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REPORT OF THE WORKSHOP ON DEVELOPMENT AND APPLICATION OF SAMPLING FRAMES AND SAMPLE DESIGNS FOR INTEGRATED HOUSEHOLD SURVEY PROGRAMMES IN THE CARIBBEAN */

(Kingston, Jamaica, 4 to 6 November, 1990)

*/ This workshop was organized by the Statistical Institute of Jamaica (STATIN) in cooperation with the Economic Commission for Latin America and the Caribbean (ECLAC), and the collaboration of the "National Household Survey Capability Programme" (NHSCP) of the Statistical Office of the United Nations (UNSO), as part of the activities undertaken by the project "Development and Application of Sampling Frames and Sample Designs for Household Survey Programmes in Latin America and the Caribbean", administered by ECLAC and with the financial support of the United Nations Population Fund (UNFPA)

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ABBREVIATIONS

CELADE	Latin American Demographic Center - United Nations
CENTS	A computer package for processing census data
COBOL	A computer programming language
CONCOR	A computer program from the US Census Bureau for imputation for missing data
CPI	Consumer Price Index
CSO	Central Statistical Office
DBASE	A data base program for PCs
DSA	Daily Subsistence Allowance
ECLAC	Economic Commission for Latin America and the Caribbean
ED	Enumeration District
HES	Household Expenditure Survey
HIES	Household Income and Expenditure Survey
ISR	Interviewer-supervisor ratio
LFS	Labor Force Survey
NHSCP	National Household Survey Capability Program
PC	Personal Computer
PPS	Probability Proportional to Size
PSU	Primary Sampling Unit
REDATAM	A user-friendly retrieval package for the PC designed for large databases
SAS	A statistical computer package
SPSS	A statistical computer package
UN	United Nations
UNFPA	United Nations Fund for Population Activities

I. INTRODUCTION

This workshop is part of a project sponsored by the United Nations Fund for Population Activities (UNFPA). The project duration is three years (1989-1991) and the executing and implementation agency is the Economic Commission for Latin America and the Caribbean (ECLAC), with the support of the Central Coordinating Unit of the United Nations National Household Survey Capability Program.

The formal primary objective of this workshop is to discuss general guidelines on the construction of sampling frames and designs for integrated households survey programmes.

This workshop is timed to stress the tremendous relevance of the new round of censuses for sample frames and designs. Participants should leave the meetings with an increased awareness that the new data provide a priceless opportunity for rethinking national plans for household surveys for the coming decade. Furthermore, the workshop is designed to permit open and free-wheeling discussion involving professionals representing the sampling community in national statistical organizations of the region. This cross-fertilization of ideas is intended to stimulate new solutions to old problems faced by each national organization.

The workshop is based largely on the contents of the document "Sampling Frames and Sample Designs for Integrated Household Surveys" (NHSCP 1986) which was sent in advance to participants. In addition, participating countries were sent a questionnaire in March 1990 (approximately) asking for information about the national survey taking infrastructure. Responses to this questionnaire have been incorporated into the planning of this workshop and much of the information received is reproduced in the summary tables of this document.

Prior to the start of the workshop, participants were given a copy of a discussion guide which laid out the topics to be discussed together with some cursory observations designed specifically to generate discussion. This document is attached as an Appendix.

The workshop lasted two and one-half days (Monday 5 November - Noon Wednesday 7 November). The discussion was organized around ten general areas of interest which were outlined in a document prepared and distributed before the workshop.

For the first two days of the meeting, the participants discussed five topics each day. Each topic was handled in the same way and each discussion was chaired by a different representative. Each topic was introduced briefly after which all country representatives were invited to comment on the situation in their country with respect to that topic. These interventions lasted no more than five minutes each, giving a total elapsed time of around one hour. Finally, one half-hour was devoted to an open discussion of the particular questions laid out in the "Topics for Discussion" boxes included in the Discussion Guidelines document and reproduced below.

The last half-day was set aside for wrapping up the discussions of the first two days. This included continuing with topics of interest that were not sufficiently discussed and touching on topics of particular interest that may not have been raised. Participants' input was requested in preparing the agenda for this last half-day. An attempt was made to identify areas where common experience and opinion could be translated into concrete, albeit general, recommendations.

Participants were requested to prepare statements carefully, to make them as brief and concise as possible, and to strictly adhere to the topic at hand. The list of discussion topics is by no means exhaustive but given the duration of the workshop it would have been difficult to handle more. It was important that all participating countries be given a chance to provide input based on their national experience. It is hoped that this inter-country exchange is one of the aspects of the workshop that will prove particularly productive.

Participants were requested to comment not only on the current situation but also on changes planned as a result of the availability of new census data. Furthermore, it was stressed that the discussion was geared toward general plans for the next decade. Individual survey idiosyncracies, important as they are, should not overshadow the goal of identifying common experiences and practices.

The topics for discussion are expressed mostly in the form of questions about the current state of affairs. However, participants were invited to go beyond this description and express opinions about what would be ideal or desirable for their individual country.

II. SUMMARY TABLES

Table 1
Basic Data

Country	1990 Popn. (000s)	Census Date (1990s)	Most Recent Survey				
			Name	Year	Geographical Coverage and Domains	Actual Sample Size (households)	Sampling Fraction
Aruba	60	7 Oct. '91					
Bahamas	253	1 May '90	LFS	1989	National, Islands and Island Groups	2,440	5%
Barbados	255	1 May '90	National AIDS Survey	1990	National	3,600	2%
Belize	187	12 May '91	HES	1989	National, 6 Districts, Urban-rural	2,100	5%
B.V.I.	15	12 May '91	HES	1983	Tortola (mainland)	274	
Cayman Is.	26	15 Oct. '89	HIES	1990	National	750	8%
Dominica	82	12 May '91	LFS	1989	National	497	20%
Grenada	98	12 May '91	LFS	1988	National	1,000	10%
Jamaica	2,456	7 Apr. '91	LFS	1990	National	7,812	1.5%
Neth. Ant.	188	27 Jan. '92	LFS	1989	Curaçao	2,250	6%
St. Kitts	44	12 May '91	Manpower Survey	1987	National		
St. Lucia	150	12 May '91	Income and Health Care	1989	National	600	20%
Suriname	422	'92	Manpower/ Demographic Survey	1989	Paramaribo and Wanica	600	
T. & T.	1,234	15 May '90	Continuous Sample Survey of Population	1989	National	9,700	1/120

Table 2
Sample Frame, Stratification

Country	Area/ List Frame	Sample Frame	Stratification
Aruba	List	Population Register	Electoral Districts
Bahamas	Area	1980 Census of Pop. & Housing	Islands Constituencies
Barbados	Area	Population Census	Parishes
Belize	Area	1980 Census of Population	Districts Urban-rural
B.V.I.	Area	1980 Census Enumeration List	Not used
Cayman Is.	List	1989 Census	Not used
Dominica	Area	Household Visitation Records of Health Centres	Not used
Grenada	Area	1981 Census EDs	Not used
Jamaica	Area	Population Census	Sampling regions Parishes Urban-rural
Neth. Ant.	List	Population Registry	Not used
St. Kitts	Area	1980 Census EDs	Not used
St. Lucia	Area	Population and Housing Censuses	Districts
Suriname	List	Electric Company Housing Lists	Electricity consumption levels
T. & T.	Area	Population Census EDs	14 Urban-Rural Domains (Main towns, Counties)

Table 3

PSU Information

Country	Total # PSUs in Population	Total # PSUs in Sample	Nature of PSUs	Range in Size (households)	Secondary Sampling Units	Sample Take per PSU
Aruba	All Addresses	500	Addresses	NA	NA	NA
Bahamas	430	52	Census EDs	33-797	Households	47
Barbados	456	45	Census EDs	150-200	Households	
Belize			Census EDs	150-200	Households	
B.V.I.	24	5-6	Census EDs	100-275	Households	
Cayman Is.	10,423	750	Households	NA	NA	NA
Dominica	300	76	Blocks	60	Households	8
Grenada	214	21	Census EDs	80-150	Households	
Jamaica	3,750	434	Census EDs, Combined and split	80-200	Dwellings	18
Neth. Ant.	40,000	2,250	Households	NA	Household Heads	NA
St. Kitts			Census EDs	125-150	Households	
St. Lucia	256	41	Census EDs	100-150	Households	
Suriname	80,000	1,200	Households	NA	Households	NA
T. & T.	1,598	1,134	Census EDs	150-200	Households	5

Table 4

Fieldwork

Country	Length of Interview per Person (mins.)	Number of Call-backs Required	Response Rate	Interviewer-Supervisor Ratio	Interviewer Workload per Week (Households)	Number of Interviewers per PSU	Duration of Fieldwork (weeks)
Aruba			60%			NA	
Bahamas	20	>4	95%	5	25		2
Barbados	12	>4	99%	4	16-20		12
Belize			65-75%	7	10		6
B.V.I.	30	3-4	46%	3	10		2
Cayman Is.	30	4-7	85%	5	10	NA	52
Dominica	30			7.5	20		
Grenada	30	4	88%	5	15	1	3-4
Jamaica	15	1-3	>95%	5	14-15		4-6
Neth. Ant.	30	3	95%	15	19	NA	5-6
St. Kitts	20	0	96%	5	20		2
St. Lucia	30	3	>90%	5			
Suriname	30	3-4	90%	6	30-40	NA	
T. & T.	25	3	96%	4-5	24		12

III. MEETING MINUTES

Topic A: User Requirements Analysis
Chair: Osmond Gordon

Individual Country Comments

1. Who are the users?

The main user is the government: individual officers, agencies, ministries, departments, planners. Other users are private researchers, international agencies, statistics boards, large banks, private industry and firms, students, and nationals studying and working abroad.

2. How sophisticated are the users?

Users as a whole do not have a very clear idea of the type of data they require or even how to formulate in statistical terms the questions they want addressed. Users by and large lack good statistical training. Clarification is often required in any exchange with users.

3. To what extent does the national sampling office communicate and interact with users to find out their needs? How does this interaction take place?

In general, interaction with users is on an *ad hoc* basis as the need arises and as each request is received. In some cases, the interaction is more formal especially when the census is being planned. Some countries have created committees to discuss data requirements but usually these groups meet very seldom and are not productive. Given the approach of the 1990 Censuses there is talk in the region of reactivating these committees. There is a desire to formalize the user-producer interaction but it has been very difficult in the past and continues to be so. Previous attempts at instituting such a forum have met with little response from the user community.

A notable exception to the above trend is the Statistical Users Committee in Dominica which was created in 1989 and consists of both public and private sector representatives. This group has been actively providing positive and useful feedback to the data producers.

There are isolated cases of interaction with organizations such as the Central Bank although there is usually no formal infrastructure in which such communication can take place. Some national ministries produce data independently and then compare with the data collected and disseminated by the Central Statistical Office (CSO). In other cases (e.g., Netherlands Antilles) a permanent Advisory Group in the Department of Labor provides input in the form of user requirements and feedback.

Users are generally not canvassed even on an informal basis. This gives rise to users coming to seek help but only after the design has been established and the fieldwork already begun.

As a whole, statistical data products are not marketed, largely because the national statistical offices are too busy performing the tasks already assigned to them.

There is a clearly felt need for the development and elaboration of a statistical data infrastructure in all national offices. As the situation now stands, the statistical offices are not equipped to carry out their mandate, much less respond to users' needs. Users have expressed interest and have defined needs but with ever-decreasing frequency since they realize that these cannot be satisfied within the existing state of affairs.

4. What are the main user requirements in terms of frequency, types of analyses, geography, coverage, precision, and sub-populations?

Minimal information was provided on this topic. A need has been perceived for data in the areas of health, literacy, and education and surveys are being planned to collect such information. If sufficient user demand exists, modules can be added onto the Labor Force Surveys. In the case of the British Virgin Islands, surveys are used to revise the CPI which is currently based on data collected in 1982 and limited to the capital.

General Discussion

It was stressed that users are varied and they are not always well-trained. Furthermore, the individual CSOs are not always able to provide the necessary technical assistance. Nevertheless, it is usually the CSOs who are solely responsible for determining what data are to be collected, under what standards, and using what methodology.

In most countries, there currently exist National Census Advisory Committees. Thought could be given to prolonging the mandate of these groups to make them into permanent Statistical Coordinating Groups to serve as fora where user requirements could be discussed. In response to a question concerning the potential usefulness of these groups, given the historical experience, it was pointed out that there is a need to emphasize the importance of an interaction with users in order to assist in establishing design factors such as sample size, domains, and coverage. In the case of Trinidad and Tobago, there were two census committees. One, a technical one, worked very well. The second, an Advisory Committee composed mainly of users, evoked very little interest and contributed little to the overall process.

The producer-user dialogue is also important to discuss how to balance the need for data against budgetary restrictions. If resources are limited, the difficult decision must be made between doing the survey poorly or not doing it at all.

It was suggested that maybe it is time for statisticians to "come out of the closet" and begin to aggressively market their services and products. There is a need to increase the public visibility of the statistical data producer. Sometimes the statistical community limits its objectives by considering the publication to be the end product. Producers should be more aggressive in making

and marketing a larger number and variety of products in more attractive packaging (e.g., user-friendly data retrieval systems, workshops). Also, it is important to consider whether resources are being wasted in producing data that are not needed or used. Duplication of data should be avoided.

Mention was made of the issue of confidentiality which should be considered as a factor that might limit collection and dissemination of data required by users.

Finally, several participants mentioned that it should be kept in mind that, whereas in theory it is desirable to educate users in what kind of data they need, in practice only recommendations can be made. It is hard to exert pressure on the user community. The final decision usually rests with the CSOs.

Topic B: Frame Sources and Characteristics

Chair: Bryan Boxill

Individual Country Comments

1. What is the principal basis for the national sample frame?

In almost all cases, the census was the basis for the national sample frame. For Dominica, the frame is based on Nurses' Visitation Records. It is felt that the data are very relevant, up-to-date, and of better quality than the census. In two cases (Aruba and Netherlands Antilles) the sample frame is based on a population register which is updated using census results. In the case of Suriname, the frame is based on the list of users of the electricity service.

The problem of updating frames was universally mentioned as a major source of concern.

2. What are the main elements included?

In those countries basing the sample frame on the census, the main listing element is the census enumeration district (ED). These range in size but usually contain around 100-300 households. Larger EDs are split to make them more manageable and smaller ones are combined to create large enough work units for the interviewers. EDs are constantly being updated with information gathered during each survey.

3. If multiple frames are used, give above information for all frames.

Multiple frames are almost not used at all. They were mentioned only once in connection with population projections.

4. Is the national sample frame a list or area frame? Is it possible to use both types of frames? How is the choice determined?

An area sample frame is used in all countries except Aruba, British Virgin Islands, Cayman Islands, Netherlands Antilles, and Suriname. In Cayman Islands there is no unique address registration system but there does exist a listing of households by block and parcel. This is the sample frame used for survey taking. No area frames are used. A decision was made, as a result of the visit of a United Nations NHSCP expert, to switch from an area-based design (stratified, clustered, multi-stage) to a simple random sample from a list of households. To a large extent this was based on the small size of the population of Cayman Islands, namely 26,400.

In Belize, an area sample is used in rural areas while a list frame is used in urban areas. The list sample is taken from a frame of households based on the 1980 Census and updated using administrative registers. In British Virgin Islands the list frame that is used consists of a list of households prepared as a result of the census process.

General Discussion

Several statistical offices stated their willingness to consider the possibility of using list frames instead of area frames, especially since in the Caribbean most nations are small both with respect to area and population. Furthermore, few countries have geographically difficult terrain which would preclude the use of list frames. This kind of frame has the advantage of permitting simple random sampling rather than more complicated clustered multi-stage designs.

It was pointed out that in the larger countries, such as Jamaica and Trinidad and Tobago, the list frame approach would be impractical. It was suggested that any country with over 30,000 households would have a difficult time using list frames. Some representatives expressed skepticism at the idea of replacing area frames with list frames.

In the case of Bahamas, a country which consists of 14 islands and island groups, it is not statistically feasible to use anything other than an area frame as they are also used as political domains.

The computerization of sample frames is far from widespread although some countries are planning for it in the near future. Mention was made of recently developed software designed to facilitate this task (e.g., CELADE's REDATAM and CENTRAC from the US Bureau of the Census).

It was pointed out that there is a fundamental problem with the geographical units for which data are collected. Very often these have to be completely redefined with every census. It might be more efficient to create "geo-statistical" units which would be relatively permanent, kept on a computer file, and maintained throughout the intercensal period. They would be used to satisfy sampling and analysis requirements but not necessarily to handle fieldwork assignments.

Some work has been done in some countries towards creating such "geo-statistical" units however several problems must be recognized and faced. These

include the construction of new highways and major housing developments, the realignment of boundaries of administrative sub-divisions, and the growth of human settlements. In fact, the last factor is affecting the very relevance of the Census ED as a viable first-stage sampling unit.

Topic C: Sampling Units

Chair: Keith Padmore

Individual Country Comments

1. Describe the PSUs in terms of size (population, housing units) and definition (counties, districts, etc.).

   Much of the information discussed here is presented in Table 3.

In the case of countries using the area sample design, in most cases the PSU is the census ED. These are being updated based on results from the 1990 Censuses and in several cases it is necessary to split and combine EDs to form final PSUs. It seems that in most cases PSUs range in size from 50-250 households with urban PSUs being larger than rural PSUs. PSUs are usually formed in such a way as to respect urban-rural boundaries and other administrative unit boundaries. Both equal probability of selection and PPS are used to select PSUs in the first stage.

In the case of Dominica, the PSUs are blocks of about 60 households each and of which there are about 2,600. In Jamaica the EDs are grouped to create geographically contiguous PSUs with an average of 80 households. PSUs in turn are grouped into sampling regions with an average of 2,400 households. Two PSUs are selected in each sampling region.

For countries using list sample frames, the PSU is the same as the final sample unit, that is, a household or an address. Problems arise when the sample frame is a list of addresses and more than one household is found at an address. In some cases (e.g., Cayman Islands) census EDs might be used in the future if it is decided to adopt an area sampling approach. Particular difficulties are caused by illegal and unrecorded out-migration (e.g., Netherlands Antilles).

2. What is the total number of PSUs created? How many are used in each survey?

   This information is provided in Table 3.

3. Does the PSU size vary with the total sample size or sampling fraction? Does it depend on whether the survey is single or multiple-round?

   No information was provided on these topics.

4. What are the units below the PSU level?

For countries using area sample frames with EDs serving as PSUs, usually the household is the unit selected within the PSU.

5. Are households listed, and if so, at what stage? If listing is not used, state reason. If listing is used, how many households are listed?

The listing strategy varies with some countries (e.g., Bahamas, British Virgin Islands, St. Lucia) listing at the same time as sampling takes place while others (e.g., Grenada, Jamaica, Trinidad and Tobago) list explicitly as a separate operation previous to drawing the sample.

General Discussion

The methods used for splitting and collapsing, both conceptually and in practice, were discussed. In some cases this operation is carried out on all PSUs in the population whereas in other cases it is only performed if the PSU is selected into the sample.

The question was also raised as to the characteristics of the PSU identifier (numeric, alphabetic, with or without supplementary information) and whether information is stored to permit tracing of a PSU's history. In most cases, the PSU identifier is a numeric code which contains at least some information about the PSU. In some cases, these identifiers contained too much information and had to be shortened because they became too long and unwieldy. However, in many cases, it is possible to trace the PSUs' history through mapping schemes that relate the current PSU number to previous identifiers.

Participants were encouraged to be open-minded about the choice of area or list sampling. Those countries who work with area samples might consider the possibility of doing list samples, as is done in the Netherlands Antilles with a population of 40,000. For that matter, statisticians involved in list sample survey might also consider the pros and cons of switching to an area design.

It was suggested that, given the variety in PSU size, it is important to establish criteria for determining the ideal PSU size and to study how these criteria affect the PSU size in each country. However, in order to establish criteria it is important to first understand clearly the advantages of cluster sampling. It was pointed out that the single over-riding reason for using clustering is to reduce costs associated with drawing a sample. Usually these relate to travel costs which in the case of most Caribbean nations is not a major problem.

Topics D and E: Frame Maintenance and Frame Problems

Chair: Yolanda Goodwin

Individual Country Comments

1. Comment on sources, methods, and frequency used for updating and maintaining frames.

Updating of frames does not occur in all cases but where it does, it is either carried out when the interviewers and supervisors visit the PSUs or on a more regular basis. Most frames are entirely updated every 10 years, based on the census results. In these cases the same PSUs are used throughout the intercensal period. There is often no attempt to update in the intercensal period except in some cases when the interviewers and supervisors visit the selected PSUs. In Trinidad and Tobago the selected PSUs are listed once every year.

In one case (Netherlands Antilles) updating based on the LFS results was attempted but unsuccessfully.

2. How are the sample frame materials stored and backed-up?

In almost all cases, the sample frame materials are stored either in hard-copy, on computer (diskettes, tapes, hard disk), or both. Those countries with only hard copy versions are attempting to computerize the information.

3. Who has administrative responsibility for the frame and who has access to it? How easy is the access?

In most countries, the administrative responsibility for the frame resides with the government and, in particular, the statistical office. Access is usually open but it is not always easy.

4. How long are the same PSUs used?

In all countries the PSUs are used for 10 years, except Jamaica where they are replaced every five years.

5. Does there exist a surprise stratum? How is it constructed and maintained? How is the sampling rate determined for the surprise stratum?

No countries employ a surprise stratum.

6. What are known and suspected problems with coverage of the frames used?

No known problems were identified.

7. What are other known and suspected deficiencies in frames used (e.g., duplicates, inaccuracies, and use of outdated information)?

There was a feeling that problems might exist but they are unknown and unspecified. The definition of household has proved to be a complex issue especially given the many illegal aliens now present. Other issues affecting coverage were mentioned but not elaborated.

General Discussion

Question were raised as to whether it would not be preferable to live with the frame errors rather than expend considerable effort in correcting these errors and whether there was a need to update the entire frame or only the selected PSUs.

In theory, the whole frame must be updated, not just the sampled PSUs. However, updating only the sampled PSUs does not introduce any bias only an increase in variance.

It was also pointed out that there has been no mention of frame problems due to high-risk areas due to, for example, warfare and criminal activity. In fact, there seem to be very few cases in which there are areas that are off-limits.

The issue of the effect of illegal aliens on the quality of the frame was also raised (e.g., Barbados, Netherlands Antilles). In the case of Barbados, it appears that the illegal aliens are surprisingly cooperative. There is, however, a problem distinguishing between tourist units and permanent dwellings.

Finally, it was pointed out that it is important to protect data from natural disasters.

Topic F: General Sample Design Issues

Chair: Vernon James

Individual Country Comments

1. How long does it take to execute the sample design and what are the quantity and type of resources required?

There was some confusion as to how exactly the question should be interpreted. However, it seems from the comments that in most countries the resources needed to actually draw the sample are not excessive, in some cases as little as two person-weeks. The execution of the sample, that is, the part of household selection that is done in the office takes somewhat longer but also is not a major drain of resources. However, it is the listing operation, without which sample selection cannot take place, that is time-consuming. In the case of Belize, a national sample takes four months in all, including office operations and listing.

In some cases, unavoidable delays extended the duration of the survey (e.g., Hurricane Hugo in Dominica).

In Jamaica, most of the resources are spent on creating the PSUs (about six person-months).

It was pointed out that computerizing the sample frame and the sampling mechanism greatly reduces the time needed for drawing the sample.

2. Is a master sample used? If so, what are its characteristics?

A master sample is not explicitly used in any country. However, in some countries the set of PSUs is used repeatedly and thus to some extent fulfills the function of a master sample.

3. What are the most commonly targeted total populations for which inferences are drawn based on survey samples?

In most countries the target population is the adult population with institutions being excluded. The target population in some cases is the Labor Force, in others those aged 15-64, or 15 and over, and in some cases the entire national population.

4. What are the sub-populations (domains) for which survey samples are required to produce results?

The most commonly mentioned domains for which estimates are produced are the employed, unemployed, males, females, females in the Labor Force, main age groups, geographical and administrative sub-divisions, youth, and industry and occupation groups. In many cases the urban-rural split was not considered important, given the size of the countries in question.

5. What are the sample sizes, both for total and domain estimation?

Information on this topic can be found in Table 1.

General Discussion

The discussion began by considering criteria that are used to determine sample size. The most important factors mentioned were: available resources, field considerations (e.g., length of fieldwork, number of interviewers), and desired level of precision. In some cases desired precision is considered more important than available resources.

It was suggested that countries might consider lowering the sample size if there is not much need for domain estimation. Certainly a sample size of 2,000 households, or even persons, is "healthy" in that for a simple random sample it will give a standard error of 1% for a proportion of 50%. Sample sizes below 2,000 could be entertained especially for surveys that are not "multi-purpose".

Related to the topic of sample size, it was mentioned that NHSCP is currently reviewing a draft of a forthcoming publication on the calculation of sampling errors. It is expected that this technical document will be available

early next year. All countries are strongly encouraged to calculate and disseminate sampling errors.

It is important to conserve the efforts invested in preparing and executing sample designs by establishing a good record-keeping system. This is an important argument in favor of developing and using a master sample. However, it is difficult to understand how national statistical offices, under-staffed and under-financed as they are, can keep good records. Lack of money and staff are the two major obstacles to developing good statistics.

It is precisely in response to such considerations that in January 1989 the United Nations NHSCP proposed that a pool of regional resources be created supported by the CARICOM Secretariat under a sub-regional NHSCP project for the Caribbean. The pool would provide a core group of expertise to be called upon for technical assistance. In addition, the United Nations hopes that this kind of workshop will assist in creating intra-regional cross-fertilization of ideas based on experiences gained at the various national levels. A second round of such workshops is planned for 1992 at which time the same Caribbean countries will have an opportunity to discuss how the census was incorporated into their survey infrastructure. Finally, funds have been provided by UNFPA to promote horizontal technical assistance in this field via ECLAC.

This project will require some commitment, albeit small, on the part of all countries. Funding agencies will be reluctant to support a project involving all countries. It might be preferable to start with a pilot test based on only a few countries. CIDA is also being sounded out as a potential source of funding for such a project. In any case, it might be a good idea to start something among countries even on a small basis. This would, first, get the ball rolling while major financing is being discussed and would demonstrate to the funding agencies the seriousness of the countries' commitment. Building survey capabilities is an important part of all on-going discussions between funding agencies and the CARICOM Secretariat.

It might be possible to create such a pool now by tapping national talent from the region. What is needed is a bold initiative and a consideration of all options.

The problem remains of paying for nationals while they are away from their posts. Maybe such technical assistance could be considered in the form of an intra-regional loan. It is possible that governments could lend professionals for free. Only per diem and transportation costs would have to be covered.

The project financing this workshop also has funds established for technical assistance. The minutes of this workshop will be distributed to all countries in the Caribbean, including those unable to attend. It is hoped that this exchange will provide a basis on which countries could decide in what areas to seek assistance and from where to ask for such assistance.

Work must proceed even though resources are sorely lacking. Activities such as this workshop and subsequent follow-ups are very welcome.

Topic G: Stratification and Multi-Round Sampling

Chair: Isbeth Bernard

Individual Country Comments

1. Describe the stratification strategy and sample allocation.

In many countries, stratification is not used (British Virgin Islands, Cayman Islands, Dominica, Grenada, Netherlands Antilles, St. Kitts and Nevis). In Cayman Islands stratification is not used since the population is relatively homogeneous.

In those countries employing stratification, the main stratification variable is geographic or administrative areas (e.g., ED, constituency, parish, urban-rural). In Suriname stratification is survey dependent. In one survey the population was stratified by level of consumption of electricity.

Sample allocation, for those countries using stratification, is usually proportionate to the estimated population or number of housing units. This results in equal probability of selection.

In most cases, stratification was introduced to reduce sampling error.

2. For multi-round surveys, specify rounds per year, rotation strategies, percentage of rotation, and units of rotation.

Most countries do not use multi-round surveys. Those who do not are: Bahamas, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Netherlands Antilles, and St. Kitts and Nevis.

In Barbados, originally the multi-round sampling was based on four rounds per year. Later, the interval was extended to six months to give only two rounds per year. Half the sample is rotated out every round. Recommendations are being sought for ways to determine the ideal rotation fraction.

In Jamaica, the multi-round sampling design calls for retention of 50% of the sample after each round. Consequently, each household is visited twice annually.

In Trinidad and Tobago, the LFS involves four rounds per year with about 2,400 households per round. One-third of the sample elements are repeated each quarter.

General Discussion

Countries not using stratification were asked to comment on reasons for this decision. Dominica does not use stratification in order to simplify the design. In some cases (Cayman Islands, Grenada, and St. Kitts and Nevis), implicit stratification is used in the sense that housing units are ordered geographically and by political and administrative divisions before the sample is drawn.

Several factors need to be considered in determining the optimal rotation fractions:

- reliability of sample estimates (e.g., priority in estimates of level or change),
- number of times it is convenient to return to the same household.

The risk of non-response is an important determinant of the rotation fraction. Interviewing the same household twice a year does not seem to be a problem except possibly for questions on consumption.

The sample in Suriname is redrawn every quarter to reflect real changes in the population. In the case of the Budget Survey where a diary is used, the rotation is done much less frequently.

It was pointed out that it is unfortunate that published results from multi-round surveys often do not include data on changes, but only on levels. There is a conflict between rotation, whose objective is the efficient measure of change, and published results which give only levels. If the main intereste is in levels then it would be more efficient not to rotate. There is a sense that the general public is not interested in data on changes.

It is important to collect and analyse information on non-response by panel in multi-round surveys to determine the effect of rotation on response rates.

Another issue that arises in relation to multi-round surveys is how to prepare annual estimates. In Trinidad and Tobago, the straight arithmetic mean is used to prepare annual estimates.

The question was asked of Barbados, Jamaica, and Trinidad and Tobago whether annual surveys preceded the quarterly surveys and, if so, what prompted the decision to change. In the case of Barbados the decision to change to quarterly surveys was based on a need to collect information more frequently for short-term planning. In Jamaica, before 1967 surveys were carried out when needed. In 1967 the decision was made to do surveys twice annually and, finally, on a quarterly basis. These changes were implemented in order to more accurately measure economic fluctuations. In the case of Trinidad and Tobago, before 1963 there were a series of *ad hoc* surveys which produced reliable annual estimates but were unable to measure change. This was the primary reason for introducing the current design.

Finally, the point was raised as to whether quarterly data are really necessary and if the political-administrative apparatus is able to react quickly enough to justify the added expense of quarterly surveys. One possibility would be not to carry out the quarterly survey every year but only once in a while, e.g., every five years, to measure seasonal patterns. This consideration becomes especially important when one realizes that once users become accustomed to quarterly data, it is difficult to return to annual series.

Topic H: Multi-Stage Sampling
Chair: Alfred Butler

Individual Country Comments

1. Describe each stage, giving measures of size and probabilities.

In the case of countries using list samples (Aruba, Cayman Islands, Netherlands Antilles, and Suriname), there is only one stage of selection, namely sampling addresses or households from the list frame. In some cases (e.g., Aruba), if more than one household is found at a selected address, then one is selected at random. Usually the selection of households is done systematically from the list which is ordered in some fashion, at least geographically.

In countries using area sampling, there are at least two stages of selection. The first stage involves selection of PSUs, usually using PPS, and the second stage usually consists of selecting households within the selected PSUs. The overall probabilities of selection across the two stages are kept constant for all elements of the population.

In Belize, a one-stage design is used in urban areas whereby households are selected directly from a list. In rural areas, two-stage PPS selection is used.

In Jamaica, the first stage entails selecting two PSUs from each sampling region with probability proportional to the number of dwellings in the PSU. In Trinidad and Tobago, all PSUs are first ordered by certain occupational characteristics of the PSU's labor force. One-third of the PSUs are selected in the first stage.

2. Is the design equal probability? Elaborate.

In the majority of cases, the design is based on equal probabilities of selection. In Bahamas there is some compromising of the basic equal-probability design due to multiple households per address. In Belize, the probabilities are not quite equal since a minimum sample size is allocated to each stratum.

3. Describe the selection of households in the last stage and the selection of respondents within households.

By and large, the selection of households in the last stage is systematic. In Jamaica, circular systematic sampling is used.

With respect to selection of respondents within households, in almost all cases all eligible respondents are interviewed. In addition, proxy responses are accepted in several cases (e.g., Barbados and Jamaica). In St. Kitts and Nevis and Trinidad and Tobago interviews are held with the head of the household or a proxy.

General Discussion

The question was raised as to whether any countries resort to over-sampling and which designs are self-weighting. Most national designs are self-weighting although over-sampling can be introduced should the need arise. For example, in the case of Belize, certain strata are over-sampled by virtue of the fact that a minimum sample size is allocated to all strata.

It was pointed out that since most countries have a fixed number of households selected at the second stage, it is unlikely that the realized probabilities of selection are equal. It is important to keep record of these divergences.

Participants were encouraged to reconsider the practice of always interviewing all members of a household. The optimum strategy depends on the survey in question but interviewing only one randomly selected member of the household can "spread" the sample over more PSUs and avoids clustering due to intra-household homogeneity.

As a follow-up to this last observation, it was pointed out that the price of selecting only one respondent per household is an increase in variance due to the introduction of household weights. If the interview is short there may be minimal costs involved in interviewing all members of the household. A similar situation occurs when two households are found where only one was expected. To maintain equal weights, both households should be interviewed. However, this might not be practical from the fieldwork point of view.

Several discussants mentioned the problem of new construction and its effect on sample probabilities resulting from the discovery of new households in selected PSUs.

Topic I: Field Issues

Chair: Oliver Knight

Individual Country Comments

1. What is the average interview time per household?

There is a general tendency for interviews in all countries to last about 20-30 minutes per person. In Jamaica, the LFS interview lasts only 15 minutes per person whereas the Living Condition Survey requires three hours per household, on the average. In Cayman Islands the HIES interview lasts 65 minutes over five visits.

2. What is the usual response rate? What is the minimum (maximum) number of callbacks?

The usual response rate is extremely high, over 80% and very often in the 90-100% range. The rates are especially high in rural areas. In some cases, the reported response rate was lower (e.g., Aruba, Belize) but this was due to

the inclusion of vacant dwellings in the response rate calculations. For unexplained reasons, the response rate in the British Virgin Islands is 46%, almost an outlier in comparison with rates in the other countries.

In most cases, 3-5 callbacks are required.

3. What is the interviewer workload per week, the total number of interviewers, and the number of interviewers per PSU?

The number of interviews that an interviewer is expected to complete in one week ranges from 10 to 40. Expectations are higher where list sampling is used since no listing is required.

The total number of interviewers ranges from 6 to 90 but there does not seem to be a very strong relationship between size of country and number of interviewers. Jamaica has the largest number, 90, but Bahamas, for example, employs a staff of 40 interviewers while Trinidad and Tobago only uses 28.

Interviewers are not assigned per PSU given the countries' sizes.

4. What is the ratio of interviewers to supervisors? Comment on the system of liaison between head office, supervisors, and interviewers.

The ratio of interviewers to supervisors ranges between 4:1 and 7:1. Exceptionally, in Netherlands Antilles, the ratio is 15:1.

Liaison between head office, supervisors, and interviewers takes the form of regular meetings usually once a week, although in some cases these meetings are held daily, especially between supervisors and interviewers (e.g., Belize and Suriname). In most cases, direct liaison is supplemented with a review of the questionnaires received in head office. In Jamaica, supervisors monitor progress by submitting weekly reports and in certain cases by re-interviewing respondents. In Netherlands Antilles, 25% of the interviews are quality-controlled by telephone or by personal visit.

5. Comment on the duration and logistics of fieldwork.

In all cases except one, fieldwork lasts from 2-12 weeks with most surveys requiring 4-5 weeks. This includes listing as well as interviewing. The exception is the HIES in Cayman Islands which lasts an entire year, with multiple visits to each household.

6. Comment on whether interviewers are temporary or permanent staff, remuneration method and level, method of recruitment and training, transportation means, and daily subsistence allowance.

Interviewers are usually temporary and hired from one or more of the following groups: unemployed, housewives, school leavers, teachers, or young students. In some cases interviewers are recruited via newspaper advertisements while in others no such advertising is necessary. Supervisors are usually permanent staff. In some countries the entire field staff is permanent (Barbados, British Virgin Islands, and Jamaica). In St. Lucia the same

interviewers are used as much as possible. In Suriname interviewers are hired as permanent staff and must be at least 25 years of age, with at least high school education. Out of 141 applicants for the last hiring session, only 15 were hired.

Some offices pay piecemeal (Bahamas, Netherlands Antilles, and St. Lucia) while the majority pay a given rate per unit time (e.g., Aruba and Suriname).

There is also variance in how transportation costs are covered. In most countries interviewers are paid transportation costs and daily subsistence allowance while in others they are expected to meet these costs themselves (Bahamas, Grenada, and St. Lucia). Even when transportation costs are paid, the interviewers are often expected to own a car (e.g., Barbados). In Suriname, government cars are used transportation.

7. How is non-response incorporated into the sample design and fieldwork?

In many cases, no strategy was incorporated into the design and fieldwork to handle non-response. In part this is due to the fact that the response rates are generally very high.

In Cayman Islands, non-response is anticipated and an over-sample is drawn in order to achieve the desired number of completed interviews. Imputation will most likely be used for non-response on the HES.

In Jamaica and Trinidad and Tobago, non-response is corrected for by weighting to the number of expected responding households. In Dominica and St. Lucia, the response rate is maintained high by extensive publicity and careful training of the interviewers.

In Netherlands Antilles and Suriname, in case of non-response, substitution from a neighbor is permitted. In Barbados some substitution of households is done for vacant dwellings.

General Discussion

The following issues were raised and briefly touched upon:

1. What is the assurance that interviewers indeed called back four times if there is no supervision in the field? (This question was addressed in particular to British Virgin Islands and Grenada.)

2. Is there any bias involved in choosing interviewers who live close to the area in which they work? (e.g., British Virgin Islands and Grenada)

3. What is the level of motivation of the supervisors who work in head office and whose salary is not related to productivity? (British Virgin Islands and Grenada)

4. If the field staff in Jamaica is permanent, how do they spend the rest of their time (i.e., when not interviewing)?

5. Is substitution a correct procedure? (Barbados, Netherlands Antilles, and Suriname)

6. Is there evidence of "curbstoning"?

Topic J: Computer Applications

Chair: Lancelot Busby

Individual Country Comments

1. Comment on the availability and use of computers, especially micro-computers, in the sample survey process.

In most cases, the necessary PC hardware and software is only beginning to be installed, although tremendous advances are being seen and plans for the future are very ambitious. Some national statistical offices (e.g., Bahamas, Barbados, Dominica) are in fact very well equipped in terms of PC hardware. In Barbados the entire survey process has been computerized. Software packages that are being used other than the readily available commercial products, are IMPS, CONCOR, and CENTS from the Bureau of the Census. Of the commercial software products, SPSS seems to be the most commonly used.

In Trinidad and Tobago, all processing is done on the mainframe although there are plans for introducing the micro personal computer.

No country mentioned the use of laptops in the field.

2. Is there sufficiently well-trained personnel available to handle computer tasks?

There is still a noticeable need for expertise and trained personnel to assist in the efficient operation of this new technology. In most countries, with the possible exception of Trinidad and Tobago, a dedicated computer resource person is not available and only some of the staff have sufficient training in this field.

One problem resides in frequent turnover due to private industry successfully siphoning off computer professionals from the public sector.

3. Can all programming and data manipulation tasks related to the sample process be easily performed?

There is, in most cases, no lack of computer equipment. However, there is still a sore need for additional expertise in the application of PC hardware and software to the survey environment.

4. Does any of the cartography exist in computer format?

Cartography, as a whole, has not yet been computerized and the lack of adequate maps will be a problem in this process. Some countries are seriously contemplating this technological advancement and have at least partially digitized geographic boundaries.

Jamaica and Trinidad and Tobago are planning to computerize their cartography after the 1991 Censuses.

5. How are sampling errors and other sample data evaluation operations carried out?

In most cases, sampling errors are not calculated and, if they are, they are not widely disseminated. Participants from some countries were not aware whether sampling errors were being calculated and in one case (Suriname) sampling errors were calculated manually on a calculator. In Trinidad and Tobago sampling errors are calculated at the national level for every quarter.

General Discussion

More information was requested concerning cartographic computer systems. It was pointed out that the next version of REDATAM is expected to include cartographic capabilities. A pilot exercise will be carried out soon in Trinidad and Tobago to test this new feature. Whatever information is currently available on this software will be forwarded to Suriname.

Participants were warned that care must be taken in designing the computerized cartographic system and in acquiring appropriate hardware and software. Some systems work very well but have defects such as an extremely long printing time. It takes several hours to print one map, then it becomes doubtful whether the computerized system is superior to manual operation if used during, or close to, fieldwork.

Discussion of Other Topics

Chair: Larry Cahoon

It was suggested that one additional topic that might be discussed in this session, since it was not addressed explicitly during the first two days, is data quality, quality control, and evaluation. Participants might want to comment on items such as the quality of their frames and any re-interviewing techniques they used in order to measure the quality of the data.

Some countries reported that no explicit quality control program is in place, but that there are plans for such a change given information garnered at this workshop and from other sources.

In other countries, quality control is achieved by very closely supervising the fieldwork with spot checks and the supervisors doing regular quality control on a sample of the households. In these cases, re-interviewing is applied on

an *ad hoc* basis, not as part of a regular evaluation program. There is a sense that in general there are no major problems in the survey process which require measurement or correction. Much reliance is placed on the personal integrity of the field staff and there is little, though not zero, evidence of "curbstoning". Supervisors are in charge of ensuring quality control. They are not paid additionally for this work but they consider it as part of their professional commitment and complete it accordingly.

Quality is maintained by following up any suspicious events and explaining clearly to the interviewers that any wayward activities may result in disciplinary action, including dismissal. Re-interviewing is not widely used but the survey data are statistically analysed to isolate potential problems. A detailed and up-to-date record is kept of all field operations.

The main problems identified are refusals and no contacts, although neither are extensive and the refusals are usually successfully converted.

The quality of the sample frame is maintained through regular updates and corrections prompted by reports from the field.

With reference to re-interviewing, the question was asked as to whether it was possible to determine which of the two answers is correct, if they are different. The point was made that it is not necessary to re-interview using the entire questionnaire. Only a few questions would be sufficient and would make the operation much less tedious. If there is a great deal of discrepancy between the two interviews, a third interview should be carried out by a supervisor or experienced interviewer.

In Suriname, no re-interviewing is done. Instead, if for example information on income is missing, the employer is contacted and a value is imputed.

It is preferable not to substitute for non-response since it engenders an acceptance of the habit on the part of the interviewers. Substitution is also not ideal since it tends to bias the sample in favor of "desirable" households.

Non-response should be handled by anticipating the response rate and drawing a correspondingly larger sample. This might also include vacant dwellings which should be estimated in deciding on the sample size. This solution, based on anticipating non-response rates, is called over-sampling and is used to handle total non-response, that is, where no information is obtained from the respondent. However, in the case of partial non-response, the more appropriate methods are imputation and weighting.

In Jamaica, substitution is not permitted although in the case of an absent member of the household, proxy response is accepted.

It is very important that statisticians responsible for national surveys explicitly address the issue of inferring to the population from the sample results. Users must be informed of the level of error involved and they must be educated in the use of these results. Users must be made conscious of the fact that survey, and even census, data are all subject to errors, many of which

can be quantified and interpreted as part of the final analysis. This would go a long way toward easing users' fears about the validity of survey data. By the same token, this effort would help prevent users from taking survey data too literally.

The question was asked as to whether interviewers should be allowed to be accompanied while they are working in the field, especially interviewing. The general consensus was that, in the interest of staff morale, this should be allowed, but the partner must take the same oath as the interviewer.

Finally, the following topics were raised and briefly touched upon:

1. With what frequency should surveys be carried out?

2. What should be done if two nested surveys (i.e., one is a sub-sample of the other) produce different results?

3. Returning to the issue of annual estimates based on quarterly surveys, how can this approach be justified in the presence of two and three digit inflation?

Summary Discussion and Conclusions

Chair: Edmundo Berumen

In reviewing the topics discussed, the following commonalities and differences between countries was observed:

1. The interviewer-supervisor ratio is about 4-5:1. This level is similar to Latin America where the ratio is also fairly constant.

2. The interview time is about 30 minutes per person.

3. PSUs tend to have around 150-200 households.

4. The overall sampling fraction is around 2%.

5. Response rates are almost universally over 90%.

6. There is a wide variation in the number of PSUs selected with a correspondingly wide variation in the sample target taken from each PSU (5-36).

From a cursory review of the national publications, it seems that few offices are rounding the published survey results. Another source of concern is the relatively few countries which calculate and publish sampling errors. Exceptions include Bahamas, Barbados, Jamaica, Suriname, and Trinidad and Tobago who do round results before publication. In addition, sampling errors are calculated although not for every survey round since the levels do not change significantly enough to justify the additional cost.

Interest was expressed in the advantages of ratio estimation and how it is implemented. It seems that ratio estimation is a commonly used technique, for example, in Barbados and Jamaica. It was explained that ratio estimation is applied using the variables age, sex, and race. It reduces variance of certain estimates and assists in adjusting for coverage problems. If the external data source is reliable, then it can, and should, be used to improve the survey results. The reliability of the data from the external source is the key factor. Ratio estimation should be used with caution if the benchmark data (e.g., the census) suffers major flaws.

It was observed that the only example of self-representing PSUs was in Belize where urban PSUs are selected with certainty.

Response rates in Belize and Cayman Islands were lower than elsewhere for two reasons. In Belize, vacant dwellings were included in the response rate and the questionnaire was long and complicated. In Cayman Islands, where there is no taxation, secrecy laws are strict. In spite of special training, the response rate suffers somewhat.

In Jamiaca, the lowest response rates are achieved in the HES while the highest occur for the LFS. Fertility surveys fall somewhere in between.

APPENDIX A

DISCUSSION GUIDE

DISCUSSION GUIDE

1 November 1990

DEVELOPMENT AND APPLICATION OF SAMPLING FRAMES AND SAMPLE DESIGNS FOR INTEGRATED HOUSEHOLD SURVEY PROGRAMMES IN THE CARIBBEAN

Workshop

Kingston, Jamaica

4 - 6 November, 1990

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Central Co-ordinating Unit
Household Survey Capability
Program
Statistical Office

Division of Statistics and
Projections
Economic Commission for Latin
America and the Caribbean

United Nations Fund for Population Activities
United Nations

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REFERENCES/BIBLIOGRAPHY

I. INTRODUCTION

This workshop is part of a project sponsored by the United Nations Fund for Population Activities (UNFPA). The project duration is three years (1989-1991) and the executing and implementation agency is the Economic Commission for Latin America and the Caribbean (ECLAC). Further details can be found in UNFPA (1990).

The formal primary objective of this workshop is to:

"discuss general guidelines on the construction of sampling frames and designs for integrated households survey programmes" (UNFPA 1990, p.4)

This workshop is timed to stress the tremendous relevance of the new round of censuses for sample frames and designs. Participants should leave the meetings with an increased awareness that the new data provide a priceless opportunity for rethinking national plans for household surveys for the coming decade. Furthermore, the workshop is designed to permit open and free-wheeling discussion involving professionals representing the sampling community in national statistical organizations of the region. This cross-fertilization of ideas is intended to stimulate new solutions to old problems faced by each national organization.

The workshop is based largely on the contents of the document "Sampling Frames and Sample Designs for Integrated Household Surveys" (NHSCP 1986) which has been sent in advance to participants, who in addition have been requested to send information about their countries' survey sampling capacity. This information has been incorporated into this document.

This document consists of six (6) sections covering the major areas to be discussed in this workshop. The discussion is general and in each case a few important, new, and sometimes controversial, aspects are raised. Throughout the document, at the end of sections, are included ten (10) "Discussion Topics" which present a series of related questions designed to stimulate individual thought and group discussion.

This document is not designed to teach or to inform. It is assumed that the readers, that is, the workshop participants, are well-versed in survey sampling. Rather, the aim of this document is to organize the subject in such a way as to facilitate discussion and to maximize the possibility of fruitful exchange of ideas between participants. In other words, the aim is to create an intellectual climate in which innovative ideas can be presented and discussed. In particular, the hope is that this workshop will stimulate discussion concerning ways in which data from the 1990 round of censuses could be used to improve households surveys.

II. ADMINISTRATIVE ASPECTS OF THE WORKSHOP

1. Timetable and Discussion Protocol

The workshop is scheduled to last two and one-half days (Monday 5 November - noon Wednesday 7 November).

The discussion will be organized around ten (10) general areas of interest which are outlined in this document. (Participants should take note that Discussion Topic C precedes Topic B in the document.)

For the first two days of the meeting, the participants will discuss five topics each day. Each topic will be handled in the same way. The discussion leader will first very briefly (5 mins.) introduce the topic. Each participant will then be invited to make a brief comment about the situation in their country with respect to that topic. These interventions should last no more than five minutes each, giving a total elapsed time of around one hour. Finally, one half-hour will be devoted to an open discussion of the particular questions relating to the topic as laid out in this document in the "Topics for Discussion" boxes.

The last half-day will be set aside for wrapping up the discussions of the first two days. This will include continuing with topics of interest that were not sufficiently discussed, touching on topics of particular interest that may not have been raised, and discussing the same topics but at a more general level. Participants' input will be requested in preparing the agenda for this last half-day. An attempt will be made to identify areas where common experience and opinion could be translated into concrete, albeit general, recommendations.

Participants are requested to prepare statements carefully, to make them as brief and concise as possible, and to strictly adhere to the topic at hand. The list of topics to be discussed is by no means exhaustive but given the duration of the workshop it would be difficult to handle more. Given the time constraints, it is imperative for discussants to exercise discipline so that all participating countries have a chance to provide input based on their national experience. It is hoped that this inter-country exchange is one of the aspects of the workshop that will prove particularly productive.

Participants will be requested to comment not only on the current situation but also on changes planned as a result of the availability of new census data. Furthermore, it should be kept in mind that the discussion is geared toward general plans for the next decade. Individual survey idiosyncracies, important as they are, should not overshadow the goal of identifying common experiences and practices.

The topics for discussion are expressed mostly in the form of questions about the current state of affairs. However, participants are invited to go beyond this description and express opinions about what would be ideal or desirable for their individual country.

2. Output

Four output products are planned, all to be prepared by the discussion leader:

1. Discussion document reporting on all points made during the workshop by individual participants.

2. A comparative table outlining the status quo in each country with respect to key aspects of the national sample frame and design. This table will be based to some extent on documents sent by countries before the workshop and also on information provided during the workshop.

3. A comparative table outlining the changes planned by each country in their national sample frame and design as a result of the availability of data from the 1990 round of censuses.

4. A summary document outlining some general recommendations agreed upon by the participants during the workshop.

III. DATA SYSTEMS AND USER REQUIREMENTS ANALYSIS

1. Data Systems

At the core of systems of demographic and socioeconomic data lies the need for a multipurpose survey infrastructure designed to satisfy the needs of a variety of users such as producers, consumers, business, government agencies, and international organizations. These needs should determine the design of the system with respect to timeliness and quality of data, ease of access, and availability of detail.

One of the least documented and studied aspects of survey methods is the analysis of user requirements. Data collectors, survey methodologists, and even analysts too frequently design an information system without adequately analyzing the necessities of the user community and without sufficiently addressing the problem of how to most efficiently meet these requirements. There is a need for producers of sample frames and sample designers in general to talk to users in order to form an accurate picture of the requirements of the user community.

These concerns are of particular importance in the design of a multipurpose data system since the very character and basic strategy of the system, not to mention detailed implementation, will depend greatly on the ultimate objectives of the project. These objectives in turn will be determined by user requirements, that is the necessities of those individuals, groups, and agencies who stand to benefit from the system.

2. Who Are the Users?

This is the first question to be asked and is necessary in order to determine the universe of users for whom the system is to be designed. It is not sufficient to simply conduct a census of potential users. Information is needed

on the type of user, that is, private individual or business, government agency, international institution, producer or consumer. Each group of users has its own priorities and can be assigned a relative importance based on its importance among the universe of potential users of the data.

In certain cases, it is not possible to canvass all users and it will be necessary to draw conclusions from a sample of potential users drawn in such a way as to cover the widest possible range of interests of this class of users.

Users can also be classified as direct and indirect or primary and secondary in the sense that direct and primary users are those who directly access the system and apply it as part of their job. Secondary users are those who benefit indirectly from the system by a filtering down process from the primary users. An example of secondary users is consumers who are affected by decisions made by primary users.

3. What Data are Required?

Once potential users have been identified it is important to canvass them to find out what kinds of socioeconomic data they require. Examples of such subjects would be infant mortality, socioeconomic status of the elderly, economic growth, etc. In the first place, users should be asked to outline their requirements in terms of what statistics and results they consider, first, essential and, secondly, desirable. These data will form the basis for deciding what kinds of sample frames and designs are appropriate.

The reason that this step is crucial is not so much that it is not known what kinds of data should form the basis of the system but rather to decide what items should be given highest priority. It is idealistic and self-defeating to anticipate that the system will provide all information required by all users. Therefore, there needs to be an objective and informed basis on which decisions can made as to which data items are essential, which are important, which are desirable, and which are simply luxury items.

Once there is consensus on the extensiveness of the data to be collected, it is necessary to fine-tune the user requirements by determining other desired characteristics of the sample frame and design such as frequency with which the data will be required and the types of analyses that the data will be subject to as well as the geographical level the users require the information. It is also important to know what coverage the users require, that is, to what extent the undercoverage of the population must be controlled. Other important characteristics of the data for which users need to have input is the desired precision of the data and the sub-populations for which analytical data are necessary. All this information will to a great degree determine how the sample frames should be designed and maintained.

In general, such data will dictate the resolution of methodological issues as the use of surveys, censuses, or administrative records, the sample frames, the sample sizes, and other aspects of sample design such as stratification and clustering. Designing frames and samples without this information is tantamount to working in a vacuum without clear guidelines to determine what the principal characteristics of the designs should be.

Discussion Topic A: User Requirements Analysis

1. **Who are the users and how sophisticated are they?**
2. **To what extent does the national sampling office communicate and interact with users to find out their needs? How does this interaction take place?**
3. **What are the main user requirements in terms of frequency, types of analyses, geography, coverage, precision, and sub-populations?**

IV. BASIC CONCEPTS AND DEFINITIONS

1. Units

It is important to keep clear the definition of the various units that play a role both in data collection and data retrieval. The sampling unit is the element that is actually selected in the sampling stage and may not necessarily be the responding or interview unit, which is the element to whom the data collection instrument is applied. Next is the measurement unit which represents the element for which measurements are taken and which may not necessarily be the responding unit. Finally there is a fourth element, the analysis unit.

For example, it is possible to imagine a household survey in which the parents are interviewed concerning their children. In this case the sampling unit might be the household, the response unit the pair of parents, the measurement unit the children, and the analysis unit all child in a family. In many situations the units coincide, for example, the measurement and sampling unit may be one and the same, but it is important to understand that there are types of units that are usually treated differently in the survey process.

2. Stratification Strategies

Stratification can be defined as the partitioning of the entire population into several independent sub-populations, or strata. This ensures a good "spread" of the sample across the population dimensions, especially if the strata are homogeneous in the sense that elements within each strata are more alike than are elements in the population at large.

One of the advantages of stratification is that it tends to decrease the sampling variance, although the effect is typically not very large. The more important reason for stratifying is to ensure that the sample distribution corresponds to that of the population. Furthermore, stratification enables the user to carry out analyses for specified domains, which can be strata or combinations of strata.

Since stratification is usually a simple procedure to design and implement, it is suggested that the sample frame be stratified as deeply as possible within the size constraints imposed by the survey parameters. However, it should be kept in mind that a master sample for a household survey infrastructure will have to satisfy the requirements of a variety of users for whom optimal stratification strategies might differ. There is a need, therefore, to define a stratification plan that is appropriate for the largest number of users.

3. Clustering

Clustering is defined as the selection of groups, or clusters, of sample elements. Clustering, as does stratification, involves the identification of groups of population units or elements. However, that is where the similarity stops. Ideally, strata are homogeneous whereas clusters are heterogeneous, each one representing a mini-version of the population. Strata decrease sampling variance, whereas clustering, at least in most household surveys, tends to increase it. Strata are never sampling units, whereas clusters are themselves sampled.

Clustering is used for its practical advantages. Whereas the ideal, from a sampler's point of view, would be to spread the sample as widely as possible over the population, this usually leads to increased costs, mainly because of interviewer travel costs. Judicious balancing between keeping costs and sampling variance low leads to optimal cluster sizes.

Unlike stratification, clustering can conceivably be designed to satisfy a multiplicity of surveys. Whereas the appropriate stratification for a given survey is very much dependent on the objectives and content of the survey, this is not so true of clusters. The same clustering scheme can be used for several surveys without changes thus providing the opportunity for a master design based on a permanent set of clusters.

4. Multi-stage units

Whereas the ultimate objective of any sample design is to select a sample of population elements, this can be done in several stages. These stages involve selecting first larger, or higher-level, units which include the final sampling units. The establishment of levels and the units at each level depend on the administrative organization of the country, the availability of data, and, to a lesser extent, the user requirements.

The units selected at the first stage are known as Primary Sampling Units (PSUs) and it is the identification of these units that is of most importance. The main source of sampling variability is the variance between these units since typically there is homogeneity within a PSU and thus within-PSU variance contributes relatively little to the overall sampling variance.

Notwithstanding the last comment, it is however important to consider carefully the definition of Secondary Sampling Units (SSUs) and units at further levels of disaggregation.

Discussion Topic C: Sampling Units

1. **Describe the PSUs in terms of size (population, housing units) and definition (counties, districts, etc.).**
2. **What is the total number of PSUs created? How many are used in each survey?**
3. **Does the PSU size vary with the total sample size or sampling fraction? Does it depend on whether the survey is single or multiple-round?**

4. What are the units below the PSU level?

5. Are households listed, and if so, at what stage? If listing is not used, state reason. If listing is used, how many households are listed?

V. SAMPLING FRAMES

1. Properties

Potentially, there is no consideration more important for a household survey infrastructure than the sampling frame. The sample frame refers to a complete list of all units in the population from which a sample is to be drawn. In certain cases, a census will be preferred in which case the sampling frame becomes the census or at least the basis for its planning.

Sampling frames need to be complete, accurate, free of duplication, and up-to-date. Their completeness can never be guaranteed but through careful preparation, maintenance, and monitoring the degree of completeness can be maximized. Similarly, care must be taken to ensure that the frames are accurate reflections of the information that is collected in the field. Checking for, and eliminating, duplicates can be an in-house operation involving a careful review, preferably computerized, of the frame to identify elements that appear more than once. These culprits need to be identified and either eliminated or well-documented. Finally it is important that adequate resources be set aside to keep the frames up-to-date based on the most recent information available and thus reflecting as accurately as possible the state of affairs at the time the survey is carried out.

2. Area and List Frames

Sample frames can either be list frames or area frames. The list frame is, as the name suggest, a list of all the elements in the population. In smaller countries this is a very feasible method that could be used instead of the more traditional area frame.

The area frame is more appropriate for countries with large populations or with a poor registration system. The area frame essentially consists of a list of areal units at several hierarchically arranged levels of geographical detail. Each areal unit would have attached to it information about its population size, number of households, and as much socioeconomic information as possible.

The most common source of data for preparing both area and list frames is the census. It is for this reason that the workshop takes on particular importance since the imminent round of censuses will provide all countries with the necessary basis for reviewing and revising their national sample frames.

Administrative records and registration systems are another source for building sample frames and can be used constructively in countries where such systems exist and are well-maintained.

3. Multiple Frames

Because of the inherently multipurpose nature of any national household survey infrastructure it is almost inevitable that multiple frames will have to be created and maintained. Since only in fairy tales are multiple frames custom-made for the survey in question it is often necessary to draw a sample from, or base a census on, several frames. This poses problems created by overlapping between frames and the ever-present issue of non-coverage of an unknown proportion of the population even by the combined frame. Survey methodologists have confronted the issue of multiple frames. Ample research, both theoretical and practical, has been reported on this topic and could be brought to bear in solving problems raised in the context of this undertaking.

This subject merits a special mention because of the multipurpose nature of the proposed system. Since it is envisaged that data for the frames will be drawn from a number and variety of sources, it is inevitable that there will be considerable need for matching between data files in order to identify overlaps between independent sources of records and in general to monitor the level of coverage of the system as a whole.

Matching is also used to supplement data collected from one source with data from another source. For example, a very realistic scenario would start with the census data file and match it to a file based on a survey taken before, at the same time as, or after the census. Matching will result in a file of records appearing on both files. Combining the census and survey data for these records expands the richness of the sample frame.

4. Maintenance

This one aspect may be the most important topic of all. Whereas there are numerous cases of successful sample frames being created, the number of sample frames that are successfully maintained and up-dated is far smaller. No effort should be spared in this task and any short-cuts taken in this important activity are bound to lead to far-reaching negative consequences.

There are several methods that can be used to effectively maintain an accurate sample frame. One is an on-going registration system whose objective is to keep the frame up-to-date by centralizing information on "births", "deaths", and all other changes. Another system which can bolster this continuous registration system is a periodical census whose frequency would be determined based on local experts' opinions as to the speed of deterioration of census data even as they are updated using the registration system.

A third, less costly, method relies on other surveys that may be carried out independently by other organizations and which might lead to information as to weaknesses in the sample frame. Ad hoc sources such as media should also be used in order to be apprised of new buildings or complexes that are being erected or areas that are being demolished.

Another important, although often overlooked, aspect of frame maintenance is its storage. It is important to consider and review such issues as medium

(e.g., hard-copy or computer), number of copies for back-up purposes, accessibility, and administrative responsibility.

Unfortunately, all such updating affects the basic probabilities of selection which may have been equal when the original frame was designed but which changed their values once the frame is updated. To minimize the resulting complications, a "surprise" stratum can be defined to gather all newly found housing units. It is important, however, to keep this stratum in mind and to include it as an integral part of any subsequent sample.

5. Primary and Secondary Selections

As mentioned in Section III.3 it is conceptually conceivable to design an infrastructure in which the PSUs remain constant over long periods of time and over many surveys, regardless of their individual objectives and characteristics. This is a desirable result and advantage should be taken of it by designing PSUs that will be large enough to be used over a decade but without overly clustering the sample.

It is possible to rely on new information (e.g., from a new census) without completely replacing the PSUs. A technique called controlled selection (Goodman and Kish 1950) allows the designer to apply probability laws to the redesign of the master sample enabling the retention of a large proportion of the original PSUs. Of course, this problem does not arise with what are known as "self-representing" PSUs which are so designated because they are so much larger than other PSUs that they are automatically included in any sample.

Discussion Topic B: Frame Sources and Characteristics

1. **What is the principle basis for the national sample frame?**
2. **What are the main elements included?**
3. **If multiple frames are used, give above information for all frames.**
4. **Is the national sample frame a list or area frame? Is it possible to use both types of frames? How is the choice determined?**

Discussion Topic D: Frame Maintenance

1. **Comment on sources, methods, and frequency used for updating and maintaining frames.**
2. **How are the sample frame materials stored and backed-up?**
3. **Who has administrative responsibility for the frame and who has access to it? How easy is the access?**
4. **How long are the same PSUs used?**
5. **Does there exist a surprise stratum? How is it constructed and maintained? How is the sampling rate determined for the surprise stratum?**

Discussion Topic E: Frame Problems

1. **What are known and suspected problems with coverage of the frames used?**
2. **What are other known and suspected deficiencies in frames used (e.g., duplicates, inaccuracies, and use of outdated information)?**

VI. SAMPLE DESIGNS

1. Characteristics and Requirements

Designing a sample is as much art as it is science since in practice it is hard to argue objectively in favor of one design over its alternatives. The most important considerations that need to be taken into account are the desired precision (accuracy) of the data and the practical limitations imposed by the frame and by the geographical, socioeconomic, and political realities in the field.

Sample size is determined mainly by the overall desired precision and the need to do domain analyses, that is, analyses based on subsets of the total population. The stratification scheme depends on the homogeneity of the population in question. Should there be a high level of heterogeneity which affects the key variables being measured, significant gains can be made by careful and deep stratification.

Decisions concerning the number of stages, clustering, and probabilities of selection are based on the frame's characteristics, the elements that can be used as sampling and response units, and the need to oversample certain segments of the population (for example, ethnic groups or the elderly).

In any survey it is crucial to calculate correct weights to account for unequal probabilities of selection which almost always turns out to be the case given the inevitable deviance in practice from the theoretical design. Weights are also needed to handle non-coverage, non-response, and ratio adjustment.

In the days before computer universality, weighting was avoided because of the resulting complexities imposed on the processes of estimation and calculation of sampling errors. Since then, there seems to be a resurgence of interest in weighted designs since, as the argument goes, complex weighting procedures can now be easily handled by simple, yet powerful, computers. This thinking ignores two important factors. First, weighting always imposes additional burdens on the producer and user in understanding the quality of data and how they were produced. Second, weighting increases sampling variances (Kish 1965, ch. 4), a theoretical result that seems to have slipped the mind of many a designer. It remains highly recommendable that sample designs be self-weighting, that is, equal-probability.

2. Practical Constraints

It is important to keep in mind that, regardless of what sampling theory may dictate, practical constraints often do not permit implementing what is theoretically optimal. Practical constraints are usually related to available material and personnel resources both with respect to quantity and quality. Other practical constraints exist such as geographically difficult terrain, making areas inaccessible and poor interviewing conditions (e.g., due to inclement weather) to name just a few. The successful sample frame and design respect the basic tenets of sampling theory while at the same time confronting

the country's realities and including explicit solutions to obstacles imposed by such constraints.

A prime example of where it is necessary to balance the theoretically desirable with the practically feasible is clustering. Given the small population and geographical extension, not to mention the accessible terrain of most Caribbean nations, a strong argument might be made for small clusters since interviewer travel costs do not represent a large proportion of the total survey costs. The ease of intra-country communication for most countries might be a further argument in favor of small clusters.

In fact, carrying this line of reasoning one step further, one might make the point that in at least some Caribbean countries, list sampling could be implemented rather than area sampling. For countries that are small, both demographically and geographically, it might be feasible to maintain an accurate up-to-date list sample frame. In at least some of these cases it could be simpler, more efficient, and more effective to design and implement a list sample than an area sample.

3. Target Populations

This term refers to the population to which inferences are to be made based on the sample results. Very often, practical limitations are an obstacle to defining the target population exactly as the user requires it. It is of extreme importance to have clearly defined both the target population and the sample frame and to explain the difference between the two together with the import of this discrepancy.

The term target populations can also refer to sub-populations of particular interest to the user. In sampling terminology these are often referred to as domains. However, it has become apparent recently that socioeconomic surveys are focussing ever more keenly on minority groups such as the elderly, the handicapped, children, adolescents, and pregnant women to name just a few examples.

Zeroing in on these populations poses particular problems since in many cases they are relatively rare and not highly "visible" in the population. In certain cases, for example the handicapped, even the definition of the target population is not clear.

However, there is obviously a need for data on these groups and solutions must be found. Information needs to be accumulated in the master frame on these populations, where they live, and some of their general characteristics. In other words, accurate and up-date mini-frames need to be kept so that when the need arises for a survey, the sample can be drawn quickly, efficiently, precisely, and at reasonable cost. Results of periodic surveys should also be stored and incorporated in the frame to provide a base for sampling these target populations.

Discussion Topic F: General Sample Design Issues

1. **How long does it take to execute the sample design and what are the quantity and type of resources required?**
2. **Is a master sample used? If so, what are its characteristics?**
3. **What are the most commonly targeted total populations for which inferences are drawn based on survey samples?**
4. **What are the sub-populations (domains) for which survey samples are required to produce results?**
5. **What are the sample sizes, both for total and domain estimation?**

Discussion Topic G: Stratification and Multi-Round Sampling

1. **Describe the stratification strategy and sample allocation.**
2. **For multi-round surveys, specify rounds per year, rotation strategies, percentage of rotation, and units of rotation.**

Discussion Topic H: Multi-Stage Sampling

1. **Describe each stage, giving measures of size and probabilities.**
2. **Is the design equal probability? Elaborate.**
3. **Describe the selection of households in the last stage and the selection of respondents within the household.**

VII. FIELDWORK

It is difficult, and often counter-productive, to discuss sample frames and designs without considering implications on fieldwork. To take just one obvious example, the size of the PSU is directly related to travel costs and the burden imposed on the interviewers. Whereas it is true that the sampler's main concern should be sample design, sight should not be lost of the practical impracticality of certain designs, no matter how efficient or theoretically attractive. In fact, the profession of sampling could be viewed as essentially an exercise in adapting theoretical principles to highly varied and often difficult practical situations. The successful sampler is the one who is knowledgeable, experienced, and resourceful enough to know how to "bend" sampling theory to make it applicable in different situations.

Some of the most important implications of a sample design is the effect it has on the field staff. Both supervisors and interviewers are directly affected by samplers' decisions and it is important to take this into consideration when designing a sample.

In designing a sample it is also important to plan for non-response. Just as inevitable as death and taxes, non-response has, does, and will always occur. It behooves samplers to consider all available strategies and to select the one that is most appropriate. One such solution is to over-sample from the outset anticipating a certain level of non-response. Simple replacement with population elements not selected for the sample is not desirable since it unnecessarily upsets the probabilities of selection in such a way that it is difficult to reconstitute the true values.

Discussion Topic I: Field Issues

1. **What is the average interview time per household?**
2. **What is the usual response rate? What is the minimum (maximum) number of callbacks?**
3. **What is the interviewer workload per week, the total number of interviewers, and the number of interviewers per PSU?**
4. **What is the ratio of supervisors to interviewers? Comment on system of liaison between head office, supervisors, and interviewers.**
5. **Comment on the duration and logistics of fieldwork.**
6. **Comment on whether interviewers are temporary or permanent staff, remuneration method and level, method of recruitment and training, transportation means, and daily subsistence allowance.**
7. **How is non-response incorporated into the sample design and fieldwork?**

VIII. COMPUTER APPLICATIONS

1. The Computer and Survey Samples

There has been a revolution in the use of computers in data systems. Whereas only a decade ago computerization was synonymous with expensive and complex mainframes, today the microcomputer, and its accompanying software, has influenced the field in a way unimaginable only as recently as five years ago.

The speed and capacity of microcomputers have increased exponentially and given the advantages of their relatively low cost, ease of maintenance, extensive software, and portability, serious thought should given to designing data systems around these machines.

"Laptop" microcomputers have been successfully used for fieldwork in many countries and office-based microcomputer networks have shown to be more than able to handle large data bases and provide for efficient retrieval from these bases.

2. Data Banks

One of the principal obstacles to creating and maintaining a sample frame has been the lack of efficient computer capacity and power to manipulate large datafiles. However, with recent advances in microcomputer technology there is virtually no limit on the size of the files that can be stored and efficiently retrieved and processed.

Storage of data banks is a crucial aspect of a sample frame, be it an area or list frame. Large amounts of data need to be keyed in and then processed and updated in order to provide a frame for the sample selection process.

Thought should be given, where possible, to the possibility of storing relational data bases, that is bases in which each level is made up of units belonging to units at the next highest level. For example, a high level could be the household with accompanying socioeconomic information. The next level would be the family with one record for each family in the household. Finally the third level could contain information about each family member. Of course,

this approach only works for data inherently related in a hierarchical fashion in the way indicated in the above example.

Finally, the system must include the ability to store sampling information (strata and cluster identifications at least) so that sampling errors can be calculated and presented. It is also imperative that probabilities of selection for at least the PSUs be recorded and maintained so that new probabilities can be calculated for samples that deviate from the original design. Finally, all information required to calculate weights must be stored. This includes data on sampling probabilities, non-response, coverage, and all other factors that are included in the weighting process.

3. Cartography

Another horizon that has been exposed by the microcomputer is making feasible the computer representation of a country's geographical description down to details such as blocks. Whereas it is true that there is an initial investment necessary in keying in all the coordinates of the units and sub-units, long-sighted planning will surely argue for all the benefits that such a system can represent.

Before any country or organization attempts such an exercise, it is imperative that a careful cost-benefit analysis be carried out, together with a careful study of all the software and hardware available on the market. Much of the technology is very new and many bugs still exist in many systems. Furthermore, the system does require tremendous computer capacity and is very draining on computer processing time. For example, in one case, the system was satisfactory except that printing of any map took so long that the efficiency of the system was seriously compromised.

Barring the above caveats, this is clearly an option that should be attractive to any organization that is contemplating establishing a household survey infrastructure. The long-term benefits could be immeasurable.

4. Evaluation and Data Quality

This may be one of the least discussed aspects of survey sampling and it is only recently that many statistical organizations throughout the world have recognized that is important to incorporate into the system the capacity to evaluate the data and to make a statement about the quality of the data. This information is priceless for the conscientious user who needs to know something about the limitations of the data in order to avoid drawing unjustified conclusions.

The data quality statement should refer both to variance (random error) and bias (systematic error) and should be broken down by source: coverage, response, coding, sampling, editing, etc.

Of particular importance for this workshop is the calculation of sampling errors which can now be done very easily on microcomputers using "canned" or custom-made programs. Even using bootstrapping techniques such as "balanced repeated replication" (Kish 1970) in order to measure sampling variance of complex statistics can be handled easily on microcomputers.

Discussion Topic J: Computer Applications

1. Comment on the availability and use of computers, especially personal micro-computers, in the sample survey process.
2. Is there sufficiently well-trained personnel available to handle computer tasks?
3. Can all programming and data manipulation tasks related to the sample process be easily performed?
4. Does any of the cartography exist in computer format?
5. How are sampling errors and other sample data evaluation operations carried out?

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APENDIX B

COMPARATIVE TABLES

Table 1

National Census Information

Country	1991 Estimated Popn. (000s)	1990 Census Date	Year of (1980-1990) Census	Duration of the Census (days)	Type of Census (DeFacto/ De Juri)
Caracas					
Argentina	32.423	15/ 5/91	1980 1991	1 1	De Facto
Brazil	153.300	9/91	1980 1991	90 30-60	De Juri De Juri
Cuba	10.700	9/93	1981 1993	10 10	De Juri De Juri
Chile	13.386	4/82 4/92	1982 1992	1 1	De Facto De Facto
Ecuador	10.000	25/11/90	1982 1990	1 1 urb. 7 rur.	De Facto De Facto
Guatemala	9.500	3/93	1981 1993	14 14	De Juri De Juri
Mexico	82.000	12/ 3/90	1980 1990	1 5	De Juri De Juri
Peru	22.000	7/92	1981 1992	1 urb. 15 rur.	De Facto
Venezuela	18.100	21/10/90	1981 1990	1 urb. 15 rur.	De Juri
San Jose					
Bolivia	7.500	13/ 5/92	1976 1992	1 urb.	De Facto
Colombia	33.600	93	1985 1993	15	De Juri
Costa Rica	3.100	4/94	1984 1994	7 7	De Juri De Juri
El Salvador	5.400	7/92	- 1992		
Haiti	6.600	93	1982 1993		De Juri
Honduras	5.300		1988	3 urb. 8 rur.	De Juri
Nicaragua	3.900	94	- 1994		
Panama	2.500	13/ 5/90	1980 1990	1 1	De Facto De Facto
Paraguay	4.300	7/92	1982 1992		De Facto De Facto
Dominican Republic	7.300	92	1981 1992	2	Combined
Uruguay	3.100	93	1985 1993	1 1	De Facto De Facto

Table 2

National Surveys Basic Data (1)

	Name	Year	Size of Sample (households/dwellings		Sampling Fraction
			Planned	Effective	
Caracas					
Argentina	Permanent Households Survey	91	35.000	30.000	1/850-1/15
Brazil	Monthly Employment Survey	91	35.600	36.327	1/570-1/140
Cuba	National Employment Survey	91		12.960	1/193
Chile	National Employment Survey	91	35.910	32.101	14/100
Ecuador	Employment and Unemployment Periodic Survey	89	11.829	10.291	11/1.000
Guatemala	Socio-Demographic National Survey	89	10.934	9.214	1/285-1/57
Mexico	Urban Employment National Survey	91	41.100	43.000	1/60
Peru	Life level Measurements National Surveys	86	5.000		
Venezuela	Sampling Households Survey	91	39.700		1/100
San Jose					
Bolivia	Integrated Households Survey	90		8.660	1/40-1/17
Colombia	National Households Survey	91	21.500	19.923	1/264-1/42
Costa Rica	Multiple Purposes Households Surveys	90	9.918	8.155	1/101-1/32
El Salvador	Multiple Purposes Households Surveys	90	6.400		1/50
Haiti	Family Budget and Consumption Survey	87	3.120	2.592	1/360
Honduras	Permanent Multiple Purposes Households Survey	91	10.250	8.800	12/1.000
Nicaragua	Established and Others Survey	91	2.400		1/4
Panama	Households Survey (Manpower)	89	10.000	8.000	1/61-1/10
Paraguay	Households Survey (Manpower)	90	1.000	1.000	1/231
Dominican Republic	Labour Force Survey	91		1.755	
Uruguay	Continuous Households Survey	91	24.000		1/40

Table 3

National Surveys Basic Data (2)

	Name	Coverage	Stratification	Publication Domains	Rounds per Year
Caracas					
Argentina	Permanent Households Survey	Urban	6 Soc. Econ. Strata/domain	26	2 (May, Oct.)
Brazil	Monthly Employment Survey	6 Regions Metro.	Implicit Stratification	6 Metrop. Regions	12
Cuba	National Employment Survey	National	169 Areas		4
Chile	National Employment Survey	National	103 Areas	13	4
Ecuador	Employment and Unemployment Periodic Survey	Urban	7 Areas	National Coast, Sierra, East	Periodic Oct.-Dec.
Guatemala	Socio-Demographic National Survey	National	18 Areas	16	Periodic (Apr.-June)
Mexico	Urban Employment National Survey	16 Urban Areas	55 Areas	16 Urban Areas	4
Peru	Standards of Living Measurements National Survey	National	3 Areas		Periodic
Venezuela	Sampling Households Survey	National	Implicit Stratification		2
San Jose					
Bolivia	Integrated Households Survey	Capitals			1
Colombia	National Households Survey	13 Metrop. Areas	6	13 Metrop. Areas	4
Costa Rica	Multiple Purposes Households Survey	National	Urb: 18 Soc. Econ. Strata Rur: 6 Geog. Strata	6	1 (July)
El Salvador	Multiple Purposes Households Survey				4
Haiti	Family Budget and Consumption Survey	National	9	National, Region, Zone	1 (Nov.-Sep.)
Honduras	Permanent Multiple Purposes Households Survey	National	Urb: 4 Soc. Econ. Strata Rur: 4 Geog. Strata	National Total Urban-Rural Central District San Pedro Sula	2 Mar.,Sep.
Nicaragua	Established and Other People Survey	3 Affected Counties			Periodic May-June
Panama	Households Survey (Manpower)		22 Admin. Areas	Other Metrop. Region	1 August
Paraguay	Households Survey (Manpower)	Metro Area of Asuncion	Other Asuncion	Other Asunción	1 Sep.-Nov.
Dominican Republic	Labour Force Survey				4
Uruguay	Continuous Households Survey				4 of 6.000

Table 4

PSU Information (1)

Country	PSU Description	Total Number of PSU in Population	Number of PSU in Sample	Size of PSU (households/dwellings)		Sample Size per PSU (house-holds/dwel-lings
				Average	Range	
Caracas						
Argentina	Censual Ratio	15.020	2.575	300	90-350	10-15
Brazil	Censual Sector	8.800	1.542	250		25
Cuba	Censual District	14.150	1.620	150		8
Chile	Censual Sectors Group	13.670	2.394	Urb. 300 Rur. 150	Urb.200-400 Rur. 50-250	15
Ecuador	Censual Subsector		624	150		5
Guatemala	Censual Sector	8.954	611	166	57-254	15-20
Mexico	Basic Geostatistic Area	5.000	1.370		>480	30
Peru	Urb. Segment of 100 dwellings Rur. District			100		30
Venezuela	Urb. Censual Segment Rur. Censual Sector	19.400	3.800	200		10
San Jose						
Bolivia	Blocks		1.764	20		5
Colombia	Censual Section (20 blocks approx.)	7.144	1.989	400	1-2.811	10
Costa Rica	Censual Segment	10.535	719	Urb. 60 Rur. 40	Urb. 40-90 Rur. 20-70	13
El Salvador	Sectors and Counties	5.152	373	300		9
Haiti	Censual Segment	4.730	312	308	130-508	10
Honduras	Censual Segment Segments Groups Populated Site	3.168	267	340	50-630	Urb: 10 Rur: 14
Nicaragua	Site	75	37	Urb. 150 Rur. 250		60
Panama	Segment Union Censual Segment	17.000	1.600	U:60 R:40 U:20 R:16		6
Paraguay	Census Area	6.979	200	Urb. 25 Rur. 50	Urb. 12- 58 Rur. 21-111	5
Dominican Republic	Municipal County and District	134	58	175,5		30
Uruguay	Blocks	38.000	7.925		1-300	3

Table 5

PSU Information (2)

Country	PSU Description	Secondary Sampling Units	Frequency		
			Yes or No	Programme	Dwellings or PSU
Caracas					
Argentina	Censual Ratio	Dwelling	Yes	25% every 6 months	Dwellings
Brazil	Censual Sector	Dwelling	Yes	4 months inside 8 months outside 4 months inside	Dwellings
Cuba	Censual District	Area Section			
Chile	Censual Sectors Group	Dwelling	Yes	Urb. every 18 months Rur. every 36 months	
Ecuador	Censual Subsector	Dwelling	No	-	-
Guatemala	Censual Sector	Dwelling Conglomerate	Yes	1/3	Conglomerate
Mexico	Geostatistic Basic Area	Blocks Group Dwelling	Yes	20% Each trimester	Dwellings
Peru	Urb. Segment of 100 dwellings Rur. District	Urb. Dwelling Rur. Dwelling Area			
Venezuela	Urb. Censual Segment Rur. Censual Sector	Dwelling Area			
San Jose					
Bolivia	Blocks	Dwellings			
Colombia	Censual Section	Block Segment (10 dwellings approx)	No	-	-
Costa Rica	Segmento censal	Dwelling	Yes	25%	Dwellings
El Salvador	Sectors and Counties	Segment			
Haiti	Censual Segment	Household	Yes	24 Segments every 4 weeks	PSU
Honduras	Censual Segment Segments Group Populated Site	Compact Conglomerate	Yes	UTM (Subsegmento)	
Nicaragua	Site	Compact Conglomerate			
Panama	Segment Union Censual Segment	Half Segment 2 Dwellings Conglomerate	Yes	25%	Dwellings
Paraguay	Census Area	Dwelling	No	-	-
Dominican Republic	Municipal County and District	Sector and Household Supervision Area Section			
Uruguay	Blocks	Dwelling			

Table 6

Fieldwork (1)

Country	Average Length of Interview per Household (mins.)	Duration of Fieldwork (weeks)	Interviewer-Supervisor Ratio	Response Rate
Caracas				
Argentina	10-15	Buenos Aires 5 Other 2	Buenos Aires 10 Ogner 6	Buenos Aires 80 Other 85-95
Brazil	40	Permanent	6	82
Cuba	15	Permanent	2-3	95
Chile	15	Permanent	5	90
Ecuador	10-20	2	4	95
Guatemala	20	16	4-5	85
Mexico	20-40	Permanent	4-5	90
Peru	240 (2 visits)	Permanent	2	89
Venezuela	15	22	3	95
San Jose				
Bolivia	30-45	8	4	90
Colombia	25-30	2	3	85-95
Costa Rica	20-45	5	3	89
El Salvador	30	21	5	83
Haiti	34	44	4	94
Honduras	30-40	4	5	91
Nicaragua	30-45	6	4	80
Panama	25	8	4,5	96
Paraguay	30-35	10	2	93
Dominican Republic	23	1	5,4	100
Uruguay	30	Permanent	3-5	90

Table 7

Fieldwork (2)

Country	Minimum Number of Call-backs Required	Interviewer Workload per Week	Substitution in case of Rejection (Yes or No)
Caracas			
Argentina	3	15	No
Brazil		30	No
Cuba	3	5-10	No
Chile	3	35	No
Ecuador	2	40	No
Guatemala	2	70	No
Mexico	2	25	No
Peru	4	Urb. 18 Rur. 12	Yes
Venezuela	1	30	Yes
San Jose			
Bolivia	3	21	No
Colombia	4	50	No
Costa Rica	3	60	No
El Salvador	4	25	
Haiti	2	2-3	Yes
Honduras	2	35	No
Nicaragua	3	25	No
Panama	3	27	No
Paraguay	3	25 Dwellings visited	Yes
Dominican Republic			
Uruguay	3	27	

APENDIX C

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