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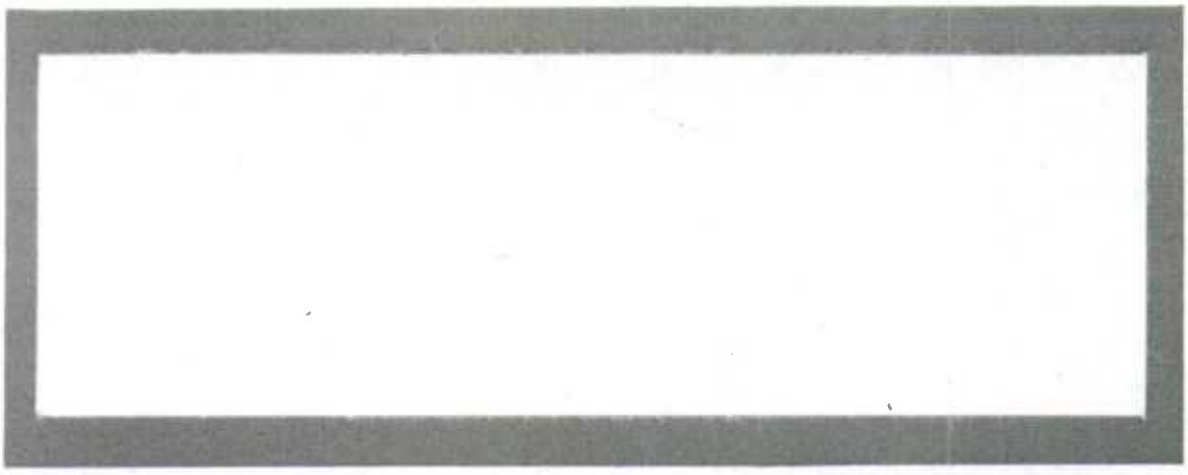

Methodology Branch

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WORKING PAPER

METHODOLOGY BRANCH

THE FIRST YEAR OF COMPUTER-ASSISTED INTERVIEWING FOR THE CANADIAN LABOUR FORCE SURVEY: AN UPDATE

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THE FIRST YEAR OF COMPUTER-ASSISTED INTERVIEWING FOR THE CANADIAN LABOUR FORCE SURVEY: AN UPDATE

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ABSTRACT

As a part of its decennial redesign, the Canadian Labour Force Survey (LFS) has recently introduced new technology in data collection. Computer-Assisted Interviewing (CAI) was introduced over a period of four months starting in November 1993. Since March 1994, CAI has replaced traditional paper and pencil data collection. This paper describes the impact of this major change on traditional quality indicators, such as nonresponse, that have been observed in the first year of CAI. The paper also introduces some new data quality indicators for the interview process made possible by CAI. Finally, the paper points to lessons learned from the change in process and identifies future directions.

LA PREMIÈRE ANNÉE DES INTERVIEWS ASSISTÉES PAR ORDINATEUR POUR L'ENQUÊTE SUR LA POPULATION ACTIVE CANADIENNE

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RÉSUMÉ

Dans le cadre de son remaniement décennal, l'Enquête sur la population active du Canada (EPA) a récemment adopté une nouvelle technologie comme méthode de collecte des données. Le mode d'interviews assistées par ordinateur (IAO) a été introduit sur une période de quatre mois débutant en novembre 1993. Depuis le mois de mars 1994, le mode IAO a remplacé la méthode traditionnelle de collecte avec papier et crayon. Ce document décrit l'impact d'un changement si important sur les indicateurs de qualité usuels, tel que la non-réponse, qui ont été observés durant la première année d'utilisation du mode IAO. Ce document présente également quelques nouveaux indicateurs de qualité pour le processus d'interview qui sont maintenant disponibles avec le mode IAO. Finalement, ce rapport conlut en dressant une liste des leçons apprises durant ce changement et en identifiant les directions futures.

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1. INTRODUCTION

The Canadian Labour Force Survey (LFS) has recently undergone a major technological changeover. Computer-Assisted Interviewing (CAI) is now the data collection method. Beginning in November 1993, the CAI mode was gradually introduced in the LFS. Within a few months, portable computers (notebooks) replaced the traditional Paper And Pencil Interviewing (PAPI). An overview of how such a fundamental change to the survey's methodology was achieved is given in Dufour, Kaushal, Clark and Bench (1995). This paper focuses on the impact of this major change on some data quality indicators, mainly on the nonresponse rate, as well as the challenges encountered during the implementation. It also discusses the introduction of new types of quality indicators which are now available with the implementation of CAI.

This paper is divided into six sections. The following section briefly describes the Canadian Labour Force Survey. The third section discusses the conversion strategy from PAPI to CAI. The fourth section analyses current and new data quality indicators. The current data quality indicators are measures which are regularly produced such as nonresponse rates and vacancy rates. New data quality indicators can be divided into two types. There are those which were produced since the introduction of CAI to monitor and measure the performance of CAI. As well, there are the quality indicators from the case management system of CAI which provide previously unavailable information about the interview process, such as the average duration of the interview and the number of calls required to contact the respondent. The last two sections outline the lessons learned and the future of CAI for the LFS.

2. THE CANADIAN LABOUR FORCE SURVEY: AN OVERVIEW OF THE SURVEY

The LFS is the largest ongoing household survey conducted by Statistics Canada. This survey produces monthly estimates of labour force characteristics of the Canadian population, such as employment and unemployment at national and provincial levels, as well as by industry and occupation. The LFS uses a stratified multi-stage sampling plan with the dwelling as the final sampling unit. The sample is split into six representative sub-samples or panels, and each month the dwellings from one of the panels (one-sixth of the sample) are replaced. Selected dwellings remain in the survey for six consecutive months. Approximately 55,000 households, representing about 110,000 individuals, are in the sample each month (see Singh et al., 1990).

Statistics Canada's six Regional Offices (RO) employ 950 interviewers to conduct LFS interviews. The first (or birth) interview with the household in the dwelling is conducted in person by an interviewer. Subsequent interviews are conducted by telephone. Prior to November 1993, all interview results were recorded using paper and pencil, entered into minicomputers at the RO and subsequently edited at the Head Office.

3. CONVERSION STRATEGY : FROM PAPI TO CAI

Even though the implementation of CAI implied complex reorganization and fundamental restructuring of survey processes, there were advantages to converting: (i) improvement in data quality (through on-line editing done directly with the respondent and elimination of human errors such as not following skip and branching patterns in questionnaires); (ii) faster data processing (data capture is now done by the interviewer at the time of the interview); (iii) long-term cost benefits (due to combining the interviewing and data capture steps); (iv) development of a generalized data collection tool and (v) the possibility of handling more complex questionnaires (internal programming of all questionnaire skip and branching patterns into the notebook lets it automatically display the next relevant question). One of the first major impacts of CAI will take place in 1997, when a new questionnaire will be introduced. This questionnaire will be much more complex than would have been possible with PAPI.

Before actually implementing CAI, there were several years of evaluation and testing. During the late 1980's, the LFS has undergone three major tests, with the specific aim of evaluating the potential of computerized data collection. The principal objectives of the first two tests were: to test the potential of CAI (Catlin and Ingram, 1988) and to test the feasibility of using new technologies in the LFS (Kaushal and Laniel, 1993). The third test, called the Data Quality Test (Kaushal and Laniel, 1995), was primarily aimed at evaluating the impact of the change on the continuity of LFS series' and on data quality. Operational development and evaluation of CAI were also covered in this test. The results of the third test concluded that CAI would have no discernible impact on either the continuity of data series' from the LFS or on the main quality indicators of the survey. On the basis of these findings, it was decided to convert the mode of data collection to CAI in the fall of 1993.

The strategy adopted was to gradually introduce CAI as the new collection method. This was done with three principal goals: (i) to avoid disruption in the historical series, (ii) to minimize the introduction of any collection mode bias and (iii) to minimize the massive change to the interviewer work procedures and in the data collection process. The strategy was to convert at random one third of the interviewers from PAPI to CAI, in all ROs in November 1993, another third in December 1993, maintain the status quo in January and February 1994 and finally to convert the remaining third in March 1994. There were two reasons for the status quo period: (i) to allow an adaptation period for adjustment and problem-solving and (ii) operational constraints. In January and February 1994, two new longitudinal surveys, which also required the use of the laptops, were introduced.

As part of the conversion strategy, when an interviewer was converted to CAI, his or her whole assignment had to be completed with CAI and that interviewer continued with the computer-assisted method during the succeeding months of the implementation process. All of the data collected with CAI were used in the production of LFS estimates. Paper and pencil interviewing was available as a contingency plan for all interviews which could not be completed by CAI for operational reasons. The PAPI backup option is in place until January 1997 when the new questionnaire becomes effective.

4. THE IMPACT OF CAI ON DATA QUALITY INDICATORS

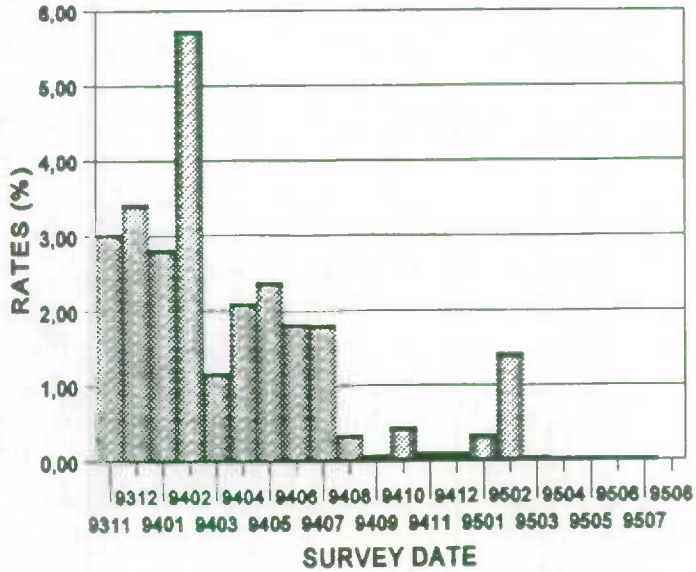
In this section, both current and new data quality indicators (DQI) are analyzed. The current DQI include some of the regular indicators which are produced and monitored monthly by the LFS Data Quality Committee (DQC), namely, nonresponse rates and vacancy rates. There are two types of new DQI: those which measure the performance of CAI (the conversion rate and the technical problems or "Z" codes) and those which are now available from the case management system. This system manages all of the survey activities from the beginning to the end of the survey cycle. Before analyzing these quality indicators, it is worth mentioning that since the introduction of CAI in November 1993, some changes have been made to the LFS that can have a direct impact on data quality indicators. For example, in September 1994, a new CAI application, i.e. a new software, was introduced. This application, faster than the previous one, implies a shorter duration of interviews and a reduction of respondent burden, which can have a direct impact on nonresponse. The second change was the introduction of the new sample. Since the new sample is more urbanized, it is expected that the nonresponse rate will be affected. Finally, between June and August 1995, a new version of the case management system was implemented. The main goal of this new version is to deal with problems in case transmission and consequently to reduce technical problems.

4.1 New data quality indicators: Evaluation of the performance of CAI

There are two indicators that are closely followed by the DQC to measure the effectiveness and efficiency of CAI. One of these is the conversion rate and the other is the technical problems or "Z" nonresponse code. Figure 1 shows the conversion rates from CAI to PAPI since November 1993. During the interview, interviewers who were not able to complete an interview with CAI, for any reason, could pursue the interview with PAPI. The proportion of interviews that should have been conducted with CAI but were converted to PAPI is reflected by the conversion rate. Ideally, there should be no conversion.

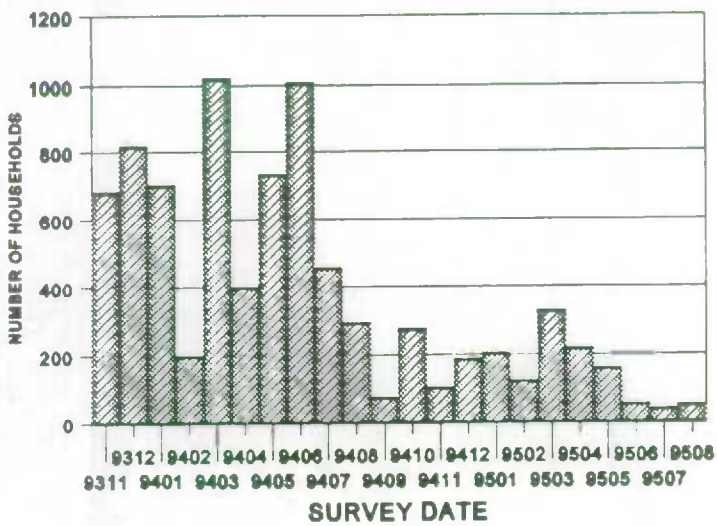
The conversion rate varied between 1.0% and 5.7% from November 1993 to July 1994 with an average of 2.6% per month. From August 1994 until now, the conversion rate is always less than 0.5%, except for the February 1995 survey (1.3%). This high rate coincides with a PC communication failure which occurred in one Regional Office, and was responsible for 99% of all cases converted in February. Since March 1995, the conversion rate has been zero. Consequently, it took about a year for this rate to stabilize and reach a satisfactory level.

Figure 1. Conversions in the field: from CAI to PAPI



As for the second indicator, technical problems, the frequent occurrence of "Z"'s is a result of the use of new technology and was most unpredictable. With the introduction of CAI, "Z" codes became more frequent. Although this code existed previously, the definition has changed somewhat. "Z" nonresponse codes have been and are still defined as "too late for processing". Before CAI, they reflected a postal problem. Since the introduction of CAI, they are a reflection of technical problems such as: transmission problems, disruptions of telephone lines, uploading data processing system failures, automatic computer maintenance function which disconnects all transmissions without warning, etc. There were also hardware problems such as: hard disk failures, magnetic tape failures, insufficient memory allocations, etc. All these problems have been resolved case by case, requiring time and resources during the survey cycle. Since all LFS operations have a very tight schedule, sometimes, there was not enough time for these late records to be processed for the current survey.

Figure 2. Z Nonresponse: Number of Technical Problems



As seen in Figure 2, the number of technical problems has decreased since the fall of 1994. This decrease coincides with a new version of the CAI application, which is largely responsible for this improvement. Like the conversion rate, it took about a year of CAI to observe an improvement in the "Z"codes. Prior to the introduction of CAI in November 1993, when "Z" codes represented failure to receive completed paper questionnaires on time, this rate was not worth monitoring closely. From November 1993 to August 1994, the average was about 600 cases per month, dropping to an average of 150 cases since September 1994. Moreover, for the last three survey months, the number of "Z"'s was less than 50 cases which coincides with the implementation of the new case management. The contribution in percentage of the "Z"'s to the nonresponse rate varied from 0.09% to 1.74%. It has stabilized around 0.1% in recent surveys (see section 4.2).

These two indicators are used to assess the performance of CAI. Both measures showed relatively high rates and numbers at the beginning of the implementation of CAI. These two indicators show that it took about a year to stabilize.

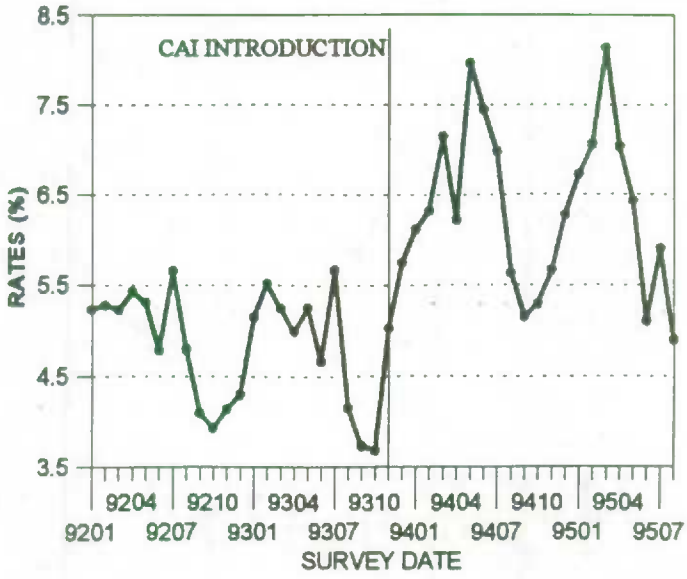
4.2 Regular Data Quality Indicators

Total Nonresponse rates

During the four-month implementation period, from November 1993 to February 1994, both collection methods were used simultaneously. During these four months, nonresponse rates were systematically higher for the sample interviewed with CAI than with PAPI. (For a more complete look at this four-month implementation period see Simard and Dufour, 1995). There is a major difference between the nonresponse rate before and after the introduction of CAI. Figure 3 shows the total nonresponse rate for Canada since January 1992.

Historically, LFS nonresponse rates average around 5% at the national level. During the first year of CAI, the nonresponse rate was generally higher than this. The national nonresponse series has a typical seasonal trend with peaks in summer months (usually in July), and troughs in the fall (most of the time in October). Since the introduction of CAI, this seasonal trend has been disturbed slightly. For example, two high values were recorded in May 1994 (7.8%) and in March 1995 (8.1%) rather than in the summer months, and the minimum for 1994 was observed in September rather than in October. Following the peak observed in March 1995, the nonresponse rate has shown a downward trend. It took 21 months after the implementation of CAI for the nonresponse rate to reach its usual value.

Figure 3. LFS Nonresponse Rates



Another complicating factor is the new sample design which was introduced gradually over a six-month period starting in October 1994, as part of the major decennial redesign of the LFS. This new design has two features which affect nonresponse rates. One of the new characteristics is the greater proportion of urban to rural sample compared to the previous design. This fact does influence this analysis since it is well known that nonresponse is higher in urban areas than in rural areas (see Figure 4). The other feature is the related hiring of a number of new interviewers, who tend to have higher nonresponse rates than experienced interviewers (defined as 6 months or more of experience with the LFS), as observed in Figure 5. Therefore, part of the increase in nonresponse after October 1994 can be explained by the introduction of the new sample design.

As mentioned previously, another factor responsible for the increase in total nonresponse rates is the appearance of the technical problems; it is, in fact, the main reason. Figure 6 presents the effect of "Z" codes on nonresponse. After subtracting the portion of nonresponse due to "Z"'s from the total nonresponse, the curve shows patterns similar to the previous year.
During the four-month implementation period, the "Z" codes were the sole cause of higher nonresponse rate for CAI. After removing them, the average nonresponse rate was almost the same for CAI as PAPI (4.9% vs. 4.7%). From March 1994 to May 1995, the technical problems continually decreased. Since June 1995, the effect of the Z codes on nonresponse rate has been negligible; similar to what it was before the introduction of CAI.

Figure 4. Nonresponse Rates by Area Types

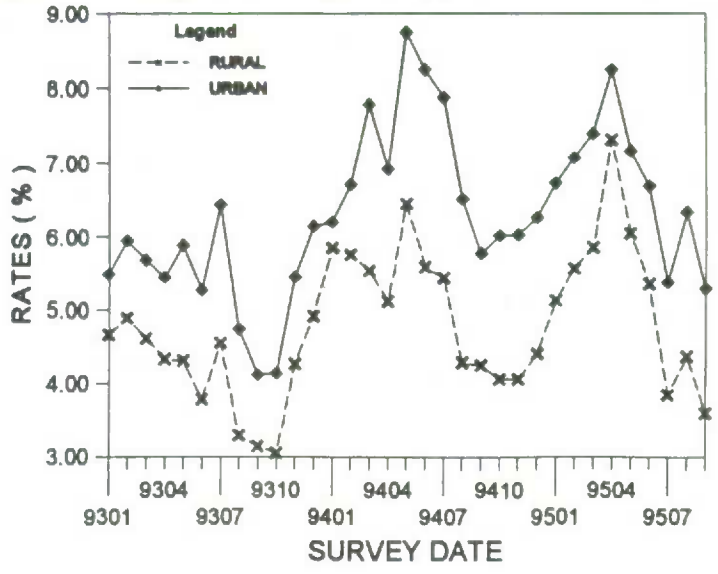


Figure 5. LFS Interviewer Nonresponse Rates by length of Experience

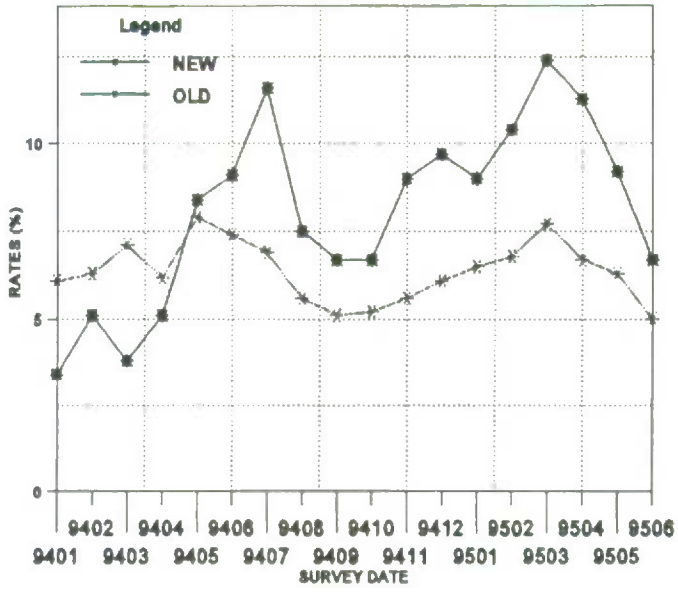
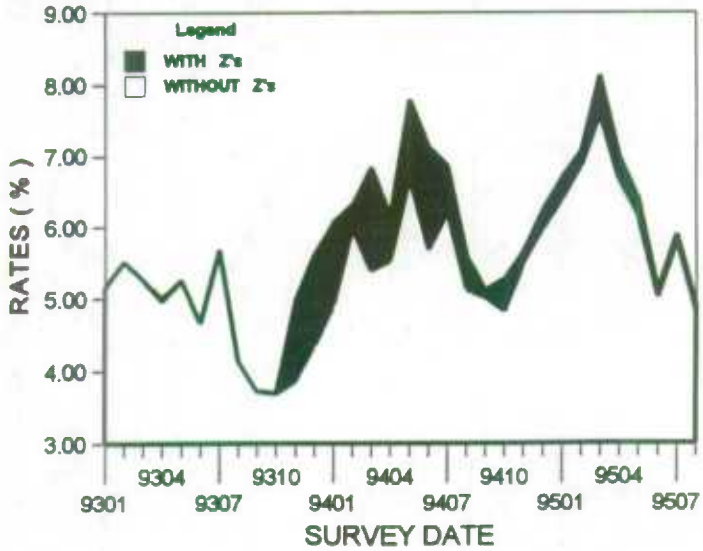


Figure 6. Impact of Technical Problems on Nonresponse Rates



Nonresponse by Reasons

There are several reasons for LFS nonresponse, which are recorded by the interviewer: (i) household temporarily absent (T), (ii) no one at home (N), (iii) refusal (R), (iv) technical problems (Z) and (v) other reason such as no interview due to circumstances within the household. The latter category contributes very little to the nonresponse rate, rarely exceeding 1%. Before the implementation of CAI, the total nonresponse rate was mostly a function of "Temporarily absent", "No one at home" and "Refusal". "Technical problems" had no role. However, with CAI, the total nonresponse rate is dominated by the incidence of "Technical problems", which became less numerous over time, and is less influenced by the other components. Figures 7, 8 and 9 present the nonresponse rates for the rns T, N and R for January 1993 to August 1995.

Figure 7. "Temporarily Absent" Nonresponse Rate

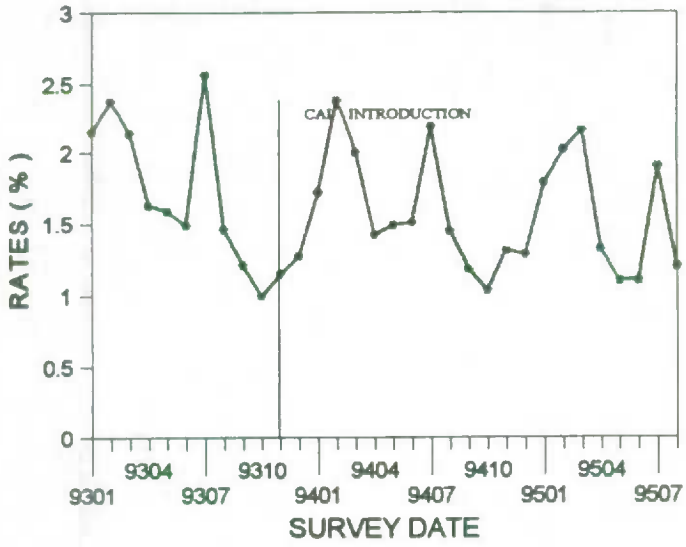


Figure 8. "No One At Home" Nonresponse Rate

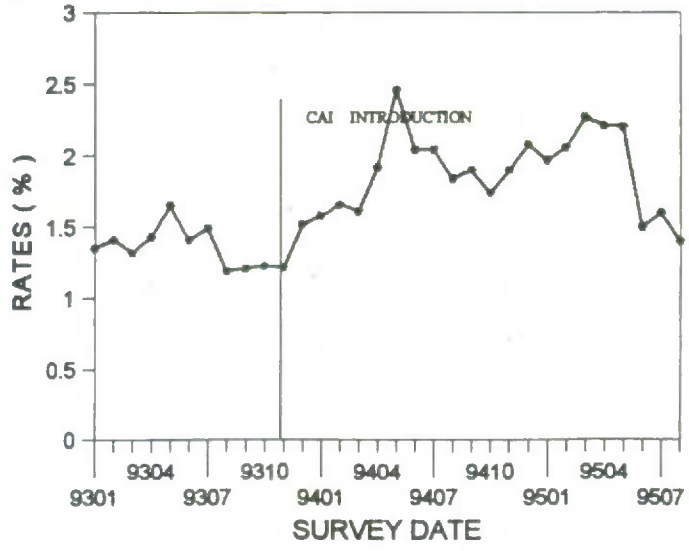
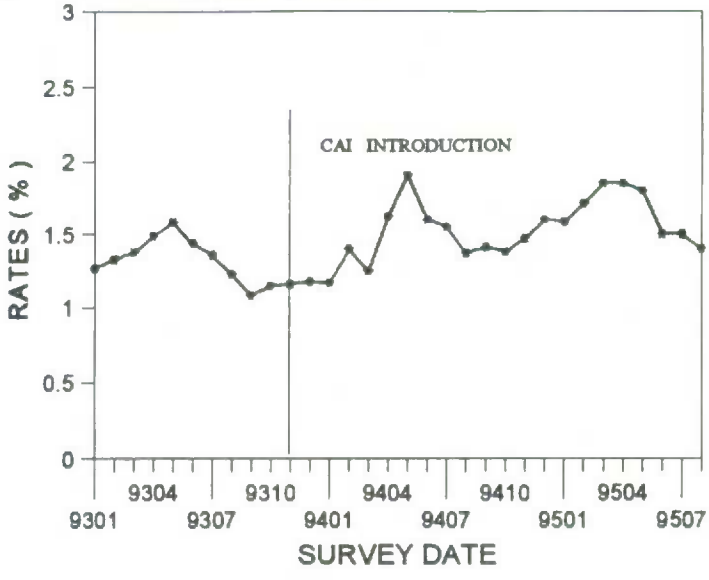


Figure 9. "Refusal" Nonresponse Rates



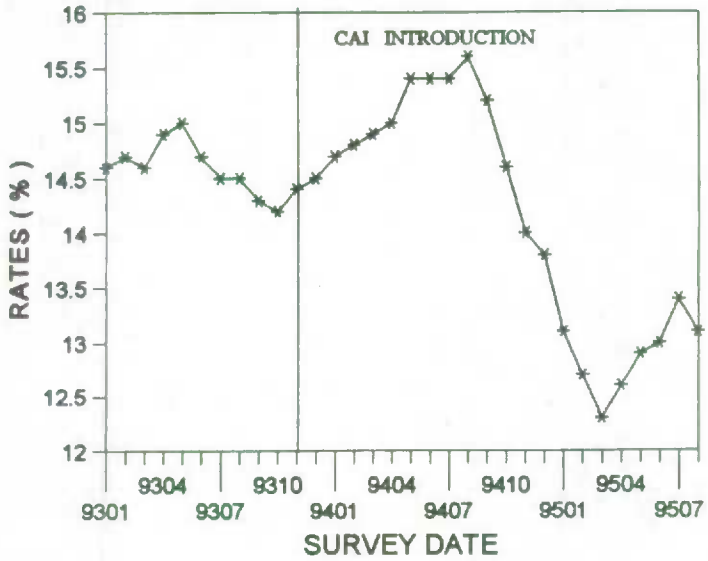
During the implementation period, these nonresponse reasons were almost the same under the two data collection modes. The introduction of CAI does not seem to have affected the behaviour of the temporarily absent series, nor does the new sample. As shown in Figure 7, high rates were obtained in February and July which coincides every year with winter school breaks and summer vacations. The "No one at home" reason (Figure 8) of nonresponse seems to be the most affected by the recent changes made to the LFS, mainly because the new sample design allocates more of the sample to urban areas. The refusal rate (Figure 9) was quite stable, before and after the introduction of CAI, fluctuating between 1% and 2%. This component of nonresponse was one of the data quality measures for which LFS managers were concerned, given the presence of a computer in the household. Many felt that the respondent would be more reluctant to respond to the questionnaire than before. However, the

nonresponse rates for this component with CAI do not show any major difference, when compared to the rates with PAPI.

Vacancy rates

The vacancy rate for Canada is graphed in Figure 10. During the implementation of CAI, the vacancy rates for the CAI sample were systematically lower than the PAPI ones. The difference between the two modes decreased over the course of the implementation period. No specific cause for the difference has been identified. After the introduction of CAI, the national vacancy rate increased to reach 15.6% in August 1994; its highest value since the previous redesign. Following this peak, a strong decrease was observed. This decrease is probably a consequence of the introduction of the new sample, which is more urbanized, and because of a more up to date sample frame.

Figure 10. Vacancy Rates



4.3 New Data From the Case Management System

All computerized survey activities are managed by a sophisticated data management system called the Case Management System (CMS). The main functions of the CMS are: routing, reporting and providing assistance to the interviewers during the progress of the survey. From this system, new data can now be gathered and analyzed. Such information includes: the average number of attempts before contacting the respondent, the best time and best day of the survey week to complete an interview and the average duration of interviews. A research team has been established to develop new data quality indicators and find efficient uses for them. These new indicators will allow a better understanding of the interviewers' work and will provide information for more efficient management of the survey. The new indicators can be used to improve interviewer training and reinforce good behaviour such as better assignment planning and scheduling. They will also provide quantitative information on many aspects of the interviewers' work.

Figure 11 graphs, for the August 1995 survey, the number of attempts before completing an interview by telephone and in person. The curves show that after 6 attempts to contact a household, the probability of reaching a respondent does not increase very much. The success rate (establishing contact) is about 95% after 6 attempts for both types of interviews. After 10 contacts, the curves are stationary. By combining these data with cost data, an optimal number of attempts may be determined.

Figure 11. Number of Attempts to Contact a Household: Personal and Telephone Interviews

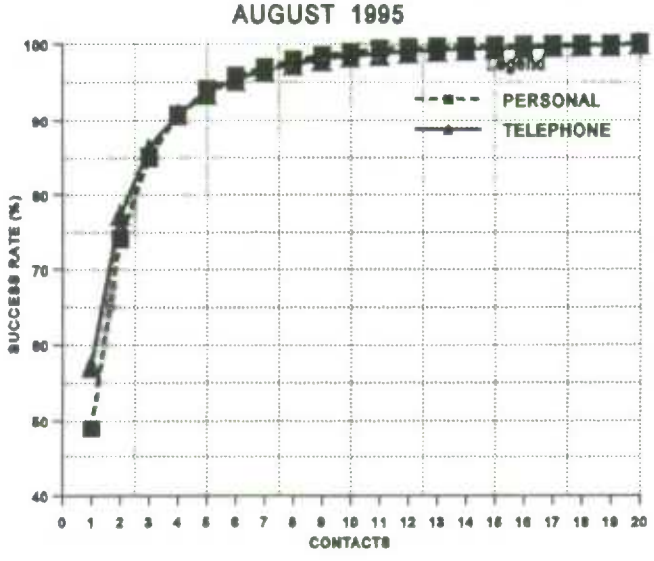
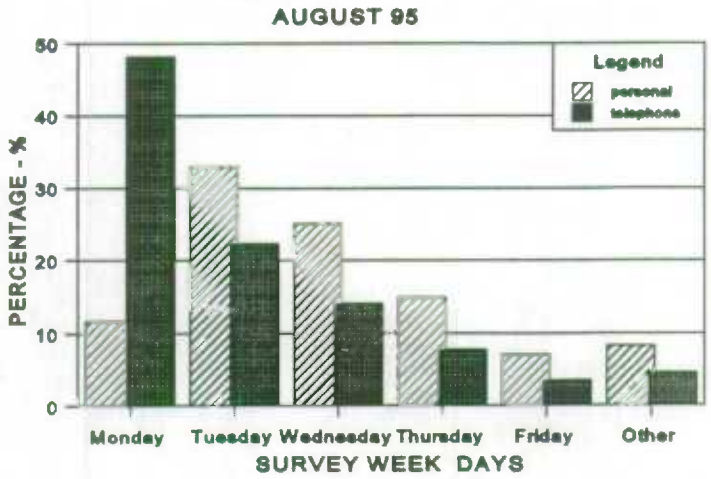


Figure 12 presents type of interview (personal and telephone) by collection day for the August 1995 LFS survey. About 70% of telephone interviews are done during the first two days of the collection week. More specifically, the most frequent times on Monday to conduct a telephone interview are: 10 am to noon, 6 pm to 8 pm and 2 pm to 4 pm. The interviewers do most of their telephone interviews on Monday, and most of their personal interviews on all other days. Tuesday 2 pm to 4 pm, Wednesday 6 pm to 8 pm and Tuesday 6 pm to 8 pm are the most frequent times for personal interviewing. The number of personal interviews decreases from Tuesday to Friday, but on Saturday, and during the summer months on the following Monday, additional efforts are made to reach respondents. During the summer, the collection week is increased by one day, and sometimes by 2 days since it is more difficult to contact respondents, especially those who are Temporarily Absent. This procedure was adopted to improve response rates.

Figure 12. Distribution by Collection Day: Personal and Telephone Interviews



The distribution of the day of the week on which a final code is allocated to the household is not uniform by nonresponse component. Some differences are expected since the treatment of different types of nonresponse is not the same. For example, interviewers are instructed to return as often as they can to a "No one at home" household, before finalizing the case. On the other hand, when nonresponse is caused by an unusual circumstance in the household, such as health problems or a death, no further contact is usually made. On average, an interviewer tries to contact a household by telephone 10 times for "Temporarily Absent", 11 times for "No One at Home" and 3 times for "Other" reasons. For personal interviews, the corresponding average numbers of contacts are: 7, 7 and 4. Figures 13 to 15 show these differences.

For "Temporarily Absent" households (Figure 13), most cases are finalized at the end of the collection period. Around 20% of cases are closed between Thursday and Saturday (possibly confirmed by a neighbour, or the respondents may have told the interviewer in advance). The pattern is almost the same for personal and telephone interviews.

Figure 13. Day of Assigning the Final Code: "No One at Home" Nonresponse

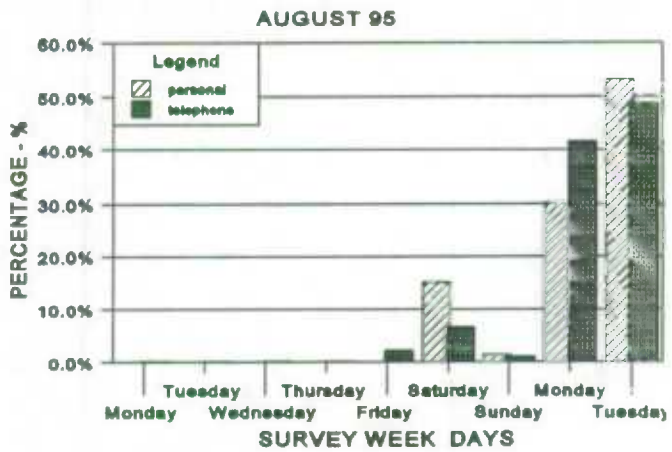
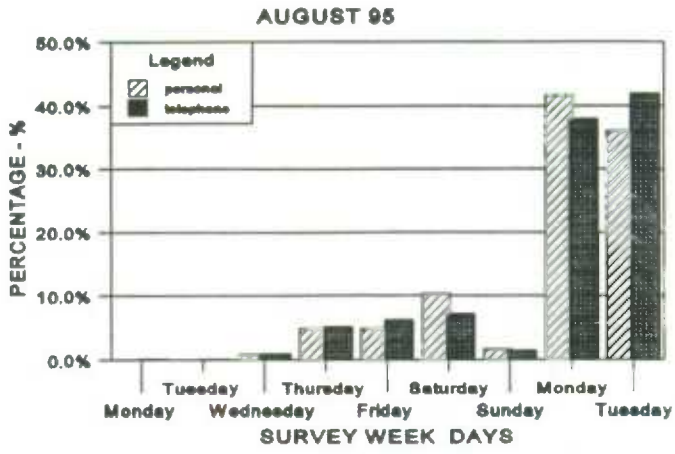


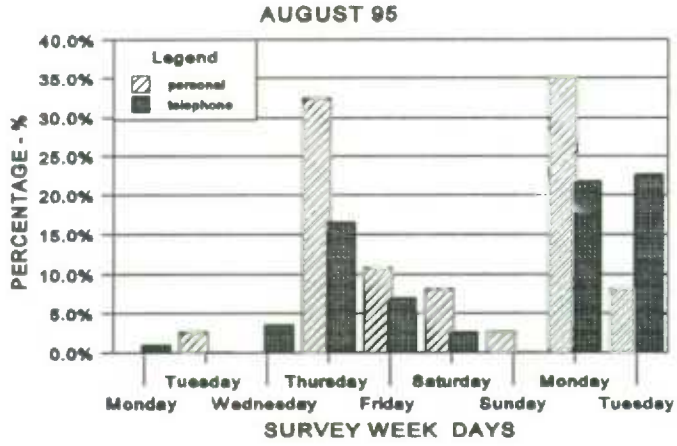
Figure 14. Day of Assigning the Final Code: "Temporarily Absent" Nonresponse



The distribution by day, when "No one at home" codes are assigned, is given in Figure 14. Interviewers are instructed that this code should be assigned later during the week than the "Temporarily absent" households since this nonresponse component cannot be confirmed. The interviewers are to try to contact a respondent until the end of the week. Consequently, about 90% of these codes are assigned on the last two days of the collection period - for both personal and telephone interviews.

For the "Other" nonresponse category (Figure 15), assigning codes is more spread out over the collection period. This is understandable, since this nonresponse category comprises a number of special circumstances in the household, and the code is assigned whenever they occur. The "Refusal" component is not treated here, since the corresponding data are not available yet. More work is needed to study the refusals since they are transferred to a senior interviewer for individual treatment.

Figure 15. Day of Assigning the Final Code: "Other" Nonresponse



As seen above, there are differences in the distribution, over the days of the week, of the assignment of final codes to nonresponding households. Also as indicated earlier, interviewers are instructed to handle different types of nonresponse differently. With these new data, it is now possible to see if the survey instructions are being followed properly. For example, interviewers are instructed that working on Sunday is up to their discretion and the data indicate that not a lot of coding is done on Sunday. The new data from the CMS will give a more complete picture of the survey and allow better monitoring of it. It is also possible to get more information about the interviewers' work and whether there are differences among Regional Offices.

Figures 16 and 17 show the frequency distribution of the duration of both types of interviews. In August 1995, the average length for a personal interview was about 17 minutes per household and the mode was 10 minutes and 30 seconds. For telephone interviews, the average length was 7 minutes and the mode was 5 minutes. This kind of information, which was difficult to obtain before CAI, can be of use: (i) to help estimate costs for LFS or supplementary survey interviews, (ii) to monitor overall costs more closely and (iii) to monitor work in the field. For example, in August 1995, some odd cases were found. An interviewer was conducting interviews in only 17 seconds. Was it a problem with the laptop, with the CMS files or something else? Further investigation is needed.

Figure 16. Distribution of Duration of Personal Interviews

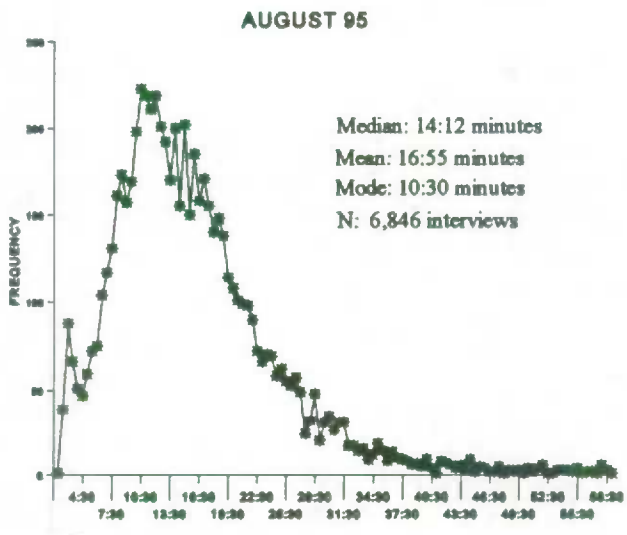
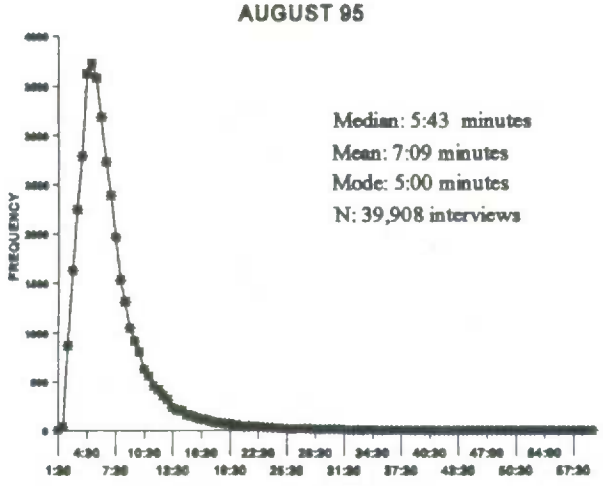


Figure 17. Distribution of Duration of Telephone Interviews



5. LESSONS LEARNED

There are five major lessons learned in the conversion of the LFS to CAI. The actual implementation of CAI took only a few months, but the effects on the quality measures of the survey lasted considerably longer. The first lesson learned was that any major change in a complicated process requires time to stabilize. For example, conversions to PAPI, as well as technical problems, which were caused by the introduction of the new technology, took about a year to disappear. Similarly, the other data quality indicators, especially the nonresponse rate, are reverting back to their pre-CAI levels only after a long adjustment period.

The second lesson is to expect the unexpected by developing contingency plans. Even though testing was done, the testing environment is never the same as the production environment, and as problems arose, people had to react quickly. For the first year, the RO field managers were simply reacting to problems as they came up. There was no time to prepare for future problems in advance. Recently, the situation has improved greatly with the stabilization of the technical problems and the PAPI conversion rate. The continuous improvement done to the CAI system is mainly responsible for this stabilization.

Thirdly, communication is essential since any relevant information has to flow smoothly between all LFS staff. Involved parties have to be informed of plans and progress, which is not an easy task in the decentralized environment of the LFS. Moreover, this information has to be communicated in a vocabulary that is easily understood.

Fourth, effective and comprehensive training of all LFS staff is crucial, especially at the interviewer

level. Interviewers had to face two challenges: new technology and new working procedures. The CAI collection process requires different skills from those needed for PAPI. The interviewers, hesitant at the beginning, now generally prefer to work with CAI than with PAPI. The flexibility and the on-line editing of CAI, as well as the perceived increase in professionalism of collecting data with a computer, are features well-liked by them.

Finally, the fifth lesson is that new skills will be required to analyze the tremendous volume of new information that is becoming available from the CAI system. Just as there was a learning curve for interviewers in converting to new technology, there will also be a learning curve for survey methodologists to interpret the new data.

6. FUTURE WORK

As for the future of CAI as a data collection method, it is very promising. Based on the success of the application of CAI for the LFS, Statistics Canada adopted this mode as the standard for household surveys. There are four major areas that have been identified for development.

In addition to the information collected on labour force activities, the LFS sample is used every month to gather other important data through supplementary surveys. Consequently, a first area of development is the conversion of the LFS supplements to the CAI mode. Most of the supplementary surveys have been completely converted (or tested) to CAI. The challenge for these surveys consists of making adjustments to return to the same level of high efficiency enjoyed with PAPI.

A second major development is a new LFS questionnaire, more complex and longer, that will be implemented in 1997. This is a direct consequence of using CAI. Given the complexity of the questionnaire, it would not have been possible with PAPI. A more complex questionnaire poses new challenges when designing data processing systems (more complex edit rules, imputation methods, etc.)

A research team has been established to examine the data available from the Case Management System to develop new measures to monitor data quality, to suggest areas where improvements may be made and to find the best way to communicate the information back to the ROs. The computer programs that will be developed by this group will also be used by other household surveys since the same Case Management System is used by these surveys.

As the technology continuously improves, more efficient and effective applications are being developed and implemented. New versions of the CMS and the CAI application are expected in 1996.

REFERENCES

Bench, J., Clark, C., Dufour, J. and Kaushal, R. (1994). *Implementing Computer-Assisted Interviewing for the Canadian Labour Force Survey.* Proceedings of the 1994 ASA conference.

Catlin, G. and Ingram, S. (1988). "The effect of CATI on Cost and Data Quality". *Telephone Survey Methodology,* edited by R.M. Groves et al., New York: John Wiley and sons.

Dufour, J., Kaushal, R., Clark, C. and Bench, J. (1995) . *Converting the Labour Force Survey to Computer-Assisted Interviewing,* Statistics Canada, Branch Working Paper (in progress).

Kaushal, R. and Laniel, N. (1993). *Computer Assisted Interviewing: Data Quality Test.* Proceedings of the Bureau of the Census 1993, Annual Research Conference. pp. 513-524

Kaushal, R. and Laniel, N. (1995). *Overview of Computer Assisted Interviewing: Data Quality Test.* Statistics Canada, Branch Working Paper (in progress).

Simard, M. and Dufour, J. (1995). *Impact of the Introduction of Computer-Assisted Interviewing as the New Labour Force Survey Data Collection Method.* Internal Report, Household Survey Method Division, Statistics Canada, Ottawa.

Simard, M. and Dufour, J. (1995). *The First Year of Computer-Assisted Interviewing for the Canadian Labour Force Survey.* Proceedings of the 1995 ASA conference. To appear.

Singh, M.P., Drew, J.D., Gambino, J.G. and Mayda, F. (1990). *Methodology of the Canadian Labour Force Survey 1984-1990.* Statistics Canada Publication, Catalogue number 71-526.