – Establishment sampling frames in developing countries have poor coverage of most industries. This is mainly because there is a lack of administrative data from which the frames can be developed. Coverage tends to be very poor for small establishments. As administrative data sources are developed, it is important for planners to include data that is needed for efficient sampling -- for example: geographic information, industry coding, and size measures (employees, wages, etc.). Some attempts have been made to select area samples of establishments, but there are difficulties setting rules for classifying establishments, discriminating between formal and informal enterprises or employment, and in identifying smaller establishments.

Household Frames in Developed Nations – Household survey samples in developed nations are usually either 1) housing unit samples selected from an administrative list or 2) two-stage area samples of housing units. The housing units within each selected 1st-stage unit are completely listed in a fairly straightforward and inexpensive listing of addresses (mostly houses and apartment units) with no need to contact persons in the units. Then a 2nd-stage sample of housing units is selected; a sampled housing unit can be found using its address.

Household Frames in Developing Nations – Administrative lists are generally too incomplete or outdated to be usable, except in a few cities, so area sampling techniques are used. A particular problem is that recognizable housing units may not exist in rural villages and towns. An extended family may use several different structures for sleeping, cooking, etc. Instead, households are identified based on kinship and living arrangements, and careful definition of the "household" concept is needed. Contact with households is needed during listing, and the head-of-household is needed for each listed unit. If a household is sampled for a survey it is re-found by finding the reference person. It is important to quickly sample households and conduct a survey to minimize problems in finding the households. Compared to housing unit listing, household listing is labor intensive

Short Agency History – Developed nations have a history of administrative and survey data collection and there will be established precedents and requirements for new data collection efforts. There will be coding conventions and documentation protocols that are standard across programs. Confidentiality and data release procedures will be established. By contrast, statistical matters such as these that are taken for granted are not as well established in developing countries.

Comparisons Over Time – I discovered the need to emphasize the importance of making comparisons over time and the need for stable methodologies to allow those comparisons. I found surprisingly little appreciation for the desirability of measuring change. Usually I found that, even when a country had two surveys covering the same topic, the data could not be compared with any validity since the questions asked were so different.

<u>Communication Compared to Statistical Agencies in Developed Countries</u>
Sharing of Information -- The sharing of or communication of information within the agencies I consulted with was very different from what I am accustomed to within my agency. Information was not shared as widely and the information flow was slower. The semi-formal exchange of information by email was very restricted. That is mostly due, I think, to the use of personal email instead of central agency servers.

Formal Documentation – This is another area under the "communication" umbrella where differences are found. With few established protocols for documentation, there are lapses that create vulnerabilities. Data layouts may not have been documented, and I found entire sampling and estimation processes with no supporting explanation on what was done. In most countries I occasionally found myself being a statistical "archaeologist", unearthing facts indicating what was probably done, and then re-creating data (samples, weights, estimates, etc.) using those inferred methods.

<u>Statistical Staff in Developing Countries</u>
Education – I did work with some professionals who did not have college degrees. Statisticians had basic statistics degrees from accredited universities, often from abroad. But they had little specialized training in sampling, weighting, nonresponse adjustment, benchmarking, variance estimation, questionnaire development or other topics in survey methodology. Training was not available in the countries and there are only limited opportunities for training abroad. (I always have about a dozen prepared modules should a seminar be needed on a topic, but that is no substitute for a course from an accredited university.) I'll also note here that statistical reference texts were always in short supply. I always recommend a sampling text (Cochran's or one of several others) and Wolter's text on variance estimation. The cost of private acquisition of texts is prohibitive for government statisticians in several of the countries.

Experience – The sample survey experience of statisticians in the countries tends to be neither long nor deep. The countries have no long history of conducting sample surveys. In some of the countries, this was exacerbated by high staff turnover (finding non-governmental jobs). Statisticians almost always worked on several programs, preventing them from concentrating on one survey and probing deeper.

Small Staff – The small size of statistical agencies not only requires that statisticians work on several projects simultaneously, but also broadens their assigned duties. For example:
- Frame development
- Sampling
- Questionnaire development and testing
- Coordinating Field Work
- Data capture and retrieval
- Weighting, nonresponse adjustment, and benchmarking
- Production of official tables

- Economic data analysis
- Documentation

Questionnaire Development

Dissatisfaction with International Standards on Labor Force Data – I consistently ran into objections to international standards on labor force data. (Why should just one hour of work make someone employed?) It was often thought that standards and the resulting questionnaires devised for industrialized economies were inapplicable to their economies. (We have subsistence farming and no real unemployment!) The United States and other countries publish many alternate measures to supplement the topside employment and unemployment figures (in the U.S. the alternates to unemployment are called "underemployment" measures). Yet there was always a pervasive misunderstanding that adherence to the international standards would allow their country to only produce one kind of employment measure and one kind of unemployment (or underemployment) measure. There was almost no realization that questionnaires already developed by other countries provided wide latitude for crating very useful alternate estimates.

The Informal Economy – All countries that I consulted with had a strong interest in the informal economy and in informal employment. It is unfortunate that the international community has not fully developed either the concepts or questionnaires or collection or the data. None of the countries I consulted with had the capability of carryout the necessary questionnaire research.

Everyone is a Questionnaire Development Expert – Every country I consulted with on the labor force questionnaire seemed eager to put their own stamp on it. Every proposed questionnaire I examined was deeply flawed. I've had many similar experiences in my own years at the Bureau of the Census and BLS where people think they are capable of writing a series of questions and are quite content to send them out (untested) in a survey. My experience is that few people have the capability of writing good survey questions, and few people have the know-how to properly test survey questions. The countries I consulted with had almost no training or expertise in questionnaire development, and were not capable of independently developing a labor force questionnaire. Tactfully bringing them to that realization could be a challenge. (The countries in the African project were also scheduled to have a consultant work with them on questionnaire development. I always encouraged the countries to consider scaling back their plans, take an existing labor force questionnaire from another country that already meets international standards, and to make minimal changes with the help of the experts.)

Recommendations

There are two areas where I suggest low-cost international support will foster long-term general improvement in the statistical agencies of developing countries.

- Strengthen the servers, and at the same time centralize email
- Use distance learning capabilities to provide university courses on survey methodology

Strengthen Servers – Stronger servers will promote data sharing and data integrity, and can also make key software available to more users. Placing agency email on a common server will promote information sharing. It is no longer necessary for server administrators on-site, so most technical details of server administration do not need to involve agency personnel.

Distance Learning – Several accredited universities have distance learning programs, including universities with survey methodology specialties. For some countries the time lags or internet speeds may make live interaction with instructors difficult. To obtain credit, each student must have an approved on-site proctor who can administer exams in a controlled environment.

Disclaimer
Views expressed are those of the author and are not necessarily those of the Bureau of Labor Statistics, the federal government, or the organizations sponsoring the referenced consulting trips.

References
Cochran, William G. (1977). Sampling Techniques, 3rd edition.

Wolter, Kirk M. (2007). Introduction to Variance Estimation, 2nd edition.