

# TELEPHONE SURVEY DEVELOPMENT ON THE CANADIAN LABOUR FORCE SURVEY

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## 1. Introduction

A recently launched telephone survey development program at Statistics Canada has as dual objectives the development of a telephone based household survey methodology, and the investigation of Computer Assisted Telephone Interviewing (CATI) for bureau surveys. This paper describes the studies in progress on the Canadian Labour Force Survey (LFS) related to the first objective. Work on CATI development has only recently begun, and will be separately reported on later.

The LFS was chosen as the survey for testing new telephone methods due to its role as a central vehicle, in terms of sample frame and design, and data collection and processing infrastructure, for the conduct of household surveys within Statistics Canada. The LFS is a rotating panel survey of 46,000 households per month. It is based on an area sample, and the current data collection methodology is a face to face interview for households in the sample for the first time, with telephone interviews in later months, provided the respondents agree.

Developmental work to date has focused on testing of two methods for conducting first month interviews by telephone within the context of the current area sample design (Section 2), and on testing the feasibility of conducting the LFS as a centralized telephone survey for households with telephones (Section 3). Coverage biases in Canada for the estimation of labour force characteristics from a telephone frame are described in Section 4, along with a brief mention of possible approaches to covering the non-telephone universe, to be investigated further in the coming year.

## 2. Conducting First Month Interviews by Telephone

Prior to adoption of the current data collection methodology of a personal visit in month one and telephoning in later months, personal visits were the rule for all months. Conversion to telephoning in later months occurred in 1974 for larger urban centers, and this was extended to all areas during 1984 as part of the latest decennial sample redesign. In both instances, the impact of telephoning was closely studied in tests embedded into the ongoing survey (Muirhead, Gower and Newton 1975), (Singh, Drew, and Choudhry 1984).

Cost savings due to adoption of the current methodology were sizable. For example, the extension of telephoning to rural and smaller urban areas, coupled with an increase in assignment sizes lead to an estimated 13% reduction in data collection costs for the survey.

Under the current data collection methodology, during the first 3 months of 1985, 90.5% of households in their 2-6 months in the sample were tele-

phoned. The non-telephone cases include those without telephones, those requesting personal visits, cases of language problems, and other miscellaneous reasons. In addition, 4-5% of first month-in-sample (MIS-1) cases were telephoned. Often these are cases where the interviewer drops off a calling card after an unsuccessful personal visit and the respondent calls the interviewer.

In anticipation of further cost savings, during 1985 tests of two different procedures for doing more telephoning for MIS-1 cases were embedded into the ongoing LFS.

### 2.1 Telephone Follow-up Procedure

The first test was of a telephone follow-up procedure, whereby if on an initial visit to a dwelling, an interviewer finds no one at home, he/she attempts to find the name of the occupant by observation (name on mail box, list of residents in apartment buildings, etc.), by use of reverse city directories, or by asking neighbours. Telephone numbers are then obtained from local directories. On contacting the household, the interviewer explains the unsuccessful personal visit, and attempts a telephone interview. If the respondent refuses, a personal visit is resorted to.

The telephone follow-up procedure was adopted on a test basis in two of the eight Regional Offices (Halifax and Vancouver), beginning in May 1985. Analysis of test results showed an average rate of telephoning for MIS-1 cases of 15.2% for the period May 1985 - January 1986. Based on findings from a time and cost study (Lemaitre 1983), this represents a telephoning rate of 30% for the initial no-contact cases, which would otherwise have been visited on average an additional 1.5 times. Non-response rates for subsequent months in the sample did not differ much between those interviewed initially by telephone vs. in person (2.2 vs. 1.7% respectively), and this small difference may be attributable to the telephoned group representing from the outset the harder to contact cases. In October 1985, interviewers involved in the test were issued a debriefing questionnaire in response to which over 70% indicated the procedure would lead to reduced travel and costs.

Based on the findings, it was decided to implement the telephone follow-up procedure in all Regional Offices commencing in May 1986. For the first two months under this procedure, the rate of telephoning for MIS-1 cases has been 17.0%

### 2.2 Telephone First Contact Procedure

The telephone first contact procedure involves finding the telephone number in advance for LFS selected dwellings by matching LFS addresses with purchased lists of published residential numbers and addresses, and attempting a tele-

phone interview for MIS-1 cases.

Testing of this procedure is proceeding in two phases in the provinces of Québec and Ontario as follows:

#### Phase 1

The objective of this initial test was to study the data quality impacts of telephone first interviews in a controlled setting where there were no other changes in the survey taking environment. For example, as is normally the case for the LFS, interviewing was done by local interviewers, and prior letters were sent explaining the survey. A sample of 350 urban clusters (ultimate area sampling units - typically blocks), having at least 2 matched dwellings was selected per month. Within each cluster one dwelling was chosen at random for the test sample, and another for the control sample. The size of the test sample corresponded to 18% of the MIS-1 cases in urban areas of Québec and Ontario. The distribution of the test sample was such that each interviewer would have from 1-4 first month interviews to conduct by telephone each month.

#### Phase 2

In this phase which began in February 1986, 25 assignments were selected in Census Metropolitan Areas of Québec and Ontario, where the telephone first contact procedure will be followed for all MIS-1 cases for which a telephone number could be obtained. Due to fluctuations in the match rates from month-to-month, assignment sizes were not adjusted during this phase of testing.

Plans for phase 2 of the test were made once positive initial results were obtained in phase 1, and if successful, full scale implementation of the telephone first contact procedure could begin early in 1987 in Québec and Ontario, and later in other provinces, pending the availability of lists.

Principal findings to date on the telephone first contact procedure are discussed below:

- (i) Match Rates: - The address matching procedure used consisted of an exact match on postal code, street name, street direction, street number and suffix, and apartment number. The match was carried out after standardization of both sets of address information. The match rate was 50%. It is planned to investigate what improvement in match rates can be achieved with use of probabilistic matching techniques.
- (ii) Phase 1 (0785-0686)
  - (a) Rate of Telephoning - For MIS-1 cases, the rate of telephoning was 72% for the test sample vs. 6% for the control sample. Major reasons given for a personal first interview for test cases included: wrong number, telephone interview refused, and the interviewer being in the area anyway. For MIS-2-to-6 cases, the rate stood at

roughly 97% for both test and control samples.

- (b) Non-Response Rates - For MIS-1 cases, total non-response was the same for both the test vs. control sample (6.1%). The component of non-response due to refusals was higher for the test sample (at 1.8% vs. 1.2%), but the rate of no-contact cases was lower for the test sample (at 4.3% vs. 4.9%).

For MIS-2-to-6 cases, the test sample had marginally higher overall non-response rates (3.6% vs. 3.3%), mostly attributable to a higher refusal rate (1.4% vs. 1.2%).

These marginal differences in non-response rates were not felt to be problematic.

- (c) Estimation of Labour Force Characteristics - Estimates were obtained of the average household size, and of the unemployment and participation rates for the test and control samples, and no significant treatment differences were found at the 95% level. This was reassuring in the case of average household size, since there was some concern that coverage of persons within households might not be as good under telephoning.
- (iii) Phase 2 (0286-0686) - The rate of telephoning in month 1 for the matched dwellings has been 84%, up somewhat from the 72% observed for Phase I. For MIS-1 cases, overall non-response is lower for matched dwellings as compared with unmatched dwellings (5.3% vs. 8.4%), although refusals are higher (2.0% vs. 1.2%). Accumulation of more month's data will permit analysis of non-response rates for later months. Analysis of cost implications of the procedure is also underway.

### 3. Telephone Sampling Test

The objectives of the telephone sampling test are to investigate the feasibility of conducting the LFS as a telephone survey for households with telephones. Two different sampling approaches - list sampling and Random Digit Dialing (RDD) - are being studied. Analysis of test results will focus on non-response rates, unit costs, unit variances, and estimation of labour force and demographic characteristics for the test treatments as compared with the ongoing LFS.

The test is being conducted from the Toronto and Montreal Regional Offices from October 1985 - September 1986, with an average sample size of 700 households per month per R.O., split equally between the treatments.

#### 3.1 List Sample Treatment

This treatment consists of a list sample of published residential numbers, supplemented by an RDD sample to cover non-published numbers and households with business numbers. A list frame, containing telephone number and billing address

for published residential numbers is purchased quarterly. List sample cases were sent a prior letter whenever the address information was specific enough to ensure deliverability of a letter addressed to the householder. For the RDD supplement, a probability proportional to size (pps) sample of hundreds banks was selected based on counts of non-published residential numbers, also purchased quarterly. (A "hundreds bank" corresponds to numbers which differ only in right most 2 digits.) Within selected banks, published residential numbers on the list were excluded, and remaining numbers were randomly screened to determine if they reached eligible households, following the same procedures as described below for the RDD treatment.

### 3.2 RDD Treatment

The RDD approach involved a pps selection of hundreds banks based on purchased counts of residential numbers (published and non-published). Banks were stratified into sparse banks containing 30 or less residential numbers, and non-sparse banks. Cluster sizes were taken as 1 residential number per sparse bank and 2 per non-sparse bank. It should be noted that with the pps selection of banks, the hit rate (defined as in-scope numbers (i.e., households) as a percent of numbers dialed), is independent of the cluster size. This permitted more efficient sampling than is possible when such counts are not available, and a two stage design with clustering at the second stage (Waksberg 1978) is required to achieve satisfactory hit rates.

Often in RDD surveys the (first) interview is carried out as soon as in-scope units are screened in. In our case the screening of numbers within selected banks to identify eligible households was carried out two weeks in advance of interviewing. Ring-No-Answer (RNA) cases were called several times over a 2-3 day period prior to checking the status of the number with the telephone company. With the sequential replacement of numbers until 1-2 working residential numbers were found, it could take up to 2 weeks to complete the screening. Hence the advanced screening permitted retention of a fixed one week period for interviewing. During screening, when residential numbers were identified, respondents were offered an introductory letter and were asked the best time to call.

In addition to the operational reasons in this instance for advanced screening, results in the literature suggest such a procedure should not harm, and may even improve response rates. The "foot-in-the-door" theory advanced by Reingen and Kerman (1977), and others, states that more readily obtained compliance with an easy initial request (i.e., taking part in the screening which is brief, includes no difficult questions and concludes with an offer of more information prior to participation in the survey), will increase the likelihood of later compliance with a more difficult request (i.e., participating in the survey for six months). In a test of "foot-in-the-door" in the RDD sampling context Groves and Migilavy (1981) found marginal increases in response rates, which, however, in their case did not justify the addi-

tional costs of advanced screening.

### 3.3 Test Results on Non Response

Preliminary results on non-response are available for the period Oct. 85 to June 86. Results on cost, variance, and effect on estimation of LF characteristics will follow later.

Table 1 presents overall non-response rates and refusal rates by month-in-sample for the LFS and for two telephone sampling treatments. For the LFS the non-response rate is defined as the non-interview rate amongst in-scope dwellings. Principal components of non-response are no-contact cases, refusals, and cases with language problems. Out-of-scope dwellings include vacant dwellings, seasonally occupied dwellings, demolished dwellings and dwellings containing only out-of-scope persons. An equivalent definition of non-response has been attempted for the telephone sample treatments.

In the LFS, the distinction between vacant and seasonal dwellings versus occupied dwellings that can't be contacted is made by means of on site inspection. At the screening stage for the RDD samples, RNA cases are verified with the telephone company. Non-working or non-residential numbers are replaced with another number, and working residential numbers are retained in the sample, but those with non-local billing addresses are classified as seasonals. At the interview stage, both the screened-in RDD sample and the list sample are treated similarly, that is non-working residential numbers are classified as vacant and RNA cases corresponding to working residential numbers with non-local billing addresses are classified as seasonals.

#### Observations from Table 1 are:

- (i) List vs. RDD Treatment - The list treatment has yielded lower non-response than the RDD treatment, with an overall non-response rate of 8.9% for RDD vs. 6.9% for list, compared with 4.2% for the regular LFS. Refusals were also higher for RDD at 4.1% compared with 2.6% for the list treatment, and 1.3% for the LFS.
- (ii) Month-in Sample Effect - For the LFS, non-response is highest for MIS-1 cases, and it is lower in later months. The same phenomenon of lower non-response rates in later months was observed for both the list and RDD treatments.

### 4. Approaches to Covering the Non-Telephone Universe

In this section we briefly examine the extent of telephone coverage in Canada, and the biases that would result from failure to cover the non-telephone universe when estimating labour force characteristics. Some possible approaches for covering the non-telephone universe are mentioned.

While the percentage of Canadians living in households without telephones is small at 1.8% (as estimated from the September 1985 LFS) their labour force characteristics are markedly

different from characteristics of those with telephones, as shown in Table 2. It is clear from the table that failure to represent the non-telephone universe would result in a serious bias for a survey such as the LFS.

As expected, the distribution of non-telephone population is not uniform. From Table 3 it can be seen that non-coverage rates tend to be higher in the Atlantic region of Canada, higher in the NSR areas (smaller urbans and rural areas), and higher amongst non-single and non-high rise apartment dwelling types.

In the short term, the most viable approach to ensuring complete population coverage, while reducing costs through more use of the telephone for data collection seems to be through use of the earlier described telephone first contact procedure with the current area frame. Probabilistic matching techniques should increase the match rate in urban areas. Also, it is planned to examine the possible extension of this procedure to rural areas. Although civic addresses are for the most part non-existent in rural areas, it may be possible to obtain the telephone pole number as part of the LFS address information, and using files purchased from telephone companies to link this to the telephone number. Under the telephone first contact procedure, in addition to reduced data collection costs, design parameters such as the amount of clustering of the sample could be re-optimized to reflect the increased telephoning. Hence, some gains would be realizable through a more efficient sample design.

Telephone first contact within the current area frame context would not appear, however, to be an optimal strategy in the longer term. Designs featuring unclustered telephone samples, supplemented in some fashion to provide coverage for the non-telephone universe should be more efficient.

Some possible approaches that we plan to examine more closely in the coming year are:

- (i) Overlapping dual frame combining an area sample providing complete population coverage, and a telephone sample. The area sample in this case could be obtained by reducing the size of the current area sample while leaving the sample design essentially in tact. Of course, the telephone first contact procedure could be used to maximize the telephoning on the area sample portion.
- (ii) Non-overlapping dual frame combining an area/list sample designed to cover the non-telephone universe only, and a telephone sample. This approach could feature: (a) oversampling of areas of suspected concentrations of non-telephone households determined from the Census, either directly or indirectly based on demographic characteristics, and (b) matching of survey dwelling lists with lists of telephone subscribers to eliminate a large proportion of households with telephones.

- (iii) Multiplicity Sampling. Another possibility is to use the telephone sample to identify a sample of non-telephone households following multiplicity rules. Although untried in this context, multiplicity sampling techniques have been used in other situations for sampling of rare populations for which a ready made frame does not exist (Sirken 1980). Telephone sample households would be asked, for example, if any immediate relatives didn't have a telephone, and if so, their address. Potential problems with a multiplicity approach in this instance are the sensitivity of asking information on third parties, and the accuracy of information obtained. However, the potential benefits of not needing an expensive area frame may justify testing out such an approach, perhaps initially without asking for address information.

- (iv) Address Register. An address register with telephone numbers for households with published telephone numbers would permit efficient sampling of both the telephone and non-telephone universes. Households with non-published numbers (which, in Ontario for example, account for 8% of residential numbers) could be sampled either as part of the non-telephone universe, or by using rdd methods. While creation and maintenance of an address register would represent a massive undertaking that may not be cost beneficial for household surveys on their own, such a register would also benefit the census of population. The feasibility of an address register is currently under investigation.

## 5. Conclusions

A short term objective of the telephone developmental work on the LFS was to increase the amount of telephoning within the context of the current area frame. To that end, after a period of successful testing the procedure of telephone follow-up of first month no contact cases was implemented in May 1986. Also test results to date are promising for a telephone first contact procedure involving matching of LFS sampled addresses against purchased lists to obtain telephone numbers so that first month interviews can be done by telephone.

Towards the longer term objective of developing a telephone methodology for conducting household surveys, initial results are quite promising for a telephone sampling approach consisting of a list sample of published residential numbers supplemented by an RDD sample for unpublished numbers and business numbers reaching households. Efforts in the coming year will focus on dual frame or other approaches supplementing telephone samples to provide coverage of the non-telephone universe.

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**TABLE 1: TELEPHONE SAMPLING TEST:  
NONRESPONSE RATES BY MONTH IN SAMPLE (1085-0686)**

MONTH IN SAMPLE	TOTAL NON RESPONSE			REFUSALS		
	RDD	LIST	LFS	RDD	LIST	LFS
1	10.5	8.7	6.1	4.1	3.4	1.3
2	8.4	6.6	3.9	3.9	2.4	1.1
3	7.8	6.1	3.8	3.9	2.2	1.2
4	8.8	6.9	3.7	4.2	2.4	1.4
5	8.9	6.5	3.9	4.3	2.9	1.6
6	9.2	6.4	3.6	4.4	2.6	1.5
AVERAGE	8.9	6.9	4.2	4.1	2.6	1.3

**TABLE 2: LABOUR FORCE CHARACTERISTICS OF TELEPHONE AND  
NON-TELEPHONE UNIVERSES  
(Sept. 1985, LFS)**

	Telephone Universe	Non-Telephone Universe	Total
Unemp. Rate	9.1	29.0	9.3
Part. Rate	65.4	51.2	65.1
Emp.Pop.Ratio	59.5	36.3	59.1
Population (000's)	18,824	345	19,169

**TABLE 3: PERCENT OF POPULATION WITHOUT TELEPHONES WITHIN PROVINCES  
BY TYPE OF AREA, TYPE OF DWELLINGS  
(Sept. 1985, LFS)**

PROVINCE	TOTAL	TYPE OF AREA		TYPE OF DWELLING		
		SR <sup>1</sup>	NSR <sup>1</sup>	Single	High-Rise Apartment	Other
Canada	1.8	1.5	2.5	1.0	1.8	3.4
Nfld	4.8	2.3	6.7	4.9	-	3.4
P.E.I.	3.4	2.5	3.8	2.7	-	6.6
N.S.	3.4	3.2	3.7	2.4	2.5	6.5
N.B.	3.4	2.3	4.6	2.5	-	6.2
Québec	1.6	1.5	1.7	0.8	2.4	2.4
Ontario	1.4	1.2	2.0	0.6	1.5	3.3
Manitoba	2.7	2.5	1.9	1.4	1.9	7.1
Sask.	2.4	1.9	2.0	2.0	0.0	4.2
Alta.	1.8	1.2	3.0	0.7	4.5	4.3
B.C.	1.7	1.4	2.5	0.7	1.8	3.9

<sup>1</sup> SR: Self-Representing (major urban).

NSR: Non-Self-Representing (small urban and rural).