

THE TESTING PROGRAMME FOR THE 1971 CENSUS IN CANADA

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1. INTRODUCTION

Data on Canadian population have four somewhat unique, or at least rare, characteristics. First, they are based on the longest series of modern censuses stretching back just over 300 years.^{1/} Of uneven territorial coverage, of uneven subject-matter content, without legislative basis until 1841, the censuses were nevertheless being taken with remarkable frequency and make up to date an impressive list of 441 enumerations (7, p. vii). Secondly, the data refer to a population which among all the Western or developed populations had for most, probably all, of the historical period the highest fertility and consequently the highest proportions of children (21, p. vii). Thirdly, Canada conducted in 1956 and in 1966, between the main decennial censuses, national enumerations, even if with a rather limited subject-matter content.^{2/} Finally, all this wealth of demographic material has been used and analyzed to an extent which until a few years ago could be described only as modest, though the recent quickening of interest in problems of demography and social survey methodology in federal government departments, provincial governments, universities and research institutions, will soon, no doubt, fill this gap.

The testing programme for the next censuses in Canada should be viewed as part of this general development. Many previous censuses had their own test operations, particularly when departures from earlier content or earlier procedures were considered (e.g. 8, p. 17). These tests were held typically some 18 months before the census day. On occasions they could involve numbers as high as 100,000 persons. They were largely in the nature of dress rehearsals after which only minor changes were possible, i.e. they were not investigational. In particular three innovations should be mentioned which required extensive testing: the predistribution of the Agriculture Questionnaire in 1951, the partial completion of which must have lessened the enumerative burden on the enumerators; the introduction of mark sensing in 1951 with consequent machine reading and the postal check on a national scale in 1961 in urban areas which had appropriate mailing service.

In any case, these and other tests made their contribution to the gradual improvement of the census procedures and census results without, however, departing from the basic method of a door-to-door canvass and enumeration through interviews. An exception to this statement is the sampling form in 1961 which was dropped off by enumerators, completed with regard to the sensitive subject of income (it also included fertility and migration) by the respondent and then picked up by the enumerator. One of the most important improvements was due to the establishment of eight permanent Regional Offices after the last war to conduct the monthly Labour

Force Survey. At the same time these offices became the focal points of the census-taking activity as well, resulting in an undoubtedly better selection, training and control of the census enumerators. Another major improvement was due to the gradual emergence of a more conscious and better-oriented training programme.

1.1 Motivation of experimentation

The first serious effort to measure errors in a Canadian Census was made in 1956. Much more ambitious programmes were mounted in 1961 and 1966 and more realistic estimates of coverage and content errors were obtained. Projects designed to evaluate the 1966 Census are the subject of the second paper of this session. Hence, they will not be discussed in the present paper. It should be noted, however, that the evaluation programmes of the 1956 and 1961 Censuses had a considerable impact on our thinking (9, 10, 13, 18). We were surprised to find that our censuses, after all the hard work that went into improving them, failed to enumerate 2.5-3.0 per cent of the population and that, in fact, the per cent under-enumeration went as high as 10 per cent for a few critical age-sex groups. We were surprised to find that the response variance of the census statistics on such questions as education, labour force status, industry and occupation was about as high as the sampling variance would have been with a 25 per cent sample (13). In addition, of course, these statistics were also subject to response biases as well. By far the largest portion of this response variance was accounted for by the so-called correlated response variance (16), i.e. roughly speaking the component due to the effect of an enumerator interviewing a substantial number of households (about 150 households were enumerated by one enumerator). In the 1961 Census we have used sampling to a limited extent, but it is substantially true that most of our census statistics had no sampling error but substantial response errors. Any cost-benefit analysis would indicate, that if we were able to reduce the response errors substantially at the price of introducing some controllable amount of sampling error, we would be better off.

We need not emphasize to this audience that the last ten years saw not only the development of some key experiments and important mathematical models leading to a better understanding of the limitations of our censuses, but it was at the same time a period of enormously increasing utilization of census statistics. Further, not only have our users become more numerous — they have become more sophisticated as well. Their needs are: more precise census statistics (even for relatively small areas and/or special sub-populations), measuring more characteristics, available sooner, available in various different forms (in published table form, on tape, on punch cards, in the form of graphs), capable of being followed up

by special surveys and linkable with other data. It was considered essential to ensure that the 1971 Census incorporate a number of methodological changes to meet the requirements of census users during 1972-76.

Two of the impulses leading to our programme of experimentation have been mentioned so far: efforts to improve understanding of the census-taking process and the needs of users. A third important impetus should be mentioned: the experiments carried out by the Bureau of the Census. These experiments demonstrated that:

- (a) it is feasible to establish an urban address register;
- (b) the Post Office can collaborate in materially improving such a register;
- (c) such a register can effectively be used for sampling purposes;
- (d) if a census form is mailed to addresses on the register, then a large proportion of householders will complete the questionnaires in a machine-readable form, with relatively little follow-up; and
- (e) that such a mail census with follow-up holds out important possibilities for reducing the response errors and at the same time making some gains in reducing the coverage errors.

The advantages and disadvantages of self-enumeration have been widely discussed (2, 33). We would like to emphasize only those of the advantages which loomed high in our thinking:

- (i) the enumerators' contribution to the response variance should decrease sharply since the role of enumerators is restricted to follow-up;
- (ii) the early return of mailed questionnaires to a central office 3/ permits an independent edit in time to trigger off an early follow-up, where necessary; this, we think might reduce both the response variance and the response bias;
- (iii) each adult member of the household is able to answer the census questions for himself;
- (iv) respondents are able to consult records;
- (v) the publicity campaign can be made to "peak" during the mail-back period;4/
- (vi) the cases of non-contact might be reduced for people who are difficult to find at home but whose mail will reach them, a consideration particularly important in view of the increasing proportion of women participating in the labour force;
- (vii) coverage errors might be reduced, since

each household would have several chances of being included in the census: during the preparation of the address register, during its improvements through subsequent (mainly, post office) checks and through the intensive probing during the enumeration process;

- (viii) the address register, in machine-readable form, can facilitate geographic tabulations in table or graph form, it can facilitate linkages of census data with data from other sources and it can facilitate the taking of special follow-up surveys.

There was, clearly, a method of census-taking emerging, which held out important promises, at least in urban areas.5/ Throughout the first half of 1966, discussions were held which led to the decision about midway through the year to conduct an experiment using this method.

1.2 Some "boundary conditions"

The problem of developing, testing and implementing a new method of census-taking had some restrictions and conditions attached to it. To borrow a mathematical phrase, these were the "boundary conditions" of our problem.

The first unalterable condition was, naturally enough, that a census will have to be taken on June 1, 1971. Working backwards from this date, it appeared that by the middle of 1969 the method of census-taking, the content of questionnaires and all the important features of the field work will have to be "frozen". At this point a dress rehearsal will be held, but no major changes in procedures. The developmental and testing process will have to be carried out, therefore, during a two-year period.

The second "boundary condition" was the limitation of staff. In mid-1966 when the green light was flashed for testing, there was no organization or personnel available for full-time work on the test programme. The regular staff of the Census Division was working full steam on the processing and publication of the 1966 mid-decade census. A nucleus of full-time staff was borrowed, others had to squeeze in some part-time work. This staff situation in a very real sense determined the pace of our testing programme. The first test could not be scheduled for earlier than the fall of 1967, with a second series of tests in 1968, and finally the dress rehearsal of 1969. This schedule put a very heavy burden on the 1967 test. In fact, the 1968 tests will have to be planned largely, without the benefit of the results of the 1967 test being available.6/

1.3 Plan of the paper

After these introductory remarks the remainder of the subject will be discussed under four headings: an outline of and comments on the specific method of census-taking which was tested in September 1967; an outline of the evaluation programme carried out in conjunction with this test; comments on alternative methods of producing an

address register; and a brief discussion of some of our future plans.

2. REASONS FOR AND OUTLINE OF THE LONDON TEST

2.1 Reasons for the specific type of test

The methodological changes which have to be tested before they could be relied upon include:

- (a) self-enumeration with or without use of mail;
- (b) use of address registers;
- (c) automatic geographic coding;
- (d) new computer hardware, including especially input devices; and
- (e) new computer software.

Long discussions were held, and several position papers were written, covering a very large number of logically possible alternative methods of conducting and analyzing census tests. Without closing our eyes entirely to other methods, alternatives compatible with the main aspects listed above were chosen on grounds of intuition, common sense and experience elsewhere, mainly in the U.S.A. The impact of any major methodological changes on operational procedures and subject-matter content also needed testing. Such impact would be felt on field edits, the flow and handling of questionnaires, production of manuals, training and organization; all creating new problems and requiring new attention. Not all of them could, or indeed should, be tested in one 1967 test.

There was however no difficulty in selecting the obvious corner-stones for the structure of the testing programme. They were four in number:

- (i) construction of an address register;
- (ii) mailing-out and mailing-back of questionnaires;
- (iii) self-enumeration on a questionnaire of sufficient length and complexity; and
- (iv) locally organized editing and follow-up procedures to deal with total non-response and partially (and/or inconsistently) completed questionnaires.

Naturally, these corner-stones would provide the opportunity for testing a host of other aspects, some of which have already been indicated briefly in paragraph 1.1 above, but it was understood that they would have to give way, if pressure of work and need for other attention, did not permit going outside these four main purposes.

Clearly, such purposes excluded testing in remote areas with no mail delivery, in areas where the construction of address registers would be prohibitively expensive, and in areas with population centres so small that it would be uneco-

nomical and unrealistic to organize a local office for the centralized edit and follow-up.

The questionnaire eventually used was a householder questionnaire, rather neat and FOSDIC readable. It was of two kinds: short with only basic questions for every household and a long one for one in every four households with two facing pages per individual and well over 70 questions, many with several sub-questions.

2.2 The London Test

The town of London in Ontario was selected out of eight candidates of comparable population size because of several characteristics which made it attractive for testing purposes. Its size (about 200,000 persons), its owner-tenant ratio (close to the national average), its considerable industry and occupation diversity, and its higher-than-average proportion of converted dwellings rendered it an attractive site for the test. Its low ethnic diversity made it unrepresentative, but it was decided to take on this problem at the next round of tests.

In the event the preliminary and impressionistic opinion is that we have chosen "too well". The co-operation of the public and local authorities was of a high order. The publicity given and received was favourable and positive. There was an eagerness on the part of the public to help. Just over 85 per cent of questionnaires were (3) returned by mail, the great majority within a few days. This compares favourably with results obtained in similar tests in the U.S.A. (4, 31). The Telephone Answering Service gave assistance to almost 7 per cent of householders (3) which is higher than expected (6, 17). This again can be taken as an indication of the public eagerness to do well. The selection of an "orderly" city was intended to give the test a better than a fair chance to become an operational success. A very low response rate would not only knock out the cost-benefit basis for a mail questionnaire, but would also probably knock out the whole idea altogether by showing that the Canadian public is not prepared to deal with a mail census.

Within the proportion returned by mail the proportion acceptable without further field work is the next factor determining the economics of the new method.

Within the proportion which fails edit specifications, the proportion of incomplete or inconsistent questionnaires which can be cleared through the telephone and which consequently requires no costly personal visit follow-up is the third important factor determining the economics of the new method. There are proportionately fewer telephones in Canada than in the U.S.A., but according to the telephone companies Canadians speak more and on the average, longer than natives south of the border. It cannot a priori be said whether the lower density will be made up by the apparently greater volubility or talkativeness and, therefore, ensure an economic follow-up by telephone.

It is not the purpose of this paper to dwell at any length on the complexity of the operations in the local office. To raise a large labour force at short notice for short periods, to train it in a large number of varied and complex tasks under supervisors who themselves are unfamiliar with the tasks (consider the setting of rates of pay as an example of the variegated problems), to design and work an organization which will process tens of thousands of pieces of paper, each with hundreds of entries, through many different steps, in many different places — these were all no mean tasks to be performed. The satisfaction that these unaccustomed labours can be carried out satisfactorily had to be secured.

It goes without saying that however successful a test may be as an operation and however promising its economics, it must first of all give satisfaction on two points: there must be improved coverage and a higher quality of subject-matter content.

2.3 Important differences between Canada and the U.S.

In a number of ways Canada is similar to the U.S. This is a source of great help to us, since it enables us to learn effectively from the numerous experiments conducted by the Bureau of the Census in the field of census-taking. We can avoid proven pitfalls and follow up the avenues that appear promising in the US experiments. Our colleagues in the Bureau of the Census have given us of their time and experience unstintingly, invited us as observers to their field trials and discussed with us with complete frankness both their successes and their failures. However, there are, in spite of the great similarities, important differences between Canada and the U.S. We shall list a few of the differences which are most significant from the point of view of census methods.

Our census has to be bilingual. Every citizen is entitled to complete his questionnaire in either of the two official languages. This means that if we want to have a mail census, then in certain parts of the country we have to mail out in the same envelope both an English and a French questionnaire.^{7/} Doubling the amount of paper to be addressed and mailed causes operational problems but, more importantly, it may cause some response problems as well. The long form is long enough as it is and it may well frighten some potential respondents. Two long forms, even if one of them can be thrown away, may be the straw that breaks the camel's back. There may well be some problems in the office as well since questionnaires have to be sorted by language for edit as well as telephone or field follow-up.

A second problem relates to the Canadian winter and to the fact that there is no commercial mailing list. There is no commercial need for it since our Post Office is willing to distribute un-addressed advertising material to householders. We have to prepare therefore our own mailing list. This means that we have to have in the urban areas

two distinct field operations: first a listing job,^{8/} then the mail-out, mail-back census with field office edit and follow-up. One operation cannot smoothly blend into the other since after the listing of addresses and before the mail-out we need several months to key-punch these addresses, prepare the appropriate workloads, implement one or two Post Office checks. For a census date of June 1 the ideal listing time would therefore be some time in February or March. The Canadian winter being what it is, one tries to avoid extensive field work during these months. In fact, the last convenient opportunity is during October of the previous year. This has its disadvantages, however, since our list likely becomes more outdated during those eight months than it would be during three or four months.^{9/} We have to rely on other sources, primarily the Post Office to update our register, although some of the probing questions on the questionnaires themselves will hopefully improve coverage.

A third important difference relates to scale which this time works primarily to our advantage. The permanent field force of the Bureau of the Census has, as its prime function, the conduct of the Current Population Survey. Similarly, the main task of our permanent field force is to take the Labour Force Survey. These two household surveys have similar objectives and standards. Sampling being the undemocratic discipline that it is, we need about the same sample size as our American colleagues in spite of the fact that the Canadian population is only about one-tenth as large. This means, however, that we have about ten times as high a sampling ratio, ten times as large an experienced field force per capita. This field force can do the bulk of the October listing job, minimizing the problem of hiring and training for this additional task that we have. Equally as important, we may well be able to rely on the permanent field supervisory personnel to run the census field offices.

A fourth important difference relates again to scale, but this time it is disadvantageous. Planning top management and analysis is very little related to the scale of operations. Consequently, the per capita investment on this type of activity has to be much higher in Canada than in the U.S.A. This difficulty, as indicated earlier, is somewhat relieved by the possibility of drawing on the experiences of our professional colleagues elsewhere, particularly south of the border.

3. EVALUATION PROGRAMME OF THE LONDON CENSUS TEST

The evaluation of the London Test will, of course, be carried out on many fronts. Very important aspects of it will be based on judgement and observation: how orderly was the operation, were instructions followed, was it possible to adhere to the timetable of operations, could this timetable be condensed in some fashion, could such an operation be carried out on a national scale, etc. This type of evaluation provides the earliest assessment of the operation. Another key indicator, also available very early, is the response rate on short and long forms as well as the number of telephone and personal visit follow-ups on each.

The more formal evaluation of the test will be carried out under four headings. These are the evaluation of coverage, local office procedures, computer editing and content.

3.1 Coverage

A person or household can get into the count under the London Test procedures through five streams: the field listing, the quality control of field listing operation and some of the relisting triggered by the quality control, the advance Post Office check, the final Post Office check and follow-up which may be triggered off by responses to certain probing questions on mailed questionnaires.^{10/} One of the objectives of the coverage evaluation programme is to estimate the additions and deletions of basic addresses, subaddresses or households ^{11/} and persons from each of the five sources. Provision has been made to identify on the relevant records the source of additions and deletions. The total number of additions and deletions by source can also be tabulated by size of basic address, size of household, type of area (e.g., downtown versus suburban), etc.

An important aspect of evaluating the contribution to coverage of some of the operations is afforded by the quality control operations. The original field listing (¹⁵) was quality controlled as well as the advance Post Office check. The field listing was quality controlled through the relisting by supervisors of a sample of the more difficult blocks and the comparison of the supervisor's list with the lister's list (¹²). The advance Post Office check was quality controlled by withholding a sample of addresses originally listed and by checking whether the Post Office made up a "missed address" card for them (¹).

The key measures from the coverage point of view will, of course, be the proportion of persons and households finally added by the combined procedures listed above and estimates of proportions missed in spite of these procedures. The total number of households or persons added will be broken down into the number of households in added basic addresses, as well as the number added in partially enumerated basic addresses. We shall also estimate the impact of definitional errors on the count of households. Similarly, the number of all persons in added basic addresses, added households in partially enumerated basic addresses and partially enumerated households will be estimated separately. We shall also attempt to determine some of the characteristics of the added persons.

Parallel to the measures of basic addresses, households and persons added through the five main streams, estimates of basic addresses, households and persons missed in spite of these procedures will be given. Some of these estimates will be based on the Post Office quality control, but the basic tool will be the Post-Enumeration Survey (PES). A brief description of the design of the PES might be in order.^{12/}

The blocks of London were stratified according to the likely deficiency of the address register. The information for stratification was obtained by comparing the address register with other lists and noting the number of addresses on the other lists which were not on our address register. A stratified sample of 20 per cent of the blocks was selected. Within the selected blocks every second basic address was selected to yield a 10 per cent sample of basic addresses.

The first step of the Post-Enumeration Survey (coverage) was a very thorough field relisting of the basic addresses within the selected blocks about two weeks before the census date. This relisting of basic addresses will form the basis of our estimates of the number of basic addresses missed by the census as well as of the number of households and persons missed in completely missed basic addresses.

The next step in the operation was that of the reenumeration. The sample for the reenumeration consisted of the 10 per cent sample of basic addresses originally selected from the census address register plus all basic addresses which, on the basis of the relisting described above, appeared to have been missed by the census. Although from the point of view of sampling efficiency it would clearly have been advantageous, no subsampling was carried out within the basic addresses, since we felt that subaddresses and households are not sufficiently unambiguous to be used as sampling units (an exception to this rule was made in large, regular apartment houses). In fact one of the objectives of the reenumeration is to learn something about the definitional problems. The interviews and questionnaires were highly probing on coverage: both on coverage of persons within the households and on coverage of households at the same basic address. A series of questions were asked probing the de facto population as well.^{13/}

On the content side the only questions asked of everyone in the PES sample were related to age, sex, marital status and relationship to the head of the household. Two housing questions of some coverage importance were also asked. A substantial amount of reconciliation was carried out to clear up discrepancies on both coverage and content between the census and the reenumeration survey. In addition, a few weeks after the reenumeration all persons who were apparently missed by the census were reenumerated once again on the long questionnaire. The objective of this second reenumeration was to find out more about the characteristics of persons who were missed by the census.

3.2 Local office procedures

The following major activities are carried out in the local office or directed from the local office: mail check-in, edit of questionnaires, telephone follow-up, personal follow-up and coding. Ideally we would like to quality control all of these operations, but at any rate at least we would like to evaluate them.

The check-in of the mail returns, since it was obviously an absolutely key operation, was 100 per cent controlled, i.e. all mail returns were checked and all discrepancies were reconciled.

The quality control of the edit operation took the form of acceptance sampling at the work unit level, i.e. all rejected work units were re-edited and the editors concerned were retrained. Only six editors out of 70 were affected by the quality control intervention and it is doubtful whether this operation was worthwhile in terms of its impact on quality. The speed of editing was too great to be caught by control. At best of times, through quality control operations we can control and estimate the average outgoing quality. However, since this operation was carried out in the field office in the heat of operations, the records of the quality control operation do not provide us with refined enough tools to evaluate in detail the edit operation and its impact on the final product. For purposes of evaluation, therefore, a 10 per cent sample of the "short" part of the questionnaires was selected and reproduced (actually this was necessary anyway for the Post-Enumeration Survey as described above). These reproduced questionnaires were edited by the Head Office Staff after the close of the London Office. These specially edited questionnaires were then matched with the "short" pages of the original questionnaires which, by this time, were through the regular processing. A comparison of the original questionnaires with the duplicate copies will enable us to evaluate in respect of the "short" pages the work of the various sections of the local office since the editors, the telephone follow-up enumerators and field follow-up enumerators were all using pencils of different colour and their contributions can be distinguished from each other.

There is, at the time of writing this paper, no plan to evaluate the impact of editors on the long questionnaires and those housing parts of the short questionnaires which will be reproduced for PES purposes, though no doubt some manual study of their interventions will be evolved sooner or later. However, the study of the multi-coloured dots (the "tallies") described in paragraph 3.4, although directed mainly towards assessing partial non-responders, may coincidentally provide for each, or some questions estimates of the proportion of entries made by respondents, by editors, by the two kinds of follow-up and the proportion of entries left blank (the proportion of entries completed by respondents has an important impact on the response variance). It may thus provide estimates for each, or some questions on the questionnaire of the effect of the various operations in reducing the N.A. rate (i.e., the proportion of blanks which should not be blank).

3.3 Computer editing

No firm plans have been made for a formal evaluation of the set of computer programmes used for edit and imputation. We created some possibilities, however, which we intend to follow up and which might help us in assessing these pro-

grammes. While the editing programmes are being readied, specifications for the comparison of the questionnaire tapes before and after are being worked out. The intention is to obtain a count of the interventions of the editing programme.

The set of programmes will automatically and without manual intervention create a fully edited file and it will make all the imputations in the case of missing or inconsistent information. A summary will be obtained at the work unit level of all imputations made by the computer. On the basis of these summaries the subject-matter statisticians can decide to pass the work unit or to intervene manually. The programmes will be assessed from several different points of view. The first point is: do they deliver as good a job as clerks? Other important questions are: in what ways should the programmes be altered? How much imputation, at what area level, for what questions should subject-matter professionals let pass without review and at what point should they review the imputations? We think that the process itself of looking for answers to these questions will be very useful on account of its educational effect.

A more formal evaluation of the effect of these programmes on the basic demographic variables of age, sex, marital status and relationship to head of household will take place through a matching of the Post-Enumeration Survey records with the edited census file.

An interesting and very important problem relates to the computer assignment of family codes. A household, which typically will report on one questionnaire, may contain more than one family. The information on the questionnaire does not explicitly reflect all the possible complex family relations, only the relation of each member of the household to one person: the head of the household. Names would provide a useful indication but names are not available in machine-readable form. They will be used by manual coders in coding families 14/ and then checked with the mechanical coding of families based on the few relevant pieces of information available for everyone: age, sex, marital status and relation to head of household.

3.4 Content evaluation

A considerable number of tests of the content of the questionnaire have been considered. They can be conveniently described by being grouped under three headings: those which are not likely to be undertaken (e.g., 5), those which will be undertaken with high priority in order to provide data for the decisions affecting the remaining parts of the testing programme, and those which will be done more thoroughly but which are unlikely to have an early impact on the future testing programme. We shall only outline the projects which will or are likely to be undertaken.

There are several urgent, high priority projects. A quick tally will be made, question by question, of blanks on a small sample of ques-

tionnaires (up to five were permitted by editing instructions on non-essential questions), of imputations by manual editors, of completions by telephone follow-up, of completions by personal visit follow-up, of completions by non-response follow-up. The proportions under each question will be combined with observers' impressionistic reports. This will be the immediate basis on which questions will be redrafted, rearranged and relevant parts of the questionnaire design changed. A larger sample of questionnaires will be analyzed more intensively. Summaries from the editing at the microfilming stage may throw some modest light on some content issues. Questionnaires obtained in the monthly Labour Force Survey in London will be matched, item by item, with the questionnaires obtained from the same households in the Census Test (about 400 households are affected of whom 100 were enumerated on a long form in the Census Test). As indicated earlier the coverage PES questionnaire has a few entries of interest from the content point of view. They will be compared with the answers of the self-respondents and analyzed for their content implications. Questions which have shown themselves to be particularly difficult and ambiguous are likely to be tested in the field, with two or three alternative wordings, early in 1968 to give some input for the questionnaire content in the 1968 test(s). All these are modest endeavours but limitations of time and personnel make any wider action inadvisable.

A more ambitious programme is envisaged for the later part of 1968 and for 1969 with long-term implications, but it is unlikely that its results would have much impact on the remaining parts of the testing programme, except possibly on the last dress rehearsal in 1969.

4. EXPERIENCE WITH ADDRESS REGISTERS

As explained earlier the commercial address registers, such as are available in Canada, are not likely to be comparable in comprehensiveness with lists available in the United States. However, investigations into the possibility of existence of city directories and their qualities continue. A commercial offer has been received to build up a list but at a unit price so low that the possibility arises that the firm does not appreciate the high standards expected from such a list.

A preliminary enquiry directed to over 50 urban centres with a 1966 population of almost 7 million (or some 35 per cent of the total population of Canada) revealed that most of them maintain an assessment roll or an electric utility billing list, usually both (28). A fifth of the lists (counting by population size) is in a state not easily transferable into machine-readable form and a quarter is "not available to outside users". Only half of the managers of the lists are "willing to supply an extra copy". It is not necessary to enquire into the extent of overlap between the fifth, the quarter and the half, because it is not unreasonable to expect that should the purpose be explained more fully, most of the lists would become available. It remains to be determined ex-

perimentally whether these lists can be used for the purposes of the 1971 censuses either as the core of the address register or only to support and strengthen a register produced otherwise.

Two address registers have been built up in the Bureau mostly from administrative sources (20), and the evidence available with regard to these two address registers is described in the following two paragraphs. Inasmuch as both registers have been constructed in the towns of Ontario and inasmuch as the municipal assessment rolls are important elements in both lists it is not certain how far the experiences are valid for assessment rolls in other provinces with different legislative requirements for these rolls.

While these rolls appear to promise the biggest immediate pay-off, our eyes are not closed to the possibility of utilizing some other sources as well, such as voters' lists, building permits, demolition permits, completion records of the Central Mortgage and Housing Corporation, City directories, postal lists of deliverable addresses (11).

In connection with address registers, reference should be made to their great potential for uses other than as a vehicle to mail out census forms. At least two important potential applications should be mentioned. One relates to the automatic assignment of geographic co-ordinates to the addresses in the register and through the register to the census documents. This capability might add new dimensions to our ability to retrieve census data for user-specified areas. Geocoding is the topic of another paper presented at this session (14). The other important potential application of address registers is during the intercensal period as a sampling frame for current surveys. This latter potential application is, of course, contingent on our ability to keep the register up-to-date at a reasonable cost.

4.1 Kitchener-Waterloo address register

The address register for the two neighbouring towns of Kitchener-Waterloo was built up in 1966 from the 1961 Census lists of households, the current electricity billing lists and the current municipal assessment rolls. The detailed technical operations which led to it and the results have been reported upon in several memoranda (11, 19, 24, 25, 26, 27). It was no big discovery that the out-of-date 1961 Census lists of households contained only 65 per cent of the addresses on the joint list (26).

Of the two other sources the assessment rolls are clearly superior (90 per cent as against 83 per cent) but they still miss proportions too high to leave to the postal check to make up. We intend to investigate why some addresses on the electrical billings and in the census list were missed from the assessment rolls.

The 37,000 addresses in Kitchener-Waterloo were checked by the Post Office letter carriers against the slots which they have on their sorting tables. Although some action or another by the

letter carriers was required with regard to 6,000 addresses (e.g., there were apparently 2,000 duplicates), the genuine additions were a mere 2 per cent. However, because a third of about 1.3 per cent of addresses which were withheld from the letter carriers for quality control purposes were not reported as missing during the postal check it can be assumed that another 1 per cent has not been discovered (27).

4.2 London address register

The September 1966 listing of households in London already mentioned earlier provided not only the main source for the distribution of questionnaires in September 1967, but served also for the purposes of the study of address registers. The listing was carried out on principles very close to those of the monthly Labour Force Survey (15, 29).

Whenever possible the listing was to be done from external appearance, and enquiries inside households were not encouraged. The operation was quality-controlled in the hard-to-enumerate central part of the town (12). In such areas the over-all "error" rate was 12 per cent and some observers felt that this high rate could be combated only through enquiries inside the household.15/

In May 1967, the list was postal-checked and 4 per cent of new addresses were gained. Of addresses withheld from the Post Office (a sample of 1,319) almost a quarter was not reported as missing by the Post Office (1). It can, therefore, be assumed that there was another 1 per cent of addresses not found by the Post Office in this advance postal check.

The second postal check, conducted just before the D-day of September 12, 1967, added another 905 addresses, but missed again some addresses judging from the 264 householders who reported not having received mailed questionnaires and who were not on the address register.16/

A direct measurement of the completeness of the list will be attempted in the Post-Enumeration Survey. The address register has also been studied through a comparison with other lists in a manner similar to the study of the Kitchener-Waterloo address register (22, 30).

5. PRESENT PLANS

5.1 Further methodological tests

Address registers being the very cornerstone of any mailing operation, investigations into their reliability, alternative modes of building them up and their costing will continue. In some areas mailing is not feasible. In the absence of other suitable lists and on account of low population density, listing in such areas could be so expensive that only simultaneous enumeration could be considered with respect to short forms. In these areas we may have some experiments to drop off the long forms and ask respondents to mail them back.

In areas where mailing is possible, but a centralized operation to control editing and follow-up is not, a substitute method to carry out the editing and other operations from the back of the enumerator's car would have to be designed and tested. In such areas, the arrangements would have to be made through local talent and it would not be possible to reap the benefit of organization by our regional office personnel. The population concerned might be as much as 35 per cent of the country, if we exclude the 45 per cent in the 17 metropolitan areas and the agricultural or rural areas with, say 20 per cent where the need to take a Census of Agriculture simultaneously creates special conditions and requirements.

There is a host of methodological tests which, though important, are not likely to be undertaken because of shortage of personnel: publicity (the public relations circumstances of a national census cannot be satisfactorily simulated for a local test), questionnaire format and design (linear, columnar, page-per-person, etc.), influence of training (which type is effective with what kind of people?).

5.2 Content of questionnaires and mode of controlling its quality

Alternative wordings for several questions, where there is reasonable hope for some tangible results, are likely to be tried. A few new questions are likely to be tried on an experimental basis. These endeavours will be carried out in the two official languages of the country.

The attempts to discover the influence of editing instructions (both manual and mechanical) have already been described earlier, as well as other investigations leading to the assessment of the meaning of census questions and answers (e.g., 23). Another important question to which no answer will probably be available in time to formulate the 1971 plans is how to strike the balance between the expense of editing and the resulting content of the questionnaires. High-quality editing triggers off follow-up directly and proportionately.

5.3 Census users and their contributions

The main endeavours in the determination of questionnaire content are user-oriented. Same goes for the outputs, but these are too important topics to be treated at the end of an already too long paper. A separate section in the Census Division has been recently established to develop the understanding of users and our understanding of their needs.

FOOTNOTES

- 1/ The first nominal census of Canada was taken in 1666 and covered the then European population of 3,215 persons enumerated (8, p. 9).
- 2/ In the middle of the four earlier intercensal periods such censuses were held only in the Prairie Provinces experiencing then high migration.

- 3/ At least where the functioning of such a central office is a feasible operation. Where due to low density it is not practicable, edit decisions and follow-up decisions have to be taken in less controlled and less independent circumstances.
- 4/ In areas where a mail census is not possible, questionnaires have to be picked up or actually completed through canvassing by enumerators. In such areas the publicity in nearby large cities is likely to be a source of disquiet to conscientious respondents.
- 5/ We did not expect the new method to be a cure for all our problems. We were aware that the improvements in the 1960 US census were smaller than hoped for (32). Then there are always unexpected teething troubles, such as over-imputations of large numbers (32) on a new mechanical device.
- 6/ Results of the 1967 test will begin to become available late in 1967, with most of the results becoming available in 1968, too late for the planning of the 1968 tests.
- 7/ But see footnote 15 for an alternative solution.
- 8/ Assuming that a field list of households is to be the prime source of the address register. As explained later, this is by no means certain. And, of course, this argument would be quite invalid should some kind of list-drop-off (at least the long questionnaire) -mail-back be adopted.
- 9/ Whether the winter months while the building activity is at its lowest make really much difference to an address register, remains still to be determined.
- 10/ Actually in London there was a sixth source: publicity. Some 264 respondents telephoned that they had not received questionnaires and were found not to have been on the list (another 243 were found to be on the list and were given duplicate questionnaires).
- 11/ In long-standing Canadian census parlance, households are identical with dwellings. It is hoped with the new concepts relating to address registers they will also be identical with subaddresses. A basic address is one street address which may have one or several subaddresses (apt. 1, apt. 2, etc.) within the same basic address.
- 12/ Before the description of the Post-Enumeration Survey, a qualification should be stated: it is the experience both in the United States and Canada that such evaluation surveys appear to be more successful in uncovering missed subaddresses and even more so basic addresses, but seem to be less successful in finding persons missed in partly enumerated households.
- 13/ This appears to be a less successful part of the main London questionnaires, at least it seems to be inferior to the back page of the New Haven questionnaire.
- 14/ The office coding of families (and the manual coding of the more intricate relations to head of household, as well as some other minor manual entries) delay the processing of the "short" part of the questionnaire. In the processing of the 1966 Census, families were created mechanically as they will be in 1971.
- 15/ No figures are available on the increases in

costs due to such procedure. Enquiries inside households, if uniformly imposed, would incidentally provide an opportunity to determine whether households should be sent an English or a French questionnaire.

- 16/ See footnote 10 for other details.

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