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STATISTICAL OBSERVER

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The Statistical Observer is a publication designed to contribute toward informing economists, statisticians and related professionals throughout Canada about selected statistical and research developments undertaken in Statistics Canada, in other federal departments and agencies, in provincial departments, in universities and in business and independent research organizations.

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Evaluation of Canadian Censuses

Introduction

This paper provides a brief summary of a few of the major evaluation projects designed to measure non-sampling errors in the Censuses of Canada. Censuses are particularly vulnerable to non-sampling errors because of the enormous job that has to be carried out in a short period of time, resulting in a great increase in the staff of the statistical offices involved.

Objectives of Evaluation Programs

Four objectives of evaluation programs can be identified:

- (a) **Analysis of sources of error with a view to subsequent improvement** — Analyses of sources of error are carried out to identify the most important sources in order to determine the optimal survey design and, hence, be able to make improvements in subsequent surveys.
- (b) **The measurement of accuracy of survey results to guide users** — Because statistics are used in making many decisions of great impact in both the private and public sectors, it is important for statisticians to try to guide users on the accuracy of statistics being produced.
- (c) **Evaluation of alternative methods of survey design** — The main objective here is not the measurement of absolute levels of error but the measurement of the differences in error levels between the alternatives considered. This measure is used to assist in the selection of the most practical method of surveying; for example, mailout vs. drop-off of questionnaires.
- (d) **Evaluation for purposes of continuing control** — This aspect of evaluation falls mainly in the area of quality control which is carried out to identify and remove poor work. However, some quality control plans also point out weaknesses in operating instructions, manuals and procedures.

The remainder of this paper will dwell on various areas of evaluation where such techniques are particularly important to Census operations, namely in the evaluation of *coverage* errors, *response* errors and *processing* errors.

Evaluation of Coverage Errors

In a census, a coverage error occurs when a person or household which, according to the definition, is within the scope of the enquiry is either not included or is included more than once.

Thus, coverage errors result in biases. For this reason, unlike sampling errors, they cannot be estimated from the census itself: their evaluation involves a comparison with an independent, superior standard.

There are three well-known methods of estimating coverage errors in censuses. The method used most often consists of selecting a sample of areas and enumerating these shortly after the census, using particular care to ensure that all households are included in the evaluation survey. This method was tried after both the 1950 and 1960 U.S. Censuses, as well as after the 1961 Canadian Census. Statistics Canada's experience, as well as that

of our American colleagues, indicates that this method of estimating coverage errors may grossly understate them, particularly the errors due to missing persons in partially enumerated households.

Another known method of estimating coverage errors is the so-called analytical method. This method uses demographic techniques of age cohort analysis to estimate the current population by age and sex. The main weakness of the method is the way it deals with external migration and persons missed in the previous census. Therefore, it is not particularly suited to "open" countries, such as Canada where these two factors may involve a significant number of persons. Moreover, this method is not capable of estimating coverage errors by regions (at least, in countries such as Canada where internal migration is significant.) Finally, it does not lend itself easily to the classification of the missed persons, except by age and sex, because of the difficulty of establishing a model to predict, with reasonable accuracy, the behaviour of other characteristics over time.

An entirely different method, which has been used with considerable success in Canada after both the 1961 and 1966 Censuses, and now in progress for the 1971 Census, is called Reverse Record Check. It consists of tracing, in the census, a sample of persons selected from several lists (for example, birth and immigration records and previous census files) representing everyone who lives in the country at the time of the census.

When these people are traced to their current address, the census documents are searched to see if they were enumerated there. If not, the potentially missed persons are contacted again to see if they were enumerated at an address other than the one to which they were previously traced. The census records are then checked for these additional addresses.

The main advantage of the Reverse Record Check, compared with the re-enumeration method of estimating coverage errors, is its completely independent approach. It avoids the major problem of evaluating coverage errors; that is, that the evaluation method itself might miss the same persons who were missed in the census. This is much more likely to happen in a re-enumeration study than in the Reverse Record Check since, in the latter method, people who are currently in a critical age group (that is, an age group particularly vulnerable to coverage errors) are selected mostly from the list provided by the previous census at which time they may not have been in this critical age group. Also, in Reverse Record Check, one is trying to locate particular persons rather than carry out vague instructions such as "enumerate everyone".

The Reverse Record Check has several interesting analytical by-products as well. It enables the tabulation of missed persons by the characteristics in the previous census, to the extent they were selected from that source, and furnishes some information on intercensal migration, since it involves matching between consecutive censuses. This method also provides interesting possibilities for assessing the accuracy of age reporting of infants and

smaller children, since part of the study is based on locating a sample of children selected from birth registers. In some cases, the accuracy of reporting country of origin can also be checked because country of origin is known for that part of the sample which is selected from immigration records.

The Reverse Record Check was tried for the first time in Canada in the evaluation of the 1961 Census. It was somewhat of an exploration of the method and therefore, a relatively small sample size, 6,000 persons, was used. This sample size was just large enough to estimate the overall national rate of under-enumeration to within a sampling error less than ± 0.5 per cent (two standard deviations). The actual percentage estimated to have been missed by the 1961 Census was 3.3 ± 0.5 per cent. A much larger study of the same kind was carried out following the 1966 Census (sample size, almost 27,000 persons) permitting a more refined breakdown of the under-enumeration by age and sex.

The percentage of persons missed in the census decreased from 3.3 per cent in 1961 to 2.6 per cent in 1966 — a notable improvement of more than 20 per cent. The main difference between the two censuses was the number of questions to be answered. In the 1961 Census, a relatively long series of questions was asked, whose underlying concepts enumerators sometimes found difficult to explain; whereas in 1966, the number of questions was severely limited. The limited content of the 1966 Census permitted interviewers to concentrate on the coverage aspects of this census, resulting in major improvements. This finding influenced the planning for the 1971 Census methodology.

The Reverse Record Check Study is being repeated for the 1971 Census. There are several new features being added, most important of which is that, having identified the sample of persons who were missed in the census, they will be contacted and asked a series of census-type questions. A tabulation of the results will indicate not only the number of people missed in 1971 but also the impact of their omission on the different census tabulations. This will be an example of guiding users with respect to the reliability of census tabulations. The same data will also enable Statistics Canada to identify the characteristics of persons most likely to be missed by the census, thereby aiding in the search for new methods of census-taking to help reduce under-enumeration in the future.

Evaluation and Measurement of Response Errors

Response errors may occur whenever data are requested, provided, received or recorded. Questions may be misinterpreted by the respondent, or the respondent may not know, may not remember, or may purposely want to distort the correct answer. Different enumerators may ask or explain questions differently, or interpret responses differently. Response errors can be classified into two categories.

(1) **Response Variance** is that component of the response errors which has a chance to cancel over a large number of responses.

Some interviewers may tend to inflate a count while others tend to deflate it; some respondents tend to over-state their response to a certain question, other tend to under-state it; some questions on the questionnaire may be ambiguous, or difficult to communicate, and may invite misunderstandings in either direction. All these factors, and many others, contribute to response variance. Because this type of error may be in either direction, the net error from this source may be quite small for large areas, but it can be very large for small areas or rare characteristics. It also tends to be much larger for sensitive characteristics which are normally difficult to measure.

As part of the evaluation program of the 1961 Census, a project was carried out to measure the response variance, particularly the component of the response variance that can be attributed to interviewers. Although this study was restricted to a selected compact area of the country, an area considered to have generally similar characteristics to the remainder of the country, the results had an enormous impact on the procedures eventually adopted for the 1971 Census.

The estimates of response variance derived from this project showed that, on the average, the response variance due to enumerators was of the same magnitude as the sampling variance would have been if the census had been carried out using a 25 per cent sample instead of 100 per cent enumeration. It became quite clear that for many characteristics the contribution of enumerators to the response variance was the largest source of error for small area estimates. As a consequence, it was clear that the census methodology was not in optimal balance with respect to cost and error; that is, if the response variance due to enumerators could be significantly reduced, one could introduce sampling into the census and still achieve a net reduction of errors, at the same time achieving some reductions in cost and a definite improvement in timeliness. As a result of these considerations, plus a good deal of testing, the new methodologies of self-enumeration and sampling for the 1971 Census emerged. The point to be emphasized here is that the methodology of the 1971 Census was influenced in a very significant way by the response variance study. A more comprehensive study of response variance is being undertaken in the 1971 Census to measure the impact of self-enumeration on response variance and to provide tables of the total mean square error for different size of census estimates and for different characteristics, or groups of characteristics, at the regional level.

(2) **Response Bias** is, roughly speaking, that portion of the total response errors which is "left over" after all cancellation involved in the response variance has occurred. It is made up of response errors which have a tendency to occur more in one direction than in the other. Such errors do not cancel out even over large areas or a large number of respondents, and may be particularly significant for statistics at the metropolitan area, provincial or national level. As in the case of response variance, response bias also has a tendency to be much larger for characteristics that are difficult to measure.

Response bias sometimes may be detected, but not measured, on the basis of analyzing departures in the data from hypothetical models (internal consistency analysis). A typical example of this latter situation is the analysis of age reporting. It is observed in many surveys that the number of persons reporting ages ending with a 0 or 5 is unreasonably large in relation to the number reporting ages ending in 9 or 1, or in 4 or 6. Response bias, however, is notoriously difficult to measure or even approximate.

Processing Errors

Errors are, of course, introduced into survey data not only during the reporting of data but also during processing. To minimize such errors, quality control techniques were applied to several operations in the 1971 Census. The most notable of these involved: (a) the enumerators — a sample of questionnaires was selected from an enumerator's assignment and checked; if the enumerator made more than a specific number of errors, the entire assignment was returned for proper completion which may or may not have required re-interviewing; (b) the coders of questionnaires — the work of each coder was controlled by having a different coder independently code a sample of the questionnaires in his workload and comparing and adjudicating all discrepancies; (c) the work of microfilming which precedes the FOSDIC document reading; and (d) the document reading by FOSDIC. In addition to the immediate feed-back into the quality of the census, these control operations provide a wealth of evaluation type data, which will be analyzed from the point of view of future censuses.

This is the first Canadian census in which considerable effort has been put into quality control; however, no evaluation data are available yet. Nevertheless, observations of all 1971 Census operations (including quality control procedures) have indicated the need for a more extensive and intensive quality control program for the 1976 Census. Planning toward this end is already underway.

This article is taken from a paper presented by Mr. A. V. Winkworth at the American Population Association meetings held in Toronto, April, 1972. Readers are invited to contact Mr. Winkworth, Director, Socio-Economic Survey Methods Staff, Methodology and Systems Branch, Statistics Canada, Ottawa K1A 0T6.

The following article, by Professor. C.A. Moser, Director of the United Kingdom's Central Statistical Office, is reprinted from the Statistical News, and based on an article that first appeared in the London Financial Times in October 1971.

Revisions to economic statistics are never long out of the news. This is not surprising as economic statistics are, by their nature, subject to frequent revision. It is the price to be paid for getting out first estimates as quickly as possible and for seeking to improve their accuracy as soon as more information becomes available. Normally, this does not seriously affect the overall pattern of the figures but just occasionally circumstances combine to produce a really large revision which may change the economic picture. This inevitably leads to comment — sometimes hostile — about the revisions; and although this may sometimes be justified, it quite often springs from an incomplete understanding of the nature of statistical estimates. Statisticians are as sensitive to criticism as anyone else and mildly resent suggestions that they can't get their sums right first time. The problem of revisions is far more complex than this and I want to try to clear up some misconceptions and to indicate our current thinking on the subject.

Most people who follow economic developments are aware that statistics are subject to revision. But occasionally one still comes across someone who directly, or in a letter to the press, expresses genuine surprise that, for example, our current balance of payments surplus or deficit for a particular year is no longer exactly £549 million as he had read in a reputable journal only 6 months before. Indeed political legerdemain might be implied. That may be thought to represent a very unsophisticated level of understanding; but it does exist and it provides the natural starting point for a discussion about revisions.

Very few economic statistics can be said to represent the 'fact' of the situation in terms of accounting accuracy. We do not have and would not want to have at our disposal a complete record of the transactions of every firm in the country or of those of our 55 million fellow citizens. Nor do we necessarily have good sample surveys covering every important aspect of economic activity, though the coverage of our data is being constantly improved. What are produced, are the statisticians' best possible estimates of what is happening, or has happened based upon the information that is available to them at the time. And this is the crux of the matter. In nearly all cases, the information will increase and change, sometimes several years after the first estimate is made. If we are to meet our obligation to produce the best possible estimate at any given time, then clearly revisions must be made in the light of this further and more complete information. We are never anxious to do this. It makes life more difficult for users and does not help to generate public confidence in official statistics. But, as I hope this article will show, it is unavoidable. What is a desirable aim however is that the level of the revisions and their timing should follow some clearly defined guidelines and that users should be aware of the limitations of the figures. First, how and

why do revisions come about?

The causes of revisions to statistical series might, for convenience, be divided into short and longer term, although the division is not really as clear cut as that. The 'short-term' revisions relate to the completeness of the information, and it is useful to consider a particular example – the monthly Index of Industrial Production – to illustrate this. For many industries, monthly returns, often providing quite broad information, are collected from a relatively small sample of firms, and, if a publication deadline is to be met, there must be a cut-off point; if, as is usual at that stage, the response is incomplete, the first estimate will be subject to revision as the late monthly enquiries are backed up in many cases by a much more thoroughgoing quarterly survey which provides a more complete coverage and which will, therefore, almost inevitably lead to further revisions to the monthly figures. This pattern cannot be avoided; it would not be right for us to burden all firms with providing all the figures we would like as frequently as every month. For some industries, we in fact have very little monthly information.

Similar revisions occur as quarterly data are replaced by annual. To take one example from our balance of payments statistics: the Department of Trade and Industry conduct a quarterly enquiry into firms' direct investment overseas and their earnings from existing investment; an annual enquiry is also carried out, with a considerably larger sample, producing better – and thus often revised – figures.

Here it is relevant to mention the related problem of the accuracy of these 'final' estimates. Much of our day-to-day work is concerned with very gradual improvements to the component parts of the big statistical aggregates, like the national accounts. Ironically, the more we improve the accuracy of the final figures the greater revisions there may be – other things being equal – to the preliminary estimates. Of course other things do not have to be equal – the preliminary estimates can be improved too – but there are likely to be transitional periods where this is the case. It may well happen with the monthly Index of Industrial Production where, from now on and for some time to come, we shall be introducing the very much improved series of quarterly output statistics.

It is useful to look separately at these 'short-term' revisions because the statistician has a choice here which is not the case with other types of revision. The earlier he chooses to produce the first estimate, the less complete and reliable will be the information available (although, of course, this would be greatly helped if the speed of response from industry were generally improved) and – again other things being equal – the greater, on average, will be the subsequent revisions. Similarly, the more frequent the estimates – monthly rather than quarterly, quarterly rather than annual – the smaller will be the amount of information for the first estimate and, again, the greater the revisions. It does not follow that all efforts to improve timeliness need lead to less accurate figures. There are many ways in which this can be tackled – such

as streamlining internal procedures, making more use of computers, employing more sophisticated statistical techniques to forecast from partial data – without necessarily impairing the precision. But sooner or later, one must reach the point where one can speed up further only by putting out less complete and thus less reliable figures. And here the statistician has the very real choice between on the one hand faster figures and more revisions and on the other less up-to-date figures and fewer revisions. Clearly there are limits here – it is no use publishing figures very early if they are too unreliable for analysis or interpretation – but still the statistician will be criticised either way. However, a choice must be made. In my set of priorities, greater speed comes top, and we now issue, for example, very quick preliminary figures for consumers' expenditure and are trying to improve timeliness right across the board. This will mean more revisions, but in my view the price is worth paying.

What other forms of revision have in common is that they affect not just the recent figures but the whole series back for a year or several years. They may be of a regular kind. For most seasonally adjusted series the seasonal factors generally have to be revised once a year to take account of the gradual changes in seasonal patterns. This is not always very straightforward. For example, the pattern of consumers' expenditure on cars is affected by extraneous factors such as changes in purchase tax and hire purchase arrangements and, on one particular occasion, a change in the month in which the new registration letter is introduced. Again, composite indices – such as industrial production – are built up by 'weighting' the detailed figures according to the structure of – in this case – industrial output as measured by a periodic census. When a new census is taken and the structure is seen to have altered, clearly the 'weights' of the index must be altered accordingly with consequent revisions throughout the series. The availability of comprehensive data from a census also provides a benchmark from which estimates for more recent years, perhaps derived by extrapolation from annual estimates of wages and salaries in manufacturing industries which are not really firm until final census of production results are available.

Revisions may also occur irregularly and for special reasons. Deficiencies may be discovered in the basic source material – I should think that everyone has heard of the under-recording of exports – and when such things occur, happily very rarely, they must be put right. Another irregular cause of revisions occurs when a new, superior source of information becomes available. Thus, in measuring changes in the production of most plastic goods in the Index of Industrial Production we have, for many years, had to make do with estimates of the industry's purchases of plastic materials. Well, this is better than nothing but it suffers from obvious limitations. A new series that measures directly the sales of plastic goods will soon become available and we shall substitute it for the old one. The Index will be improved therefore, but the immediate effect will be . . . more revisions.

So, economic statistics represent, for the most part, the best estimates that can be made of the facts of the situation on the in-

formation available at the time; and they will nearly always be subject to revision as more and better information becomes available. There are, therefore, always limitations on the extent to which a series can, and should be used, particularly if it is measuring very small changes over a short period and one of the statistician's main tasks is to inform and educate users in these limitations.

More positively, however, we hope to be able to do more to help users by devising a clear set of guidelines for handling revisions, but the way ahead is not easy and there are no quick and simple solutions. There is, for example, the question of the timing and frequency of revisions. On the one hand it is desirable to try to produce the 'best' figure at any given time by continually revising as new data come to hand and as new series become available; taken to its limit, this could involve issuing revised figures every day in some cases. Against this, one obviously does not want to irritate users with constant changes and discontinuities. Should revisions therefore be made at fixed time intervals?

Alternatively, should revisions be made whenever the change amounts to more than a certain percentage? It can be very annoying to see series revised for trivial amounts that are well within the margin of error of the estimate. In trying to find an acceptable rule, however, one runs into problems with the big economic aggregates like the national accounts. These estimates are built up, bit by bit, from information obtained from different statistical enquiries, the results of which may be published independently of the total national accounts. A revision to one of these series – let us say the capital expenditure of the iron and steel industry – may be important in relation to that industry and will have to be published. In terms of total GNP it may be trivial; but to keep the figures consistent this must be revised too, albeit by an apparently insignificant amount. There is the question too of how far back we should revise. Occasionally, for example, there is change in classification which will necessitate revisions to a particular series. A decision must be taken on how far back we are obliged to carry the revisions in order to provide an uninterrupted series for users.

More difficult still is to determine what are tolerable limits for the size of the revisions; and consideration of this must be linked with the more complex problem of the margin of error of the 'final' estimate. The main problem is that economic statistics are put to many and varied uses and a certain margin of error may be acceptable for one purpose but not for another.

We are now looking at all of these aspects and, in seeking criteria, we shall certainly consider experience in other countries. Attempts to work out guidelines for the release of principal economic indicators are at present being made by government statisticians in the United States. They have three main objectives. The first is to ensure that revisions to preliminary estimates are not unacceptably high in relation to the actual month-to-month or quarter-to-quarter changes in the final estimates. The second aims to achieve an acceptable standard of accuracy for the final estimates in relation to the underlying movement. If any series does not match up to these criteria, a decision would be required on

whether to spend money to improve it (and incidentally add to the burden of form filling) or whether to discontinue it. The third objective is to reduce the number of revisions by regulating the number of estimates that can be issued for a particular series within a given period of time. We have already had discussions with our friends in Washington about this and we shall watch closely to see how these developments work out in practice.

As I have made clear, we shall always and inevitably have revisions to contend with and this must be more widely recognised and understood. But a clear, consistent and generally acceptable basis for dealing with them should help to make life less difficult for all users and it is our intention to progress toward this end.

NEW PROJECTS

1972 Survey of Selected Leisure Time Activities

In March 1972, Statistics Canada conducted a survey of selected leisure time activities of Canadians – the first project of this kind on a national basis in Canada. With co-ordination and general direction provided by the Cultural Information Section of the bureau's Education Division, the survey was carried out as a supplement to the March 1972 Labour Force Survey and was funded in part by the Arts and Cultural Support Branch of the Department of the Secretary of State. The survey enquired into participation in activities and attendance at events during the two and one-half month period ending mid-March 1972.

The primary objective of the leisure time study was to provide a wide range of users (most particularly, federal departments involved in support programs) with estimates of attendance and participation in the arts, adult education, recreation and some forms of popular entertainment. The study was **not** designed as a time-budget survey; that is, no attempt was made to measure the amount of non-work time available to Canadians.

A secondary objective of the leisure time survey was to provide the groundwork and some benchmarks for an expanded program of studies in the area of leisure activities of Canadians.

Because the leisure time survey was linked with the regular monthly Labour Force Survey, estimates of attendance and participation can be made at the national, regional, and provincial levels, for twenty defined age-sex groups. Correlations with population density, some socio-economic variables, and some personal characteristics of the population can also be made.

Processing the survey's individual reports from about 65,000 respondents was completed in May, and a linked leisure time-labour force record has been produced for each respondent. Some preliminary tabulations are now available; other more detailed classifications will be made available in special releases of Statistics Canada.

The following are a few examples of the kind of information derived from the leisure time survey:

- estimated attendance (and percentage of population) at live theatre, ballet, classical musical performances, popular music performances, museums, art galleries, cinema, sports events, etc., with differentiation between free events and events for which admission was charged;
- estimates of the weekly time spent watching television, listening to radio, tapes, records, etc., reading, participating in hobby activity, in recreational sports activity, etc.;
- estimates of the numbers enrolled, and the amount of time spent per week, in continuing education courses, in hobby or general interest courses and in formal instruction in performing and creative arts;
- estimates of the number of Canadians who participate in specific sports and recreation activities such as skating, cycling, jogging, snowmobiling, recreational hockey, etc.

Readers interested in more information on the survey of selected leisure time activities are invited to write to J.E. Wicks, Chief, Cultural Information Section, Education Division, Statistics Canada, Ottawa, K1A 0Z5.

Two New Census Dissemination Services

The Data Dissemination Section of the Census Division was created to provide users of census data with a centralized and comprehensive range of user services. One feature of this section is a Census User Enquiry Service – a focal point within the Census Division for processing user enquiries. The Service will answer user requests or, if necessary, direct the questions to appropriate Statistics Canada staff members.

Another project of this section is the Census Data Newsletter, established to inform users of developments in the dissemination of data from the 1971 Censuses of Population and Housing, and Agriculture. The first Newsletter, released in May 1972, described the documentation being prepared for the Data Dissemination Program. Future issues will deal with other aspects of the program such as the User Summary Tape Program, the procedures for answering special requests and geocoding.

Information about these and other Census programs may be obtained from the Census User Enquiry Service, Statistics Canada, Ottawa K1A 0T6. The telephone number is 613-996-5254.

Developmental Endeavours of the Governments Division in 1972-73

The 1972-73 fiscal year will be an active period of development for the Governments Division of Statistics Canada. This Division, part of the Financial Statistics Branch, is responsible for collecting, processing and publishing statistics on the financial transactions of governments and government enterprises.

Early in 1972-73, the Director of the Division and senior statisticians of its Local Government Section attended the annual federal-provincial conference on municipal statistics sponsored by Statistics Canada. The Conference was held in Victoria, B.C., April 19-21, and concerned itself extensively with the implementation of the classifications described in the recently issued *Financial Information System for Municipalities* (catalogue numbers 12-532, 12-533 and 12-534, occasional). Among the topics discussed were problems encountered in the implementation of the system and improvements in the collection of municipal data. The delegates from Statistics Canada also informed their provincial counterparts of certain initiatives about to be taken by the bureau in the area of local government financial statistics. These Governments Division initiatives relate to the development of a local government debt data bank, the gathering of information on local government enterprises, and the delineation of the local government universe.

The local government debt data bank will be a computerized perpetual inventory of all local government debt transactions. It will generate a highly flexible output on all significant aspects of new and existing bond and debenture issues of local governments. The system is being developed one province at a time.

The objective of the project to gather information on local government utilities is to produce data on local government enterprises comparable with those already produced on federal and provincial government enterprises. At the outset, the project will be based on highly aggregated information already supplied by local government utilities to other divisions of Statistics Canada.

The questionnaires from which the information is now extracted will be expanded, as necessary, to suit the requirements of the project.

The delineation of the local government universe is a much needed undertaking. At present, serious difficulty is encountered in relating results of sample surveys on local government financial transactions to total data because of lack of knowledge on the dimension of the universe. The first attempt to remedy this shortcoming takes the form of a survey of all metropolitan areas to try to identify their local government entities and to seek information on the services they provide. The financial relationships which exist among these entities, and between them and other levels of government will also be examined. In many instances, this project will be carried out jointly with the provincial departments of municipal affairs.

In mid-1972, the Governments Division plans to release the publication, *The Canadian System of Government Financial Management Statistics* (catalogue number 63-506) which will outline the coverage, concepts, methods, and classifications used in the preparation of data on the financial transactions of governments and government enterprises. It will contain comprehensive explanations of the statistical treatment of these transactions within the system and among the various components of the system. The revenue, expenditure, asset, liability, and sources and uses of funds classifications for governments, and the income, expenditure, asset, liability, and net worth classifications for government enterprises will be described in detail. The report will also provide a description of reconciliations of the data of this system with the corresponding data of the System of National Accounts.

Data on the revenue and expenditure estimates of the federal government will be released in another Governments Division publication in 1972-73. This report will be a companion to *Federal Government Finance* (catalogue number 63-211) and will extend the revenue and expenditure series of the latter publication to the present by making use of information contained in the federal estimates and budget speeches and in special releases on the anticipated transactions of certain federal special funds.

More information on these and other Governments Division activities may be obtained by contacting J.B. Smith, Director, Governments Division, Financial Statistics Branch, Statistics Canada, No. 5 Temporary Bldg., Ottawa, K1A 0Z7.

NEW REPORTS

Census Research Memoranda

The Population and Housing Subdivision of the Statistics Canada Census Division has produced a series of research memoranda covering many aspects of the 1971 Census. The following list gives the number, author, title and date of papers produced to date. (Numbers omitted from the list correspond to papers now out of print). Readers wishing to obtain copies of these papers and/or any related information may contact the Census User Enquiry Service, Statistics Canada, Ottawa, K1A 0T6.

General Series (PH-Gen-)

0. Freedman, H.A., "Index of Population and Housing Research Memoranda" (periodically updated)
1. Davy, R.J. and Freedman, H.A., "The 1971 Census of Population and Housing Publication Programme: Content and Time-table" (May 10, 1971)
5. Freedman, H.A., "The Role of the Population and Housing Sub-division in the 1971 Census Dissemination Programme" (Nov. 19, 1971)
6. MacIntosh, D.A., "1971 Census Methodology" (Dec. 1, 1971)
8. Dodds, D.J., "Sampling in the Self-enumeration Areas of the 1971 Census" (Dec. 1, 1971)
9. Brackstone, G.J., "The 1971 Census Weighting Procedures" (Dec. 1, 1971)
11. Freedman, H.A., "The 1971 Census Dissemination Programme" (June 2, 1972)
12. Census Division, "Content of Questionnaire for the 1971 Census of Canada" (March 1970)
13. Davy, R.J., "An Overview of the 1971 Census of Canada" (June 12, 1972)

Methodology and Systems Series (PH-Meth-)

1. Murphy, E.M., "The Random Rounding Technique for Guarding against Illegal Disclosure in Published Census Tables" (May 29, 1972)

Demographic and Social Characteristics Series (PH-DC-)

2. Bradley, D.R., "Demographic and Social Characteristics Questions, Censuses of Canada, 1871-1971" (Nov. 19, 1971)

Family Series (PH-Fam-)

1. Gauthier, Herve, "The Census Definition of Family: 1871-1971" (May 1971)

Housing Series (PH-Hou-)

2. Priest, G.E., "The 1971 Census of Housing: Information for Census Data Users" (Nov. 19, 1971)

Household Series (PH-Hhld-)

2. Singh, H., "An Integral Framework of the 1971 Census Household and Family Statistics" (Nov. 19, 1971)

Economic Characteristics Series (PH-Ec-)

2. Samlalsingh, R., "A Guide to Economic Characteristics Concepts, 1971 Census" (Nov. 19, 1971)

Place of Work Series (PH-PW-)

1. Simpson, J.K., "Place of Work in the 1971 Census" (Nov. 19, 1971)

Geography Series (PH-Geog-)

1. Ricour-Singh, F., "Census Geostatistical Areas" (Dec. 15, 1971)

2. Lefebvre, J.J. and Terjanian, A., "The Census Geographic Code: Hierarchy and Documentation" (Dec. 15, 1971)

3. Hubert, P., "Reference Maps of the 1971 Census of Canada"

4. Page, R.S., "Census Thematic Maps Using Computers" (Nov. 19, 1971)

Another report closely connected with the Geography Series is contained in the booklet, *GRDSR: Facts by Small Areas*, released by the Methodology and Systems Branch. This report introduces the GRDSR (Geographically Referenced Data Storage and Retrieval) system as a method of assembling statistical information by user-specified areas. The booklet can be obtained from the Census User Enquiry Service or from the Methodology and Systems Branch, Statistics Canada, Ottawa, K1A 0T6.

QBS Series on Fixed Capital Formation

The Investments Division of the Quebec Bureau of Statistics is producing a series of reports on gross fixed capital formation in Quebec in 1969. The Bureau plans 28 bulletins, corresponding to the major industrial groups as defined in the Standard Industrial Classification. Included are the primary sectors, major groups of manufacturing activity, construction and transportation sectors as well as public utilities and business and financial services.

The information in these publications is expected to be most useful to those concerned with the equipment goods market in Quebec, particularly producers and dealers of such goods and industrial promotion staffs.

All bulletins in this series are expected to be released by late 1972.

A list of titles in the series and copies of the bulletins are available from the Bureau de la Statistique du Québec, Ministère de l'Industrie et du Commerce, Hôtel du gouvernement, Québec 4, P.Q.

Alberta Business Trends

The Alberta Bureau of Statistics has compiled data from many sources to produce a report on the performance of Alberta's economy during 1971 and the first quarter of 1972. This compact bulletin, entitled *Alberta Business Trends* uses tables, charts and text to present facts on such economic indicators as the labour force, farm cash receipts, retail trade, bank transactions, building permits, manufacturing shipments and many others.

Alberta Business Trends, May 1972 is a publication of the Alberta Bureau of Statistics, Department of Industry and Commerce, Government of Alberta, Edmonton, Alberta.

Ontario Economic Review

Two recent issues of the *Ontario Economic Review* report on some newly-completed projects of the Ontario Department of Treasury and Economics. The January/February 1972 issue contains a review of economic activities in Canada, and Ontario, in 1971 and a forecast for 1972, prepared by the Economic Planning Branch of the Policy Planning Division.

The feature article in this issue describes the recently-completed input-output model of Ontario's Niagara Region. The paper outlines the conceptual framework for the model and includes a brief description of the underlying methodology. The three basic matrices – the inter-industry flow table, the matrix of input-output co-efficients and its inverse – are examined in the article and are presented in tabular form in the Appendix.

In the March 1972 *Special Supplement* to the OER, there is a report of a study which uses the input-output system for Ontario as the basis for a detailed analysis of some of the economic and technical implications of sectoral interdependencies in the Ontario economy.

The Ontario Economic Review is published bi-monthly by the Ontario Department of Treasury and Economics. Copies may be obtained free of charge by writing to J.J. Morning of that Department at Room 545, Frost Building South, Queen's Park, Toronto, Ontario.

Census Summary Tapes Documented

The data collected in the 1971 Census is being disseminated in many forms. One of the newest methods is the user summary tape program. These User Summary Tapes (UST) are designed especially for the user, in contrast to production summary tapes which are intended for internal bureau use. There is now available a report documenting the subject-matter content of these tapes and indicating the types of geographic area to which the data relate. The report, *1971 Census User Summary Tape Content*, is available from the Population and Housing Subdivision, Census Division, Statistics Canada, Ottawa K1A 0T6.

Inquiries about this paper may be directed to H.A. Freedman or the Census User Enquiry Service at the above address.

ANNOUNCEMENTS

New Chief Statistician

Dr. Sylvia Ostry was appointed Chief Statistician of Canada, effective June 1, 1972. Since 1970, Dr. Ostry had been Director of the Economic Council of Canada. A native of Winnipeg, Dr. Ostry attended McGill University in Montreal where she obtained Bachelors and Masters degrees in economics. After further study at McGill and Cambridge University, she received a doctorate in 1954.

Dr. Ostry taught at McGill from 1948 to 1955, then at Sir George Williams University; she was assistant professor at McGill from 1958 to 1962; and associate professor at the University of Montreal from 1962 to 1964. Dr. Ostry has engaged in a variety of research activities in association with the Department of Labour, the Special Senate Committee on Manpower and Employment, University of Oxford Institute of Statistics and CMHC among others. At Statistics Canada, she was the assistant director of the Labour Division from 1964 to 1966, and she acted as a special advisor on manpower for the Economic Council of Canada. In April 1969, she was appointed Director of the Economic Council of Canada.

New staff members in Dr. Ostry's office include **R. Desramaux** and **L. Joyce**. Mr. Desramaux, executive assistant to Dr. Ostry, was formerly with the Personnel Administration Division of Statistics Canada. His duties as executive assistant will primarily involve liaison with the office of the Minister of Industry, Trade and Commerce, officials of other government departments and of Statistics Canada.

As the Chief Statistician's research assistant, Ms. Joyce, who is trained in economics and has worked with the Economic Council of Canada, prepares background information for speeches and reports, and handles Dr. Ostry's communication with and involvement in outside organizations.

Walter Duffett Retires

Mr. Walter E. Duffett has retired after 15 years as head of Canada's central statistical agency. He was appointed to the position of Dominion Statistician (the title was changed to Chief Statistician in 1971) in January 1957, on the retirement of Mr. Herbert Marshall.

Mr. Duffett graduated in Economics from the University of Toronto in 1933, and continued his studies at the London School of Economics where he obtained an M.Sc. degree in 1935. On his return to Canada, he joined the Investment Department of the Sun Life Assurance Company of Canada in Montreal, where he was concerned with economic and financial studies of a variety of foreign countries and with substantial investment operations in these countries.

From 1942 to 1944, Mr. Duffett served in the Economics Branch of the Wartime Prices and Trade Board in Ottawa. He was involved in the development of statistical series required for wartime civilian supply administration and also participated in policy development in these fields. Subsequently, he was involved in the gradual dismantling of the wartime price controls.

In 1944, he joined the Research Department of the Bank of

Canada and became an Assistant Chief of the Department. He participated in the development of the conceptual structure underlying the first set of comprehensive national accounts for Canada, later published by the Dominion Bureau of Statistics (now known as Statistics Canada). His main duties related to economic and financial studies of developments in Canada and the United States.

In 1954, Mr. Duffett was appointed Director of the Economics and Research Branch of the Department of Labour, where he was in charge of studies of employment conditions, wage rates and industrial relations. He moved from this position to become head of the bureau.

As Chief Statistician of Canada, Mr. Duffett was in charge of one of the largest statistical agencies in the world, with a continuing staff of more than 4,500 persons. With the increasing use of statistics for decision-making by business and government, and by the public, the central statistical agency has grown rapidly in recent years. Even taking into account the fluctuating personnel requirements of the census of population and agriculture, the staff is more than 2.5 times as large as it was in 1957 and, with rising prices and wage rates, the budget is more seven times the 1957 expenditure. Pressures for growth reflect the need for more precise and detailed information than was previously the case, but also stress the growing importance of educational, cultural and other social spheres.

Mr. Duffett is a member of the International Statistical Institute, is a Fellow of the American Statistical Association and has served as Canadian delegate to the United Nations Statistical Commission and numerous other international statistical meetings. He has been an active member of the Social Science Research Council for many years and is a member of the National Advisory Committee of the Canadian Institute of International Affairs. He has been active in the Interamerican Statistical Institute and in its committees which work closely with the Organization of American States.

Mr. Duffett now begins a new career as a vice-president of the Conference Board in Canada. In view of the Board's objective to increase its members' access to good information for decision-making, Mr. Duffett's experience as head of Canada's largest information-producing agency will be of especially great value to that organization.

R.H. Bradley Seconded to Manitoba

At the request of the Honourable Leonard S. Evans, Minister in charge of the Manitoba Bureau of Statistics, Mr. R.H. Bradley, Chief, Comparative Living Costs Section, Prices Division, Statistics Canada, is on loan to the Manitoba Government for a period of one year commencing July 1, 1972. Mr. Bradley will assist in the organization of the new Manitoba Bureau of Statistics, which is established on legislation closely resembling the federal Statistics Act, and permitting maximum co-operation between the provincial and federal agencies.

It is not the intention of the Manitoba Government to duplicate in any way the work done by Statistics Canada but rather

to make fuller use of the data available from Statistics Canada, and to assist wherever possible in collecting the required statistics for the use of all Canadians. Initially, emphasis will be placed on participation in the co-operative federal-provincial 1971 Census Data Access Program.

Mr. Bradley comes to the Manitoba Government with an extensive background in the fields of public utilities, transportation and price statistics, and with considerable experience in statistical compilation and collection. Before leaving on his new assignment, Mr. Bradley, aided by the staff of Provincial Liaison and Consultative Services, studied the various areas of Statistics Canada's operations which are concerned with federal-provincial statistical activities.

I. McWhinney Retires

Miss F. Isabel McWhinney of the Prices Division, Statistics Canada, retired at the end of June from her position as Chief of the Family Expenditure Section. A graduate of the University of Saskatchewan, Miss McWhinney joined the Public Service of Canada in 1936 in the Census Division of the Dominion Bureau of Statistics (now Statistics Canada). Her 36-year career in the public service was almost entirely with the bureau, where she rose steadily through positions of increasing responsibility.

During the period from 1940 to 1956, her progressive contributions in the field of prices were impressive and wide-ranging, covering wholesale, security and farm indexes. In 1956, Miss McWhinney became Chief of the Family Expenditure Section — a group established to develop and implement a program of continuing biennial surveys of families and their expenditure patterns. Beginning as a series of small-scale urban surveys, the program was aimed at providing needed data on expenditure levels and patterns of characteristic family groups, according to income, family composition and other characteristics. The build-up of continuing expertise and methodological improvements also formed the essential base for Canada's first successful **national** survey of family expenditures, in 1969, covering farm, rural non-farm, and small and large urban centres. Miss McWhinney's leadership and professional guidance in this very difficult type of survey were essential and substantial.

Her legacy to her colleagues is the demonstration that not only can difficult tasks be very successfully undertaken, but also that they can be borne more easily with a penetrating wit and a gracious concern for others.

Appointments

T. Collier, former Provincial Liaison Officer in Edmonton has been appointed Assistant to Mr. V.R. Berlinguette, Director General of the Economic Statistics Branch.

L. Sonkodi, former Chief, Wholesale Trade Section, Merchandising and Services Division, joined the Fisheries Services, Department of the Environment, as a Senior Marketing Economist on April 1, 1972.

A. Jordan, has been named Assistant Director of the Computer Systems Development Division with responsibility for the systems

and programming work for the Administration, Economic Accounts, Financial Statistics, and Methodology and Systems Branches. A native of England, Mr. Jordan has been involved in systems analysis and development for many years. His most recent position was Manager of Systems Development for Canada Permanent Trust.

J.G. Stinson has been appointed Chief, Data Dissemination Section, Census Division. Before taking this position, Mr. Stinson was Statistics Use Development Officer for the Vancouver region.

E.M. Murphy has been named Chief of Regional Research of the Regional Statistics Research and Integration Staff, Integration and Development. Dr. Murphy had been Chief, Data Dissemination Section, Census Division.

F.G. Boardman has retired from his post as Chief, Demographic and Social Characteristics Section, Census Division.

A.D. Holmes, Director of Prices Division, who has completed 35 years of service with the bureau, is resigning from his position effective September 1, 1972. However, before his retirement, Mr. Holmes has consented to stay with Statistics Canada to undertake a special assignment — a comprehensive study of Canadian price statistics research and development. This study will concentrate on unresolved conceptual and methodological issues in price measurements but will also deal with the scope and nature of future price statistics programs.

W.M. Illing has been appointed Director of Prices Division, replacing Mr. Holmes. Mr. Illing comes to Statistics Canada from the Economic Council of Canada. At the Council, Mr. Illing had been engaged in economic analyses in various areas including housing, labour, industry, wages and prices. He was also involved in the CANDIDE econometric model project, having responsibility for several blocks — prices, employment, wages, demography and labour force.

Census Geostatistical Areas*

The traditional function of the Census Division's Geography Section is to delineate the statistical areas for the collection and presentation of census data. The areas created or adopted are used in all publications and computer print-outs produced by the census. The object of the following report (1) is to show how the section established a coherent system of statistical units at the national level, at the same time respecting the obligation to provide the provinces with data on as many types of areas as possible which they consider official.

Statistical areas can be classified in two ways: according to their hierarchical rank in the territorial subdivision; or, according to the extent of participation of Statistics Canada in determining their boundaries. In this report, we shall choose the first approach and, as we go along, specify in each case the degree of the bureau's participation.

Provincial Level

The most complicated data and cross-classifications are available at the provincial level. In addition, for certain more complex tables, and also for the breakdown of long tables into bulletins, Canada has been divided into six regions. Three of these regions, Quebec, Ontario and British Columbia, contain one province only. The Maritimes and the Prairies correspond to the traditional concept, and the last region groups the Yukon and Northwest Territories.

Multimunicipal and Intraprovincial Level

For census purposes, there are three main types of areal divisions in the provinces, all comprising individual municipalities. These areas are neither equivalent to nor comparable with one another because they were established for different purposes.

(1) Electoral Purposes

Through the Representation Act, the federal government divides the provinces into electoral districts. These electoral districts serve as a base for the creation of enumeration areas which are used for the collection of census data. Thus, although electoral districts are not statistical areas, the census must recognize them and provide data for them. In fact, the "legal reason" for the decennial census is to determine changes in population distribution as a basis for the revision of the federal electoral map. For the 1971 Census, the total population count, and the population count of the previous census, within each electoral district will be published (catalogue number 92-703) so that an historical comparison can be made. Distributions of the population, on the basis of age, marital status, language etc. for each electoral district will be available at nominal cost on special data sheets.

(2) Administrative Purposes

The provincial governments of Prince Edward Island, Nova Scotia, New Brunswick and Quebec have divided their territory into units called "counties". In British Columbia, a recent revision of the administrative structure led to the creation of regional districts which are considered, for statistical purposes, as equivalent to counties. In Ontario, in addition to the traditional counties, there

are "regional municipalities" and "district municipalities" which are treated as counties in the tables.

In some provinces, there is no administrative level between the province and the municipality. This is why Statistics Canada, in collaboration with the provincial governments, has created census divisions in Alberta, Saskatchewan, Manitoba and Newfoundland for which it provides the same data as for counties.

On the whole, counties and their equivalents are stable units which are very useful for the preparation of historical series. However, it will be impossible to make a comparison between the former divisions and the new regional districts in British Columbia, except for the total population counts.

(3) Statistical Purposes

Statistics Canada determines the boundaries of census *metropolitan areas* and census *agglomerations*. These are also multimunicipal entities which, unlike the others, exist only in major urban centres and their fringe areas. They are used in presenting data for urban areas where the municipal boundaries are too arbitrary for data by municipality to be meaningful.

Census Metropolitan Areas — A metropolitan area for census purposes is the main labour market for a densely built-up area with a population of 100,000 or more. It corresponds to the commuters' area. Since there was no place-of-work data available when the delineation was made, the following criteria were used as a basis: distance to the built-up area, structure of the labour force, and population increase. Only complete municipalities or subdivisions are included in a census metropolitan area.

The systematic application of constant criteria within the country raised two problems: comparability and uniformity. The problem of comparability stems from the difference between 1966 and 1971 boundaries. However, a bulletin will give the population count of the previous census for the 1971 delineation.

The problem of uniformity stems from the reaction of local governments. More and more, large cities or urbanized areas have planning boards, which are large users of statistical data. These agencies would like to see their planning regions or areas recognized. However, the criteria for delineating planning regions differ from one area to another. To compare data of one urban area with those of another, Statistics Canada had to use constant criteria, sometimes at the prejudice of local interest(2).

Many tables are available for census metropolitan areas. However, several breakdowns of these areas are adopted depending on the amount of detail in a given tabulation. Often only totals for the entire metropolitan area are given; sometimes a distinction is made between "urbanized core" and "fringe", that is, the remainder of the metropolitan areas; and, in some cases, statistics are shown for each municipality within the metropolitan areas. The publications provide more details by metropolitan area than by county (or division) but less than by province. There were 22 metropolitan areas for the 1971 Census, compared with 19 in 1966, the new ones being Chicoutimi-Jonquière, St. Catharines-Niagara and Thunder Bay.

Census Agglomerations — The census agglomeration concept closely resembles that of the census metropolitan area because it

* A number of printing errors in the April issue necessitated the reprinting of this article.

deals with urbanized areas only. However, the difference lies in size and in some delineation criteria. The population of agglomerations ranges from 2,000 to 100,000 whereas in metropolitan areas, by definition, it is 100,000 or more. For the delineation of census agglomerations, only the first step used for the delineation of census metropolitan areas is applied; that is, inclusion of the municipalities completely or partly located in the continuous built-up area. First, a study is made to determine whether, outside an urban municipality with a population of 1,000 or more and a density of 1,000 or more persons per square mile, there is densely built-up area with a population of 1,000 or more and a density of 1,000 or more inhabitants per square mile. In such a case, the central urban municipality and the built-up fringe are considered as the urbanized core of a census agglomeration. The area of any complete municipality or other subdivision which satisfy these criteria is included, wherever possible in the census agglomeration.

In 1966, the delineation of agglomerations with populations ranging from 2,000 to 100,000 had already started. However, they had different names depending on their size. Agglomerations where the central city had a population of 25,000 or more were called "major urban areas" and their data appeared in the regular publications. Agglomerations with 25,000 or less were called "urban areas" and data were available in special tables, only by request. Furthermore, the 1966 urban areas were only parts of municipalities which made it difficult to make comparisons with data from sources other than the census.

For the 1971 Census, 86 agglomerations were delineated. Availability of data by census agglomeration depends on the size of the agglomeration. Data for agglomerations of 25,000 will appear in the regular publications. Data for agglomerations of 25,000 to 10,000 will be available in special tables in the form of computer print-outs and more restricted variables will be available in this form for agglomerations of fewer than 10,000. However, a special bulletin will give selected variables for all the census agglomerations in Canada.

Municipal Level

The census provides large amounts of data by municipality. However, municipal boundaries often change from one census to another because of amalgamations and annexations. The "Historical" bulletin (catalogue number 92-702) gives the population count of the previous censuses for each municipality. For each census, the boundaries in effect at the date of that census are used for the population count. When boundary changes affect the comparability of data, footnotes give the explanation of the change that has taken place. In addition, the Geography Section publishes an annual report on the changes in municipal boundaries which gives the 1966 population and area of the annexed region. These two procedures tend to reduce the problem of the comparability of historical data by municipality.

(1) Cities, Towns, Villages and Other Municipalities

The criteria determining whether a municipality is a village, town or city vary from one province to another. Nevertheless, the census respects this distinction in its publications, although consider-

ing these three types of municipalities as equivalent. The same procedures apply to the five boroughs of metropolitan Toronto.

The municipalities to which departments of municipal affairs have not conferred the status of city, town or village have names which vary from one province to another. The following is a list of a few types of municipalities and the provinces to which they apply.

Parish	: Québec, New Brunswick
Rural municipality	: Manitoba, Saskatchewan
Township	: Québec, Ontario, Prince Edward Island
Improvement district	: Alberta, Ontario
Municipal district	: Alberta, Nova Scotia
Local improvement district	: Saskatchewan, Newfoundland Northwest Territories, Yukon
County	: Alberta (not to be confused with the county at the multimunicipal level)

For statistical purposes, all these municipalities are considered equivalent and their names synonymous.

Most of the tables published do not include all the municipalities because there would be too many. Tables are generally prepared for the cities, larger towns and villages and other municipal subdivisions of similar size. However, in many cases, the data for the smaller subdivisions are available on request.

(2) Other Census Subdivisions

The term "subdivision" may sometimes have a more limited meaning than a municipality and describe a statistical area created by Statistics Canada in co-operation with the provinces. In some provinces or territories such as Newfoundland, the Yukon and Northwest Territories, there are vast areas which have not been organized into municipalities. Since it may not be sufficiently useful to give only a single total for such large areas, the bureau, in co-operation with the provinces, has subdivided these territories in some cases. The resulting subdivisions have neither administrative nor legal status but serve as equivalents for municipalities for statistical purposes only.

Nova Scotia is a somewhat special case. In this province, each county contains cities, towns or villages but the rest of its territory constitutes a single rural municipality called a "municipal district". The bureau has also established subdivisions in these municipal districts of Nova Scotia in order to maintain comparability with the provinces which have a large number of rural municipalities or whose unorganized territory has been divided into subdivisions by the bureau.

Municipalities sometimes change boundaries from one census to another. The same phenomenon occurs, although less frequently, in the case of census subdivisions. Hence, the 1971 Census data will be based on new subdivisions in Newfoundland and British Columbia.

(3) Unorganized Territories and Indian Reserves

Most of the provinces — except New Brunswick, Nova Scotia and Prince Edward Island — have territories which have not been organized into municipalities. When this territory is not divided into census subdivisions, the data will appear as a total for the

"unorganized" portion of each county or its equivalent. To permit a more detailed study of these unorganized territories, the bulletin on unorganized townships gives data for areas which were originally established exclusively for surveying purposes in the Prairies and in northern Ontario and Quebec.

Indian Reserves have a special place in the hierarchy of census statistical areas. Indian Reserves do not have municipal status but they are counted separately even if they are located within the geographical limits of a municipality. In the published tables, data for all Indian Reserves in a given county or census division are combined and presented as for a separate "municipality".

Intramunicipal Level

Most of the statistical areas mentioned so far have been delineated by agencies other than Statistics Canada, but the bureau has adopted or recognized such delineations. Up to the 1941 Census, it was felt that the most detailed level for which statistics could be produced was the municipal level. Since then, there has been a trend toward giving increasingly more detailed information on areal units. This stems from the fact that users are conducting more and more detailed studies and wish to get away from the arbitrary framework of municipal boundaries. In considering the intramunicipal units, we shall proceed from the largest to the smallest.

(1) Census Tracts and Area Aggregates

Since 1941, metropolitan areas and other urban centres of 50,000 or more have been subdivided into census tracts – small statistical areas of comparable population, clearly defined physical boundaries, and homogeneous socio-economic characteristics. The boundaries of these tracts have varied from one census to another according to changes in population distribution and in highway and railway patterns. However, the 1971 Census saw the establishment of a numbering system which will make it possible, through suffixes, to integrate future changes and also to facilitate the preparation of historical series. Conversion tables have been prepared for previous years, which will make it possible to go as far back as the origin of census tracts. (For details on the definition, the method of delineation, and the role of local committees in the delineation of census tracts, see the *Census Tract Manual*, available from the Geography Section, Census Division.)

Each census tract is identified individually by the geographic code. For each census tract city or metropolitan area, a special bulletin will provide a substantial number of variables by census tracts. (See the Census Tract Series in the *1971 Census Catalogue*, number 11-500.) There will also be special computer summary tapes for the census tracts as well as data on computer print-outs.

The census tract is a purely urban statistical area. When summary tapes were prepared for the 1971 Census, it was realized that the enumeration area level would be too small to guard confidentiality in detailed tables. Nor could the problem be resolved by using the municipal level because some municipalities, especially in Quebec, contain only one enumeration area. Hence, there was a need to establish a coherent system of statistical areas at a level comparable to a census tract, but covering the whole country.

Each unit, called an "area aggregate", has a population ranging from 4,000 to 6,000, approximately comparable with a census tract. Its boundaries must respect a number of other statistical units according to lists sent to us by users, particularly by the provinces. They do not necessarily follow municipal boundaries but, in areas divided into census tracts, they will preferably follow such boundaries. The "area aggregate" may prove very valuable in the preparation of historical series, since the intention is to keep boundaries permanent.

No publication will give data for "area aggregates"; the sole purpose of this statistical area is the summary tape program.

(2) Enumeration Areas

The entire organization of the census is based on the delineation of enumeration areas. These areas usually represent the territory an enumerator can cover in the period assigned to him. Several criteria are considered in the delineation of enumeration areas:

- population: maximum of 200 households or 100 farms;
- boundaries recognizable in the field: waterways, railways, roads;
- homogeneous rural or urban character;
- easy accessibility to every part of the territory;
- respect for the boundaries of other statistical or administrative areas.

The first population counts are made by enumeration area. However, no data are published on this basis; the data will be made available in the form of computer print-outs, special tables or microfilm. Another important dissemination medium will be computer summary tapes containing tabulated data by enumeration area, from which the user can build, with the use of a computer, the area required.

Although data are available for these levels, enumeration areas are nevertheless more operational units than statistical units, because they are not stable enough to permit historical comparability. At every census, the boundaries and the numbering of enumeration areas change since the essential factor of delineation is the population size in relation to the enumeration workload. The Geography Section is preparing conversion tables in order to follow the enumeration areas from one census to another.

The boundaries of enumeration areas sometimes surround, sometimes include, unincorporated places of five or more dwellings within rural municipalities, known locally by a specific name but not officially delineated, or administered by a municipal council other than that of the neighbouring municipality. The data for these localities are not so precise as for the other statistical areas because the enumerators delineate their limits based on locally-recognized boundaries. Population counts will be available for unincorporated places of all sizes. For places with populations of 50 or more, data will be published in a special bulletin (catalogue number 92-771). The population counts of places with less than 50 people will appear only on an unpublished print-out. If an unincorporated place is large enough to comprise one or more enumeration areas, data other than population counts may be available as well.

(3) Geocoding Units

The smallest statistical unit defined by the Geography Section is the block-face to which is assigned a centroid identified by co-ordinates where the data are stored. After describing the co-ordinates of a given area, all the centroids it contains can be determined and a number of data can be retrieved. However, the data are never tabulated for individual block faces and the centroids are, in reality, "building blocks" to define user-specified areas. This new system of building blocks applies to only 14 urban centres in the 1971 Census. For the remainder of Canada, the basic geocoding unit is still the enumeration area.

Conclusion

The present article has tried to present an over-all picture of the geographical and statistical areas used by the census for presenting its data. All the terms mentioned will be defined in the Dictionary of the 1971 Census Terms and will be used for access to information.

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- (1) *This article is taken from a paper by Dr. F. Ricour-Singh, Geography Section, Census Division, Socio-Economic Statistics Branch, Statistics Canada, Ottawa, K1A 0T7. More information on this topic may be obtained from the Chief of the Geography Section and/or the author.*
- (2) *For further details on the criteria and their application in special cases, refer to the document "Census Metropolitan Areas, Revision of the Delineation, Concepts and Criteria for the 1971 Census", available from Geography Section, Census Division, Statistics Canada, Ottawa, K1A 0T7.*

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