A New Collection Methodology for the Canadian Survey of Household Spending

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1. Introduction

Historically, the Canadian Family Expenditure Survey was conducted periodically (usually every four years). It's prime purpose was to collect information on household expenditures for use in updating the weights for the basket of goods used in the Consumer Price Index (CPI). Beginning with the 1997 reference year, the survey has also had to meet the new mandate for a major project to improve provincial economic statistics. The survey (renamed the Survey of Household Spending) then became an annual program and the sample size was increased by about 50% to satisfy the new reliability requirements for provincial estimates.

Under the current collection methodology, detailed information on expenditures and income is collected during a personal interview. Respondents are asked to recall their expenditures for a one year period, resulting in a long and demanding interview for respondents. Changes in the collection methodology are, therefore, being considered because response burden and response errors, due to the difficulty in recalling detailed expenditures, are of major concern.

Two alternative approaches are under study. They involve a mixed collection mode where frequent expenditures would be obtained from a diary and less frequent expenditures from an interview. The first approach is a modified version of the collection methodology used in most European countries where a separate contact is made for the retrospective interview. The second is a Panel approach similar to the collection methodology of the Consumer Expenditure Survey conducted by the U.S. Bureau of Labor Statistics where expenditures collected in the panel interviews are restricted to less frequent purchases to reduce response burden.

This paper describes the two alternative approaches, presents their advantages compared to the current collection methodology, and shows the results of a study comparing both approaches in terms of sampling error for the major users of aggregate data. The difficulty in using one expenditure survey to fulfil both aggregate data requirements and micro-data output is also discussed.

2. The Survey of Household Spending

The requirement of the annual survey is to produce reliable provincial estimates of aggregate household expenditures on specific goods and services for use in the System of National Accounts (SNA). On a periodic basis, which historically has been about every four years, the survey must also produce average and aggregate household expenditures by detailed commodity class and sub-class to determine weights for the basket of goods used in the CPI.

Currently, information on all expenditures, large and small, made by the household are collected for a one-year period from a retrospective interview. The interviews are conducted in the January to March period and expenditures collected are those made in the previous calendar year. It should be noted that detailed food expenditures are not collected during the recall interview. Detailed food data, needed only for the CPI, have been collected periodically (usually every four years) by the Food Expenditure Survey. Respondents were asked to fill out a diary for a two-week period, recording expenditures, types of items purchased, and quantities.

Prior to the 1997 reference year, the recall interview was a very long and demanding interview with an average length of about 2.5 hours due to the level of detail required for CPI. The new annual requirement offered the opportunity to study alternative approaches with the objective of reducing response burden and response errors. However, time constraints did not allow for immediate major changes in the collection methodology. While the content detail has been reduced to reflect the needs of the project to improve provincial statistics, the basic methodology will remain unchanged for the next few years. The reduction in the level of detail resulted in an average interview length of about 1.5 hours. In the next years, alternatives to the current collection methodology will be studied with the objective of developing a new approach for collecting expenditures which could serve as input to the update of CPI basket as well as satisfying the provincial economic requirements.

3. Objectives of a new collection methodology

The main objectives of a new collection methodology are to improve data quality and to have more reasonable expectations of respondents by reducing the length of the interview and the recall effort. (It seems unreasonable to expect respondent to remember all purchases makes over such a long period). In addition to the fact that respondents felt that the survey took too long to administer, a significant finding from the focus groups with interviewers and respondents who participated in the 1996 Survey was that respondents wanted to provide accurate responses and were very concerned that they were not able to provide accurate information for many expenditures (Gower, Bélanger and Williams, 1998).

The use of a more appropriate collection mode for frequently purchased products is a major issue. The general assumption for expenditure surveys is that very frequent and small expenses are better obtained from a diary approach where all expenditures are recorded daily by the respondent during a short period of time. The results of studies done from the U.S Consumer Expenditure Survey support this assumption (Silberstein and Scott, 1991). The diary could also be viewed as a more realistic way to get accurate detailed information on frequent purchases since expenditures are recorded as they are made. This avoids the recall effort of a long reference period and allows an important reduction in the content of the retrospective interview.

Less frequent expenses would still need to be collected from a retrospective interview. One of the objectives of the new methodology is to reduce the length of the reference period in order to decrease the memory error and the recall effort required of the respondent. A reduction in the reference period would result in an increase in the variance for the less frequent expenses and a risk of increased telescoping, which occurs when a respondent reports purchases that were actually made before the reference period. The shorter the reference period, the greater the telescoping may be in relation to the expenditures being measured. Some studies indicate that this error can become important for certain expenditures (Neter & Walksberg, 1965) and the new collection methodology will have to incorporate a mechanism to minimize the telescoping error.

It is important to find and implement an approach that addresses the new annual requirements for SNA, the periodic requirements for CPI, as well as the needs of other existing users. The objectives for SNA and CPI are similar in that they both require aggregate data at the macro level, though the CPI requires expenditures at a much more detailed level. However, some users have very different objectives.

One important benefit of the current recall collection methodology is that it provides information on income and expenditures for the same reference period (one year) for each sampled household. The survey's micro data file is an important source of information for many applications such as social policy research and the determination of low income cut-offs. Although these different models used to be updated only periodically when survey data were available, the impact of a new collection methodology on these programs has to be evaluated and considered in the choice of an alternative approach (beyond the scope of this document).

4. Alternative approaches

Most countries with economies comparable to Canada's use both a diary and a retrospective interview for the collection of expenditure data. The European approach, primarily used in Europe and Australia is certainly the most common approach. The survey period (generally one year) is subdivided into a number of time periods of equal length and a different subsample of households is observed for each single period. Each selected household enters all its expenditures daily in a diary for a short period of time (generally two weeks). At the beginning or the end of the diary period, they complete a retrospective interview covering the less frequent purchases. Depending on the type of expenditure, the reference period for the interview varies from as large as one year for very infrequent purchases such as cars and household appliances to shorter timeframes for other expenditures such as health services and recreation expenditures. There is no control for telescoping with this collection methodology as the beginning of the reference period is not bounded.

Another collection method is the Panel approach where the same households are contacted many times during a certain period and asked to report all expenditures they have made since the previous contact. The Panel approach allows for a better control on the telescoping error since the preceding interview serves as a bounding for the next. In conducting its Consumer Expenditure Survey (CES), the U.S. Bureau of Labor Statistics uses a panel approach in which respondents are visited on a quarterly basis for a total of five interviews (Pearl, 1971). The first interview is used essentially as a bounding interview. Its main purpose is to inventory

the household's durable goods and to record expenditures for a certain period so that telescoping can be avoided in the next interview. The Panel approach can combine the use of diary and interviews as is the case for some countries in the Eastern Europe. In the US, a separate sample of households is used for the diary because the response burden would be too high with the 5 interviews of the panel. For the same reason, it is felt that if a Panel approach would be implemented in Canada, the diary would also have to be completed by a different sample of households.

One of the big advantages to the European approach of keeping the diary and the interview on the same sample is that for a fixed collection budget the sample size will be much larger. However, the importance of having some way of minimizing the telescoping error has led to the consideration of a hybrid option. Each household would be asked to provide expenditures through the use of a diary and an interview, with an additional contact done three months after the end of the diary period for the retrospective interview. The end of the diary period would provide the respondent with a point of reference for the beginning of the recall period. The information on the diary could also be used to verify that an expenditure reported in the interview has not already been reported during the diary period (All expenditures are generally reported in the diary in order to avoid complexity and errors due to classification).

This proposed hybrid methodology, which will be referred to as the Modified European approach, as well as the Panel approach have been identified as interesting alternatives to the current Canadian methodology. Both meet many of the objectives of the desired new collection methodology in terms of data quality improvement: the use of a more appropriate collection mode for frequently purchased products, a shorter reference period (three months) for the retrospective interview, and the possibility of implementing some controls to minimize telescoping. With a first bounding interview, such as in the CES, and repeated contacts, the Panel approach has a better mechanism for controlling telescoping but the Modified European approach would allow some control during the diary period of 14 days .

The two proposed approaches would produce an increase in the sampling error for aggregate estimates of less frequent purchases, compared to the current methodology because of the reduction of the length of the reference period. Although the sampling error is not the only factor in the choice of a new collection methodology for the survey, it is an important issue for the major users of aggregate data. An exact comparison of the sampling error under both approaches would necessitate the knowledge of all parameters of each collection methodology such as which variables are best collected in the interview, how long will the interviews require, what would the sample size and the response rates be under each approaches, etc. This information is unknown but it was possible to create a realistic model using information from past surveys and from CES.

5. Description of the models

The models were developed specifically with the objective of producing accurate aggregate estimates and reducing the length of the retrospective interview. Expenditures were divided into three major classes for collection: diary, interview and last payment.

The content of the retrospective interview was restricted to expenses which are not frequent enough to be estimated accurately from a 14 days diary. Some recurring expenditures which take the form of regular payments were identified to be collected using the last payment approach. In this approach, the respondent provides the amount of the last bill and the length of the period covered thereby reducing problems of recall and telescoping.

The classification of different types of expenditures (more than 400 are required for CPI) into the three different classes is based on information from expenditure surveys in other countries and on the percentage of the population reporting the various expenses in the 1996 Canadian survey. (Arsenault, 1998) The results are presented in table 1 as a proportion of the total expenditure (in $) from the 1996 Family Expenditure Survey.

Table 1: Percentage of Total Expenditure by class

Class of Expenditures	Percentage of Total Expenditures
Retrospective Interview	37%
Last Payment	28%
Diary	35%

Some other assumptions in the models were that three contacts are needed for the 14-day diary. As was done in the Food Expenditure Survey, a contact in the middle of the diary period was assumed necessary for motivation and quality verification. All contacts are assumed to be by personal interview until some experimentation is done on the results that could be obtained from telephone interviews. Based on the interview time from past surveys and tests, the retrospective interview is expected to take a little less than one hour. The last payment questionnaire would

be short (around 15 minutes) and administered at the end of the diary period.

Considering that interviewer time and travel costs represent about two thirds of the total collection costs, a theoretical model, based on these two sources of costs, was used for estimating the sample size ratio between the two approaches. Assuming the same size for the diary sample and the panel in the Panel approach, the ratio of sample size of the Modified European approach over the Panel was 2.2; which means that for the same budget the sample size of the Modified European approach would be 2.2 times that of the Panel.

6. Sampling Error Comparison Study

The sampling error for all expenditures being estimated from the diary and from the last payment questionnaire would be much smaller under the Modified European approach compared to the Panel approach since the sample size would be 2.2 times larger. However, it would be possible to administer the last payment questionnaire to both diary and panel sample under the Panel approach. This would result in similar variances under both collection approaches for the expenditures being collected by the last payment questionnaire.

For the expenditures estimated from the retrospective interview, implications on sampling variance depend on the correlation between expenditures in successive 3-month periods over one year. This information is not available from the current Canadian survey but data from the CES were used to compare sampling variance of the two approaches for types of expenditures collected from the retrospective interview. The objective was to compute the ratio of the sampling variance of the estimate of total expenditures over a one year period. At the time the study was done, it was not possible to get a historical file containing many years of CES data – only data for 1994 was available. Since new households rotate into the panel every quarter, only about one fifth of the sample on the file had complete information for four periods of three months (less than 1000 respondent households). Since the type of expenditures on the interview are the less frequent expenditures, the percentage of households reporting zero on a three month period is large, thus a small sample would not provide enough information.

Even if the ratio of sampling variance of the Panel approach to the Modified European could not be estimated from the 1994 CES, the data were used to evaluate if there is a gain (in terms of reduction of variance) in collecting expenditures for two successive 3-month periods on the same households compared to collecting expenditures from different households for each 3-month period. The sampling variance of the estimate of total expenditure under a two-interview approach ($V^{(2)}$) compare to a one-interview approach ($V^{(1)}$) could be written as:

$$\frac{V^{(2)}}{V^{(1)}} = (1+\delta)\frac{n^{(1)}}{2n^{(2)}} \quad \text{where,}$$

$$1+\delta = \frac{\sigma^2_{p=1} + \sigma^2_{p=2} + 2\sigma_{p=1,p=2}}{\sigma^2_{p=1} + \sigma^2_{p=2}} \quad \text{and where,}$$

σ^2_p represents the variance of expenditure in a 3-month period p and $\sigma_{p=1,p=2}$ represents the covariance of expenditure between two 3-month periods.

These ratios were computed for the major groups and sub-groups of expenditures required from the two main users of aggregate expenditure estimates: the SNA and the CPI. They are presented in table 2 and table 3 respectively. The value of $1+\delta$ is presented as an indicator of the correlation between periods for each type of expenditures (a value of 1 indicates no correlation). In the tables, ratio of variances larger than 1 indicates that the Modified European approach (where there is only one retrospective interview) would provide smaller variance. The sample size ratio of $n^{(1)}$ over $n^{(2)}$ were estimated from a model similar to the model described in section 5 but restricted to a 3-contact panel (two retrospective interviews and one bounding interview). The estimated sample size ratio was 1.64.

Results of the study for SNA requirements

The classification of personal expenditures on consumer goods and services for SNA purposes is divided into 38 Personal Spending groups of which 12 were identified to include sub-groups of expenditures to be collected from the retrospective interview. These 12 groups covered about 53% of all expenditures being collected in the interview since some expenditures are not included in the SNA classification or the mapping to the CES classification was not conceptually possible. The ratio of sampling variances and the expenses covered by the group, expressed as percentage of all expenses collected in the interview, are presented in Table 2.

Generally, the 3-contact Panel approach gives smaller variances but for many groups the difference between the two approaches is not very large. The major loss in using the Modified European Approach would be for the *motor vehicles, recreation* and *household*

Table 2: Ratio of Sampling Variance of Panel Approach (3 contacts) on Modified European Approach for SNA required expenditures collected in the interview

Personal Classification Group (restricted to group mainly composed of type of expenditure classified interview)	Expenses covered by the group (as % of all expenses collected in the interview)	1+δ	Ratio of Sampling Variance
New and used motor vehicles	17.5	1.01	0.83
Recreation, sporting and camping equipment	9.0	1.04	0.85
Motor vehicle parts and repairs	6.5	1.21	0.99
Furniture, carpets and other floor coverings	4.4	1.13	0.93
Purchased transportation	4.0	1.12	0.92
Household appliances	4.0	1.04	0.85
Reading and entertainment supplies	1.8	1.25	1.03
Fuels other than natural gas	1.5	1.52	1.24
Semi-durable household furnishings	1.0	1.02	0.84
Education and cultural services	0.6	1.30	1.06
Other household services (pet care)	0.6	1.18	0.96
Other auto related services (vehicle renting)	0.3	1.02	0.84
	53.0		

Table 3: Ratio of Sampling Variance of Panel Approach (3 contacts) on Modified European Approach for CPI required expenditures (grouped) collected in the interview

Major Group of Expenditure (restricted to group mainly composed of type of expenditure classified interview)	Expenses covered by the group (as % of all expenses collected in the interview)	1+δ	Ratio of Sampling Variance
Auto and accessories Purchases	17.5	1.01	0.83
Vehicle operation costs	6.4	1.22	1.00
Furniture and furnishings	3.7	1.14	0.93
Health care	3.3	1.20	0.98
Home entertainment	3.2	1.08	0.89
Maintenance and repairs	2.9	1.07	0.88
Computers	2.4	1.04	0.85
Inter-city transportation	2.4	1.11	0.91
Women's wear (coats, jackets, suits, dresses)	2.3	1.25	1.02
Traveller accommodation	1.8	1.20	0.98
Household appliances	1.6	1.04	0.85
Education	1.5	1.13	0.93
Recreation vehicle purchase	1.4	1.15	0.94
Entertainment events	1.3	1.35	1.11
Sporting and athletic equipment	1.3	1.12	0.92
Men's wear (coats, jackets, suits)	1.2	1.16	0.96
Single usage fees (sports and recreation)	1.0	1.31	1.07
Hobbies	0.3	1.05	0.86
Auto Rental Fees	0.3	1.03	0.85
Lawn, Garden, Snow Maintenance	0.2	1.02	0.83
Photographic Goods and Services	0.1	1.00	0.82
Boy's Wear (coats, jackets, snowsuits)	0.1	1.06	0.87
Girl's Wear (coats, jackets, snowsuits)	0.1	1.14	0.94
Truck Rental Fees	0.1	1.03	0.84
Infants' Wear (coats, jackets, snowsuits)	0.1	1.06	0.87
	56.3		

appliance groups and some small groups representing a very small proportion of total expenditures. These three larger groups include very infrequent and expensive purchases. The reference period could be increased to 12 months for the more important expenditures in these groups; telescoping error would be less problematic for such expenditures. Since the sample is spread over the year and SNA need calendar year data, respondents would have to provide information on when they bought these items (at least in which calendar year) or an adjustment procedure would have to be developed.

Results of the study for CPI Requirements

Estimates of expenditure are required to update the weights for about 185 basic classes of expenditures. The ratios of sampling variances are presented in table 3 at a more aggregated level. Similarly, a 3-contact Panel approach provides generally smaller variance but the differences are small. In addition to *Automobile* and *household appliances*, the major loss in using the Modified European Approach would be for *computers*. Although not presented in this paper, the results at a more detailed level indicate that in a few groups the ratio of sampling variances for the sub-components are much lower than the ones of the total. This is the case for *Furniture and Furnishings* where the efficiency is 0.93 for the total but the efficiencies of most components vary between 0.82 and 0.85.

7. Conclusions

The two alternative collection methodologies presented in this paper meet many of the study's objectives in terms of data quality improvement with the use of a more appropriate collection mode for frequently purchased products, a reduced reference period for the retrospective interview and the possibility of avoiding major telescoping error. As well, the length of the retrospective interview can be reduced considerably by restricting the content to the less frequent purchases.

The total response burden would not necessarily be smaller than the current collection methodology (one-year retrospective interview) but it would be spread over different contacts. Overall, the response burden would be less with the Modified European Approach than with the Panel approach. Both approaches should result in increased sampling error, but overall, when we consider the three collection modes (diary, last payment and retrospective interview) the modified European approach will provide smaller variance. (The results for the expenditures collected from the

interview will be generalised when historical CES data are available).

The major problem with both approaches is that, with a different reference period for different expenditures and a sample spread over time, income and expenditures for the same period would not be available at the micro data level. In the panel approach, annual expenditures collected in the interview would be available for a household but this would represent only about 35% of total expenditures. An expansion of the content covered in the interview of the panel approach would help meet the micro data requirements. However, this would considerably increase the response burden. Also, the increased collection costs would have an impact on the sample size and the precision of aggregate estimates. Considering that the current requirements for micro-data are periodic and that the major clients require aggregate levels, other alternatives for micro-data users will be evaluated before a final decision is made on the new collection methodology.

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