

Microdata User Guide

NATIONAL TENANT SATISFACTION SURVEY

2006

Statistics Canada Statistique Canada

Canada

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1.0 Introduction

The National Tenant Satisfaction Survey (NTSS) was conducted by Statistics Canada from August 22 to December 22, 2006 with the cooperation and support of Public Works and Government Services Canada (PWGSC). This manual has been produced to facilitate the use of the survey results and microdata.

Any questions about the data set or its use should be directed to:

Statistics Canada

Client Services
Special Surveys Division
Telephone: 613-951-3321 or call toll-free: 1 800 461-9050
Fax: 613-951-4527
Email: ssd@statcan.ca

2.0 Background

The National Tenant Satisfaction Survey was undertaken to provide information on the satisfaction of federal public servants who work in buildings under the responsibility of Public Works and Government Services Canada (PWGSC) with regard to their physical working environment.The survey collected information about employee workspace, building services, service availability, changes in services and satisfaction with the property management team. The survey was first conducted by Statistics Canada from December 11, 2001 to March 15, 2002.

The resulting data and analysis will highlight areas which need improvement as well as areas where employees are satisfied with the standard of services delivered.

3.0 Objectives

The main objectives of this survey were to:

- Determine tenant satisfaction in government buildings under the responsibility of Public Works and Government Services Canada (PWGSC).
- Enable PWGSC to better understand the needs of their tenants and improve existing building services.

4.0 Concepts and Definitions

This chapter outlines concepts and definitions of interest to the users. Users are referred to Chapter 12.0 of this document for a copy of the actual survey questionnaire used.

4.1 Survey Concepts

The survey sample frame units are the telephone numbers of the target population. The National Tenant Satisfaction Survey (NTSS) is a sample survey weighted to the number of tenants in the target population.

Population
Federal Government of Canada employees who are in federal government departments or agencies participating in the National Tenant Satisfaction Survey and who are in buildings which have been identified by Public Works and Government Services Canada (PWGSC) as under their responsibility and in-scope for the survey.

Target population
Federal Government of Canada employees with telephone numbers who are in federal government departments or agencies participating in the National Tenant Satisfaction Survey and who are in buildings which have been identified by Public Works and Government Services Canada as under their responsibility and in-scope for the survey.

Large buildings
Buildings identified with 100 or more telephone lines.

Small buildings
Buildings identified with less than 100 telephone lines.

Tenant
Federal government employees who are occupants in the buildings.

Respondents
Federal government employees who responded to the questionnaire.

Eligible cases
The telephone lines which were verified as belonging to federal government employees in large buildings under the responsibility of PWGSC in participating departments and agencies (i.e. in-scope telephone numbers).

Response rate
The number of federal government employees responding to NTSS as a percentage of the number of eligible cases.

Out-of-scope
Telephone numbers which fell outside of the sample criteria. Units were considered out-of-scope if the telephone numbers were those belonging to facsimile machines, conference rooms, data lines, elevators, or were identified as not belonging to a federal department or agency, or were those of a department or agency who did not wish to participate in the survey. Also, some telephone numbers initially thought to be in-scope were later verified to belong to buildings not under the responsibility of PWGSC or buildings not in-scope for the survey.

4.1.1 Participating Departments and Agencies

Because of the changing nature of government department names, with mergers and splits, the list below may not be a current, accurate and complete list of departments and agencies. The list provided below is a "snap shot" of the list of department and agency names we had prior to finalizing the frame of telephone numbers for choosing the sample for the survey.

- Agriculture and Agri-Food Canada
- Association of Professional Executives of the Public Service of Canada
- Canadian Food Inspection Agency
- Canadian Heritage
- Citizenship and Immigration Canada
- Department of Finance Canada
- Department of Foreign Affairs
- Department of Justice Canada
- Environment Canada
- Fisheries and Oceans Canada
- Governor General Residence of Her Excellency
- Health Canada
- Indian and Northern Affairs Canada
- Industry Canada
- Infrastructure Canada
- International Trade Canada
- Library and Archives Canada
- Millennium Bureau of Canada
- National Defence
- Natural Resources Canada
- Office of the Auditor General of Canada
- Office of the Governor General of Canada
- Parks Canada
- Parliament of Canada
- Privy Council Office
- Public Safety and Emergency Preparedness Canada
- Public Works and Government Services Canada
- Royal Canadian Mounted Police
- Royal Society of Canada
- Solicitor General of Canada
- The Leadership Network
- Transport Canada
- Treasury Board of Canada Secretariat
- Veterans Affairs Canada

Some departments and agencies elected not to participate in this survey. They include:

- Canada Border Services Agency
- Canadian Security Intelligence Service
- Human Resources and Social Development Canada
- Canada Revenue Agency

4.2 Survey Definitions

Physical work environment
Services in buildings, including cleaning, lighting, cafeteria food, office space, etc.

Parking availability
Refers to publicly managed parking lots.

Task lighting
Special lights over or on the immediate work area.

Natural lighting
Light coming through windows or skylights.

Air quality
Quality of the air in the buildings, including air movement and odours.

Building security services
Security guards, perimeter doors and management of after-hours building access.

Barrier free accessibility to the building
Easy entry into the building for people with disabilities such as wheelchair ramps.

Building system noise levels
Noise levels of furnaces, fans, and air conditioning.

Real property or facilities management
The people responsible for the management service of property assets and their equipment to employees within their department.

Property manager
The person responsible for the day to day operations of buildings and specialized facilities. This includes planning, budgeting, energy management and ensuring due diligence with respect to environmental and life safety systems compliance.

Closed office
Room with four walls from floor to ceiling and with a door.

5.0 Survey Methodology

The National Tenant Satisfaction Survey (NTSS) was administered between August 22 and December 22, 2006 to a sample of telephone numbers. The NTSS design is briefly described in the sections below.

5.1 Population Coverage

The NTSS is a sample survey of federal government employees in buildings under the responsibility of Public Works and Government Services Canada (PWGSC). Specifically excluded from the survey's coverage are employees in buildings which were expected to have fewer than 100 federal government employees. Also excluded were employees in federal government departments and agencies which chose not to participate in the survey. These included Canada Border Services Agency, Canada Revenue Agency, Canadian Security Intelligence Service, and Human Resources and Social Development Canada. Also excluded were buildings which PWGSC specifically chose to exclude for operational or other reasons and buildings for which it was not possible to obtain a list of employee telephone numbers.

5.2 Sample Design

For the 2006 survey, PWGSC hired a private contractor to collect the telephone numbers from the telephone companies. A new frame was created for this cycle of the survey, using the telephone numbers provided by the contractor. The telephone numbers in buildings and departments or agencies in-scope for the survey were identified by Statistics Canada personnel. The files included a field indicating the department or agency to which the telephone numbers belonged. Any buildings which contained only telephone numbers belonging to the departments or agencies which chose not to participate in the survey were removed from the frame.

In cases where several buildings were part of a complex (e.g. East Tower, West Tower, etc.), it was not always possible to determine to which building a telephone number belonged. The only information available was that it belonged to the complex as a whole. In these cases some, or all, of the buildings within the complex had to be combined on the frame and treated as one building.

The final frame contained telephone numbers for 199 buildings. There were a total of 138,831 telephone numbers on the frame. All survey results relate to the buildings on the final frame.

5.2.1 Stratification

The NTSS is based on a stratified design with simple random sampling within strata. Telephone numbers were used as the sampling unit and the strata were defined as the buildings.

5.2.2 Sample Allocation and Selection

When calculating the sample size some assumptions were necessary. The rate of out-of-scope telephone numbers on the frame was expected to be 35% and the response rate 80%. The survey requirements for the NTSS 2006 were to produce reliable estimates at the management type by region level (34 in all) and reliable estimates for over 30 priority buildings specified by the external client (each building can appear in only one region and it can only have one type of management). In both cases, the minimum estimable proportion was set at 0.15

(min p). The requirements for the NTSS 2006 are an important departure from those of the 2002-2003 survey.

The following requirements were used to determine the original sample allocation:

- the total sample size was set at approximately 20,000 telephone numbers.
- the minimum estimable proportion at the management type, region, and pre-specified building levels were set at 0.15 (min p).

We calculated the number of responses needed at the management type and region level in order to be able to estimate a proportion of 0.15 with a coefficient of variation (CV) of 16.5%. This was achieved using the Kish allocation. This type of allocation offers a compromise between proportional and equal allocation.

The sample selection took place at the stratum level. Telephone numbers were randomly selected using simple random sampling within a stratum.

The distribution of the sample by region is given in the table below.

Region	**Sample Size**
Atlantic	2,197
Quebec (excluding National Capital Region)	2,073
National Capital Region and Nunavut	9,787
Ontario (excluding National Capital Region)	1,683
Western (includes Northwest Territories)	2,437
Pacific (includes Yukon)	1,852
Canada	**20,029**

6.0 Data Collection

Data collection for the National Tenant Satisfaction Survey (NTSS) was carried out from August 22 to December 22, 2006. Interviews were conducted over the telephone from the Statistics Canada regional office in Sturgeon Falls.

6.1 Questionnaire Design and Testing

Qualitative testing in the form of focus groups was used to test and evaluate the questionnaire and survey concepts.

During March and April of 2001, seven focus group sessions took place in the National Capital Region, in both official languages, each lasting two hours. Before they took part in the focus groups, tenant participants were contacted by telephone to complete the survey. This was done in order to get their reactions from a respondent's point of view.

The main objectives of the focus groups were:

1) To test the overall reaction of knowledgeable clients, Client Service Unit Directors, landlords and building tenants.

2) To test the appropriateness and applicability of concepts, content and flow.

3) To test the response burden and respondent-friendliness

4) To test the cognitive processes of building tenants in responding to the questionnaire including:
    - an assessment of the respondents' understanding of various concepts and content; and
    - an evaluation of the respondents' ability to respond to questions.

6.2 Interviewing

Statistics Canada interviewers are employees hired and trained to carry out surveys. Interviewers contacted each of the sampled telephone numbers to conduct the interview. Data was collected using a computer-assisted telephone interviewing (CATI) system. Interviews lasted 10 minutes on average.

6.3 Supervision and Control

All NTSS interviewers are under the supervision of a staff of senior interviewers who are responsible for ensuring that interviewers are familiar with the concepts and procedures of the survey and also for periodically monitoring their interviewers and reviewing their completed documents.

6.4 Non-response to the National Tenant Satisfaction Survey

In total, 12,637 telephone numbers were eligible for the survey; the NTSS interview was completed for 11,939 of these telephone numbers for a collection response rate of 94.5%. More detailed information on response rates is presented in Chapter 8.0 (Data Quality).

7.0 Data Processing

An output of the National Tenant Satisfaction Survey (NTSS) is a "clean" microdata file. This chapter presents a brief summary of the processing steps involved in producing this file. The main output is the HTML documents that were derived from the microdata file that is held by Statistics Canada.

7.1 Data Capture

Responses to survey questions are captured directly by the interviewer at the time of the interview using a computerized questionnaire. The computerized questionnaire reduces processing time and costs associated with data entry, transcription errors, and data transmission. The response data are encrypted to ensure confidentiality and transmitted over a secure line to Ottawa for further processing.

7.2 Editing

A series of edits were performed on the capture file to check the data paths and flows and for internal consistency. The first type of error treated was errors in questionnaire flow, where questions which did not apply to the respondent (and should therefore not have been answered) were found to contain answers. In this case a computer edit automatically eliminated superfluous data by following the flow of the questionnaire implied by answers to previous, and in some cases, subsequent questions.

The second type of error treated involved a lack of information in questions which should have been answered. For this type of error, a non-response or "not-stated" code was assigned to the item.

7.3 Coding of Questionnaire Information

During the interview, respondents were asked to confirm the building location and department or agency where the telephone number belonged. Information related to the department or agency was captured and coded at the time of the interview. Building name and/or address related to the location of the respondent was also recorded by the interviewer, and then used to code his/her location to a specific building code.

A small number of data items on the questionnaire were recoded. These data items were related to additional services important to tenants such as: office space, food services, privacy, drinking water and shower facilities. Using automated coding techniques and manual verification, many of these open-ended responses were recoded into existing categories on the questionnaire.

7.4 Creation of Derived Variables

A number of data items on the microdata file have been derived by combining items on the questionnaire in order to facilitate data analysis and tabulations.

For example, SS_Q01 asks on a scale of 1 to 5, where 1 is lowest importance and 5 is highest importance, how the respondent would rate the importance of natural lighting while SS_Q02 asks on a scale of 1 to 5, where 1 is lowest satisfaction and 5 is highest satisfaction, how the respondent would rate his/her level of satisfaction with the natural lighting. A derived variable was created and included in the HTML document to show the average score of importance of natural lighting and the average satisfaction with the natural lighting.

Another example would be question BSER_Q05 which asks for the respondents' overall satisfaction with the services in their building. Their options are: very satisfied, somewhat satisfied, somewhat dissatisfied, and very dissatisfied. A derived variable is created to calculate overall satisfaction which adds the very satisfied with the somewhat satisfied. This derived variable is near the end of the Executive Summary HTML documents.

A final example of derived variables in the HTML documents is the "Average ratings" tables. When calculating the average importance, respondents who answered "Does not apply to me" were given a value of 0. So in this section the scale of importance ranges from 0 to 5. When calculating average satisfaction, respondents who answered "Does not apply to me" were excluded from the calculation. So in this section the scale of satisfaction ranges from 1 to 5. To illustrate the rationale for treating the "Does not apply to me" differently we will look at a fictional building. In this fictional building there are 100 respondents, 5 of whom have children of the age that could need daycare facilities.

> For the "importance" question, 95 respondents would probably rate their level of importance for access to daycare facilities as "Does not apply to me". While the remaining 5 respondents, who have children of daycare age, would rate their level of importance as 5. So if we were to exclude the "Does not apply to me" responses in calculating the "average" importance, it would show that at the building level average importance is 5.00. But in reality, 95% of respondents consider daycare facilities to be of such little importance that it does not apply to them. So the average rating for importance of access to daycare facilities in the building would be more accurately shown as 0.05.
>
> Now let's examine the average satisfaction rating, and why "Does not apply to me" is excluded from the calculation. Let us say that these same 5 respondents with children of daycare age rated their satisfaction of the daycare facilities in their building with a 5, because they feel it meets all their needs. The same 95 respondents who do not have children of daycare age responded with "Does not apply to me". If we were to rate these 95 responses with a value of 0, then the average satisfaction would be 0.05. But we know that the daycare facilities in this building are exceptional. Therefore, only those 5 respondents who responded and gave the daycare facilities a rating of 5 are considered in the average rating score.

7.5 Weighting

The principle behind estimation in a probability sample such as the NTSS is that each person in the sample "represents", besides himself or herself, several other persons not in the sample. For example, in a simple random 2% sample of the population, each person in the sample represents 50 persons in the population.

The weighting phase is a step which calculates, for each record, what this number is. This weight appears on the microdata file, and **must** be used to derive meaningful estimates from the survey. For example, if the number of individuals working in a particular building is to be estimated, it is done by selecting the records referring to those individuals in the sample that said they worked in that building and summing the weights entered on those records.

Details of the method used to calculate these weights are presented in Chapter 11.0.

7.6 Suppression of Confidential Information

Any estimates generated from this file for client use will be screened in order to protect the anonymity of individual survey respondents. Answer categories are suppressed or collapsed

into larger categories in order to ensure confidentiality. Estimates generated will be released to the user, subject to meeting the guidelines for analysis and release outlined in Chapter 9.0 of this document.

It should be noted that the amount of information contained in the HTML documents differ in a number of important respects from the survey "master" files held by Statistics Canada. As a result, the totals on all tables may not always be equal. These differences are the result of actions taken to protect the anonymity of individual survey respondents and/or organizations.

8.0 Data Quality

8.1 Response Rates

The following table summarizes the response rates to the National Tenant Satisfaction Survey (NTSS) by region.

Region	Sample Size	Number of Eligible Telephone Numbers	Number of Respondents	Response Rate (%)
Atlantic	2,197	1,475	1,413	95.8
Quebec (excluding National Capital Region)	2,073	1,068	1,009	94.5
National Capital Region and Nunavut	9,787	6,146	5,790	94.2
Ontario (excluding National Capital Region)	1,683	1,173	1,101	93.9
Western (includes Northwest Territories)	2,437	1,688	1,608	95.3
Pacific (includes Yukon)	1,852	1,087	1,018	93.7
Canada	**20,029**	**12,637**	**11,939**	**94.5**

8.2 Survey Errors

The estimates derived from this survey are based on a sample of telephone numbers. Somewhat different estimates might have been obtained if a complete census had been taken using the same questionnaire, interviewers, supervisors, processing methods, etc. as those actually used in the survey. The difference between the estimates obtained from the sample and those resulting from a complete count taken under similar conditions, is called the sampling error of the estimate.

Errors which are not related to sampling may occur at almost every phase of a survey operation. Interviewers may misunderstand instructions, respondents may make errors in answering questions, the answers may be incorrectly entered on the questionnaire and errors may be introduced in the processing and tabulation of the data. These are all examples of non-sampling errors.

Over a large number of observations, randomly occurring errors will have little effect on estimates derived from the survey. However, errors occurring systematically will contribute to biases in the survey estimates. Considerable time and effort were taken to reduce non-sampling errors in the survey. Quality assurance measures were implemented at each step of the data collection and processing cycle to monitor the quality of the data. These measures include the use of highly skilled interviewers, extensive training of interviewers with respect to the survey procedures and questionnaire, focus group testing of the questionnaire, procedures to ensure that data capture errors were minimized, and coding and edit quality checks to verify the processing logic.

8.2.1 The Frame

The quality of some of the sampling variables on the frame were dependent on the timeliness and accuracy of the data from the telephone companies. Due to

inaccuracies on the frame, it was possible that interviewers contacted employees of government departments or agencies which were out-of-scope for the survey. In these cases interviewers were instructed to apologize for the interruption and end the interview. These telephone numbers were then coded as out-of-scope. There were several other reasons why telephone numbers were considered to be out-of-scope. When the list of telephone numbers were obtained from the telephone companies it was not possible to identify lines used for facsimile machines, data lines, conference rooms etc. All of these numbers were coded as out-of-scope. Overall, 31% of the telephone numbers on the frame were coded as out-of-scope for the survey. This was higher than originally expected. The out-of-scope rate affects the quality of the data by reducing the effective sample size. Some allowance for the fact that telephone numbers would be out-of-scope was made when the initial sample sizes were calculated.

Some variables on the sampling frame play a critical role. That is why at the time of the interview we confirmed with the respondent his location and department or agency.

8.2.2 Data Collection

Interviewer training consisted of reading the NTSS Interviewer's Manual, attending a one day formal in-class training session and discussing any questions with senior interviewers before the start of the survey. A description of the background and objectives of the survey was provided, as well as a glossary of terms and a set of questions and answers. In addition, the computer-assisted telephone interviewing system used for the collection reduced the possibility of error.

8.2.3 Non-response

A major source of non-sampling errors in surveys is the effect of non-response on the survey results. The extent of non-response varies from partial non-response (failure to answer just one or some questions) to total non-response. Total non-response occurred because the interviewer was either unable to contact the respondent or the respondent refused to participate in the survey. Total non-response was handled by adjusting the weights of individuals who responded to the survey to compensate for those who did not respond.

In most cases, partial non-response to the survey occurred when the respondent did not understand or misinterpreted a question, refused to answer a question, or could not recall the requested information.

If non-respondents tend to differ from respondents in terms of the survey variables then a non-response bias could be present. To reduce the effect of any non-response bias, efforts were made to keep the response rate as high as possible. Interviewers were instructed to make reasonable attempts to obtain NTSS interviews with tenants of participating departments and agencies. For tenants who at first refused to participate in the NTSS, a second call was made by the senior interviewer and a confirmation letter was sent by facsimile from the Regional Office to the tenant's office stressing the importance of the survey and the tenant's cooperation. For cases in which the timing of the interviewer's call was inconvenient, an appointment was arranged to call back at a more convenient time. For cases where no one was in the office, numerous call backs were made.

8.2.4 Measurement of Sampling Error

Since it is an unavoidable fact that estimates from a sample survey are subject to sampling error, sound statistical practice calls for researchers to provide users with some indication of the magnitude of this sampling error. This section of the documentation outlines the measures of sampling error which Statistics Canada commonly uses and which it urges users producing estimates from this microdata file to use also.

The basis for measuring the potential size of sampling errors is the standard error of the estimates derived from survey results.

However, because of the large variety of estimates that can be produced from a survey, the standard error of an estimate is usually expressed relative to the estimate to which it pertains. This resulting measure, known as the coefficient of variation (CV) of an estimate, is obtained by dividing the standard error of the estimate by the estimate itself and is expressed as a percentage of the estimate.

For example, suppose that, based upon the NTSS 2002-2003 survey results, one estimates that 59.0% of individuals would like to see improvements made to their physical work environment and related services in their building and this estimate is found to have a standard error of 0.005. Then the coefficient of variation of the estimate is calculated as:

$$\left(\frac{0.005}{0.590} \right) X \ 100 \ \% \ = \ 0.8 \%$$

There is more information on the calculation of coefficients of variation in Chapter 10.0.

9.0 Guidelines for Tabulation, Analysis and Release

This chapter of the documentation outlines the guidelines to be adhered to by users tabulating, analysing, publishing or otherwise releasing any data derived from the survey microdata files. With the aid of these guidelines, users of microdata should be able to produce the same figures as those produced by Statistics Canada and, at the same time, will be able to develop currently unpublished figures in a manner consistent with these established guidelines.

9.1 Rounding Guidelines

In order that estimates for publication or other release derived from these microdata files correspond to those produced by Statistics Canada, users are urged to adhere to the following guidelines regarding the rounding of such estimates:

a) Estimates in the main body of a statistical table are to be rounded to the nearest hundred units using the normal rounding technique. In normal rounding, if the first or only digit to be dropped is 0 to 4, the last digit to be retained is not changed. If the first or only digit to be dropped is 5 to 9, the last digit to be retained is raised by one. For example, in normal rounding to the nearest 100, if the last two digits are between 00 and 49, they are changed to 00 and the preceding digit (the hundreds digit) is left unchanged. If the last digits are between 50 and 99 they are changed to 00 and the preceding digit is incremented by 1.

b) Marginal sub-totals and totals in statistical tables are to be derived from their corresponding unrounded components and then are to be rounded themselves to the nearest 100 units using normal rounding.

c) Averages, proportions, rates and percentages are to be computed from unrounded components (i.e. numerators and/or denominators) and then are to be rounded themselves to one decimal using normal rounding. In normal rounding to a single digit, if the final or only digit to be dropped is 0 to 4, the last digit to be retained is not changed. If the first or only digit to be dropped is 5 to 9, the last digit to be retained is increased by 1.

d) Sums and differences of aggregates (or ratios) are to be derived from their corresponding unrounded components and then are to be rounded themselves to the nearest 100 units (or the nearest one decimal) using normal rounding.

e) In instances where, due to technical or other limitations, a rounding technique other than normal rounding is used resulting in estimates to be published or otherwise released which differ from corresponding estimates published by Statistics Canada, users are urged to note the reason for such differences in the publication or release document(s).

f) Under no circumstances are unrounded estimates to be published or otherwise released by users. Unrounded estimates imply greater precision than actually exists.

9.2 Sample Weighting Guidelines for Tabulation

The sample design used for the National Tenant Satisfaction Survey (NTSS) was not self-weighting. When producing simple estimates, including the production of ordinary statistical tables, users must apply the proper sampling weight.

If proper weights are not used, the estimates derived from the microdata files cannot be

considered to be representative of the survey population, and will not correspond to those produced by Statistics Canada.

Users should also note that some software packages may not allow the generation of estimates that exactly match those available from Statistics Canada, because of their treatment of the weight field.

Data on the proportions and average values of the HTML tables are weighted estimates. The population represents the weighted number of people excluding those who refused, or didn't know the answer for each question. The number of respondents represent the number of people who answered these questions (excluding "refusals" and "don't knows").

9.3 Categorical Estimates

Before discussing how the NTSS data can be tabulated and analysed, it is useful to describe the type of point estimate of population characteristics which can be generated from the data file for the NTSS.

Categorical estimates are estimates of the number, or percentage of the surveyed population possessing certain characteristics or falling into some defined category. The number of employees who would like to see improvements to their physical work environment or the proportion of employees who are very satisfied with the services in their building are examples of such estimates. An estimate of the number of persons possessing a certain characteristic may also be referred to as an estimate of an aggregate.

Examples of Categorical Questions:

Q: Would you like to see any improvements made to your physical work environment and related services in your building?
R: Yes / No

Q: Overall, how satisfied are you with the services in your building?
R: Very satisfied / Somewhat satisfied / Somewhat dissatisfied / Very dissatisfied

9.3.1 Tabulation of Categorical Estimates

Estimates of the number of people with a certain characteristic can be obtained from the microdata file by summing the final weights of all records possessing the characteristic(s) of interest. Proportions and ratios of the form $\hat{X} / \hat{Y}$ are obtained by:

a) summing the final weights of records having the characteristic of interest for the numerator $\left(\hat{X}\right)$,
b) summing the final weights of records having the characteristic of interest for the denominator $\left(\hat{Y}\right)$, then
c) dividing estimate a) by estimate b) $\left(\hat{X} / \hat{Y}\right)$.

9.4 Guidelines for Statistical Analysis

The NTSS is based upon a stratified sample design, with simple random sampling within strata. Using data from such complex surveys presents problems to analysts because the survey design and the selection probabilities affect the estimation and variance calculation

procedures that should be used. In order for survey estimates and analyses to be free from bias, the survey weights must be used.

While many analysis procedures found in statistical packages allow weights to be used, the meaning or definition of the weight in these procedures may differ from that which is appropriate in a sample survey framework, with the result that while in many cases the estimates produced by the packages are correct, the variances that are calculated are poor. Approximate variances for simple estimates such as totals, proportions and ratios (for qualitative variables) can be derived using the accompanying Approximate Sampling Variability Tables.

For other analysis techniques (for example linear regression, logistic regression and analysis of variance), a method exists which can make the variances calculated by the standard packages more meaningful, by incorporating the unequal probabilities of selection. The method rescales the weights so that there is an average weight of 1.

For example, suppose that analysis of all male respondents is required. The steps to rescale the weights are as follows:

1) select all respondents from the file who reported SEX = men;
2) calculate the AVERAGE weight for these records by summing the original person weights from the microdata file for these records and then dividing by the number of respondents who reported SEX = men;
3) for each of these respondents, calculate a RESCALED weight equal to the original person weight divided by the AVERAGE weight;
4) perform the analysis for these respondents using the RESCALED weight.

However, because the stratification of the sample's design are still not taken into account, the variance estimates calculated in this way are likely to be under-estimates.

The calculation of more precise variance estimates requires detailed knowledge of the design of the survey. Such detail cannot be given in this microdata file because of confidentiality. Variances that take the complete sample design into account can be calculated for many statistics by Statistics Canada on a cost-recovery basis.

9.5 Coefficient of Variation Release Guidelines

Before releasing and/or publishing any estimate from the NTSS, users should first determine the quality level of the estimate. The quality levels are *acceptable*, *marginal* and *unacceptable*. Data quality is affected by both sampling and non-sampling errors as discussed in Chapter 8.0. However for this purpose, the quality level of an estimate will be determined only on the basis of sampling error as reflected by the coefficient of variation as shown in the table below. Nonetheless users should be sure to read Chapter 8.0 to be more fully aware of the quality characteristics of these data.

First, the number of respondents who contribute to the calculation of the estimate should be determined. A rough estimate of the number of respondents for a particular cell in a table can be obtained by multiplying the total number of respondents, as given in the appropriate column or row of the table, by the percentage of the estimate given in the cell of interest. If this number is less than 30, the weighted estimate should be considered to be of unacceptable quality.

For weighted estimates based on sample sizes of 30 or more, users should determine the coefficient of variation of the estimate and follow the guidelines below. These quality level

guidelines should be applied to weighted rounded estimates.

All estimates can be considered releasable. However, those of marginal or unacceptable quality level must be accompanied by a warning to caution subsequent users.

Quality Level Guidelines

Quality Level of Estimate	**Guidelines**
1) Acceptable	Estimates have a sample size of 30 or more, and low coefficients of variation in the range of 0.0% to 16.5%. No warning is required.
2) Marginal	Estimates have a sample size of 30 or more, and high coefficients of variation in the range of 16.6% to 33.3%. Estimates should be flagged with the letter M (or some similar identifier). They should be accompanied by a warning to caution subsequent users about the high levels of error, associated with the estimates.
3) Unacceptable	Estimates have a sample size of less than 30, or very high coefficients of variation in excess of 33.3%. Statistics Canada recommends not to release estimates of unacceptable quality. However, if the user chooses to do so then estimates should be flagged with the letter U (or some similar identifier) and the following warning should accompany the estimates: “Please be warned that these estimates [flagged with the letter U] do not meet Statistics Canada’s quality standards. Conclusions based on these data will be unreliable, and most likely invalid.”

9.6 Release Cut-off's for the National Tenant Satisfaction Survey

The following table provides an indication of the precision of population estimates as it shows the release cut-offs associated with each of the three quality levels introduced in the previous section. These cut-offs are derived from the coefficient of variation (CV) tables discussed in Chapter 10.0.

For example, the table shows that the quality of a weighted estimate of 60 people possessing a given characteristic in the Atlantic Region is marginal.

Note that these cut-offs apply to estimates of population totals only. To estimate ratios, users should not use the numerator value (nor the denominator) in order to find the corresponding quality level. Rule 4 in Section 10.1 and Example 4 in Section 10.1.1 explains the correct procedure to be used for ratios.

Region	**Acceptable CV 0.0% to 16.5%**	**Marginal CV 16.6% to- 33.3%**	**Unacceptable CV > 33.3%**
Atlantic	180 & over	50 to < 180	under 50
Quebec (excluding National Capital Region)	330 & over	80 to < 330	under 80
National Capital Region and Nunavut	480 & over	120 to < 480	under 120
Ontario (excluding National Capital Region)	370 & over	90 to < 370	under 90
Western (includes Northwest Territories)	260 & over	60 to < 260	under 60
Pacific (includes Yukon)	80 & over	20 to < 80	under 20
Canada	**410 & over**	**100 to < 410**	**under 100**

10.0 Approximate Sampling Variability Tables

In order to supply coefficients of variation (CV) which would be applicable to a wide variety of categorical estimates produced from this microdata file and which could be readily accessed by the user, a set of Approximate Sampling Variability Tables has been produced. These CV tables allow the user to obtain an approximate coefficient of variation based on the size of the estimate calculated from the survey data.

The coefficients of variation are derived using the variance formula for simple random sampling and incorporating a factor which reflects the sample design. This factor, known as the design effect, was determined by first calculating design effects for a wide range of characteristics and then choosing from among these a conservative value (usually the 75th percentile) to be used in the CV tables which would then apply to the entire set of characteristics.

The table below shows the conservative value of the design effects as well as sample sizes and population counts by region which were used to produce the Approximate Sampling Variability Tables for the National Tenant Satisfaction Survey (NTSS).

Region	Design Effect	Sample Size	Population
Atlantic	1.44	1,413	6,396
Quebec (excluding National Capital Region)	1.56	1,009	7,133
National Capital Region and Nunavut	1.30	5,790	65,028
Ontario (excluding National Capital Region)	2.76	1,101	5,363
Western (includes Northwest Territories)	1.64	1,608	8,715
Pacific (includes Yukon)	1.21	1,018	2,963
Canada	**1.59**	**11,939**	**95,597**

All coefficients of variation in the Approximate Sampling Variability Tables are approximate and, therefore, unofficial. Estimates of actual variance for specific variables may be obtained from Statistics Canada on a cost-recovery basis. Since the approximate CV is conservative, the use of actual variance estimates may cause the estimate to be switched from one quality level to another. For instance a *marginal* estimate could become *acceptable* based on the exact CV calculation.

Remember: If the number of observations on which an estimate is based is less than 30, the weighted estimate is most likely unacceptable and Statistics Canada recommends not to release such an estimate, regardless of the value of the coefficient of variation.

10.1 How to Use the Coefficient of Variation Tables for Categorical Estimates

The following rules should enable the user to determine the approximate coefficients of variation from the Sampling Variability Tables for estimates of the number, proportion or percentage of the surveyed population possessing a certain characteristic and for ratios and differences between such estimates.

Users who have access to the electronic version of the HTML tables also have the option of

using an automated method of finding the CVs for estimates of the number and percentage of the surveyed population possessing a certain characteristic. At the bottom of each table there is a link to a window which can be used to determine the CVs instead of looking in the Coefficient of Variation Tables provided in this guide. Note that the CVs obtained with this method are also approximate and not official. The CVs obtained using the tables and those obtained using the automated method may not always match exactly because when locating the numerator of the percentage in the approximate CV tables (first column), or the percentage across the top of the table, if the exact values are not in the table the user must find the closest values and find the CV for those values. In the automated method the percentage and the exact value of the population value are used in a formula. The automated method also has an option to find very approximate CV values for the averages for the "importance" and "satisfaction" questions. To find the CV for the average the user enters the average in the right-hand side of the window, selects the appropriate geographical region and clicks on the "calculate CV " button.

Rule 1: Estimates of Numbers of Persons Possessing a Characteristic (Aggregates)

An estimate of the number of people possessing a characteristic can be obtained from the tables of results by multiplying the percentage given in the cell of the HTML tables by the appropriate population value given in the second last row or column of the table.

The coefficient of variation depends only on the size of the estimate itself. On the Approximate Sampling Variability Table for the appropriate geographic area, locate the estimated number in the left-most column of the table (headed "Numerator of Percentage") and follow the asterisks (if any) across to the first figure encountered. This figure is the approximate coefficient of variation.

If using the automated method for calculating the CVs the user enters the percentage of interest from the HTML table and the population value given in the appropriate column or row of the HTML table. These are entered in the left-hand side of the window. Next the user selects the geographic region to which the estimate applies and then clicks on the "calculate CV" button. The approximate CV for the percentage as well as the estimate of the number of people possessing a characteristic and it's CV value will be displayed in the lower portion of the left-hand side of the window.

Rule 2: Estimates of Proportions or Percentages of Persons Possessing a Characteristic

The coefficient of variation of an estimated proportion or percentage depends on both the size of the proportion or percentage and the size of the total upon which the proportion or percentage is based. Estimated proportions or percentages are relatively more reliable than the corresponding estimates of the numerator of the proportion or percentage, when the proportion or percentage is based upon a sub-group of the population. For example, the proportion of employees who would like to see improvements to their physical work environment is more reliable than the estimated number of employees who would like to see improvements to their physical work environment. (Note that in the tables the coefficients of variation decline in value reading from left to right).

When the proportion or percentage is based upon the total population of the geographic area covered by the table, the CV of the proportion or percentage is the same as the CV of the numerator of the proportion or percentage. In this case, Rule 1 can be used.

When the proportion or percentage is based upon a subset of the total population (e.g. those in their office for less than one year), reference should be made to the proportion or percentage (across the top of the table) and to the numerator of the proportion or percentage

(down the left side of the table). The intersection of the appropriate row and column gives the coefficient of variation.

If using the automated method, follow the same instructions as in Rule 1.

Rule 3: Estimates of Differences Between Aggregates or Percentages

The standard error of a difference between two estimates is approximately equal to the square root of the sum of squares of each standard error considered separately. That is, the standard error of a difference $\left(\hat{d} = \hat{X}_1 - \hat{X}_2\right)$ is:

$$\sigma_{\hat{d}} = \sqrt{\left(\hat{X}_1 \alpha_1\right)^2 + \left(\hat{X}_2 \alpha_2\right)^2}$$

where $\hat{X}_1$ is estimate 1, $\hat{X}_2$ is estimate 2, and α_1 and α_2 are the coefficients of variation of $\hat{X}_1$ and $\hat{X}_2$ respectively. The coefficient of variation of $\hat{d}$ is given by $\sigma_{\hat{d}} / \hat{d}$. This formula is accurate for the difference between separate and uncorrelated characteristics, but is only approximate otherwise.

If using the automated method, the CVs can be obtained as in Rule 1 and then insert the values into the formula above.

Rule 4: Estimates of Ratios

In the case where the numerator is a subset of the denominator, the ratio should be converted to a percentage and Rule 2 applied. This would apply, for example, to the case where the denominator is the number of employees in the National Capital Region and Nunavut and the numerator is the number of employees in the National Capital Region and Nunavut who would like to see improvements to their physical work environment.

In the case where the numerator is not a subset of the denominator, as for example, the ratio of the number of employees in the National Capital Region and Nunavut who would like to see improvements to their physical work environment as compared to the number of employees in the Pacific Region who would like to see improvements to their physical work environment, the standard error of the ratio of the estimates is approximately equal to the square root of the sum of squares of each coefficient of variation considered separately multiplied by $\hat{R}$. That is, the standard error of a ratio $\left(\hat{R} = \hat{X}_1 / \hat{X}_2\right)$ is:

$$\sigma_{\hat{R}} = \hat{R}\sqrt{\alpha_1^{\,2} + \alpha_2^{\,2}}$$

where α_1 and α_2 are the coefficients of variation of $\hat{X}_1$ and $\hat{X}_2$ respectively. The coefficient of variation of $\hat{R}$ is given by $\sigma_{\hat{R}} / \hat{R}$. The formula will tend to overstate the error if $\hat{X}_1$ and $\hat{X}_2$ are positively correlated and understate the error if $\hat{X}_1$ and $\hat{X}_2$ are negatively correlated.

If using the automated method, the CVs can be obtained as in Rule 1 and then insert the values into the formula above.

Rule 5: Estimates of Differences of Ratios

In this case, Rules 3 and 4 are combined. The CVs for the two ratios are first determined using Rule 4, and then the CV of their difference is found using Rule 3.

10.1.1 Examples of Using the Coefficient of Variation Tables for Categorical Estimates

The following examples based on the NTSS, 2002-2003 are included to assist users in applying the foregoing rules. Please note that the data for these examples are different than the results obtained from the current survey and are only to be used as a guide.

Example 1: Estimates of Numbers of Persons Possessing a Characteristic (Aggregates)

Suppose that a user estimates that 33,396 employees were very satisfied with the services in their building during the reference period. How does the user determine the coefficient of variation of this estimate?

1) Refer to the coefficient of variation table for CANADA.

2) The estimated aggregate (33,396) does not appear in the left-hand column (the "Numerator of Percentage" column), so it is necessary to use the figure closest to it, namely 35,000.

3) The coefficient of variation for an estimated aggregate is found by referring to the first non-asterisk entry on that row, namely, 1.0%.

National Tenant Satisfaction Survey (NTSS) 2002 - 2003

Approximate Sampling Variability Tables for Canada

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE											
	0.1%	1.0%	…	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	76.3	75.9		70.3	68.2	66.1	63.8	61.5	59.1	54.0	41.8	24.1
20	53.9	53.7		49.7	48.3	46.7	45.1	43.5	41.8	38.1	29.6	17.1
30	44.0	43.8		40.6	39.4	38.1	36.9	35.5	34.1	31.1	24.1	13.9
.												
.												
.												
15000	********	********		1.8	1.8	1.7	1.6	1.6	1.5	1.4	1.1	0.6
20000	********	********		********	1.5	1.5	1.4	1.4	1.3	1.2	0.9	0.5
25000	********	********		*********	*******	1.3	1.3	1.2	1.2	1.1	0.8	0.5
30000	********	********		*********	********	*******	1.2	1.1	1.1	1.0	0.8	0.4
35000	********	********		*********	********	********	*******	1.0	1.0	0.9	0.7	0.4
40000	********	********		*********	********	********	********	*******	0.9	0.9	0.7	0.4
45000	********	********		*********	********	********	********	*******	0.9	0.8	0.6	0.4
50000	********	********		*********	********	********	********	********	*******	0.8	0.6	0.3
55000	********	********		*********	********	********	********	********	*******	0.7	0.6	0.3

NOTE: FOR CORRECT USAGE OF THESE TABLES PLEASE REFER TO MICRODATA DOCUMENTATION

4) So the approximate coefficient of variation of the estimate is 1.0%. The finding that there were 33,396 (to be rounded according to the rounding guidelines in Section 9.1) employees who were very satisfied with the services in their building during the reference period is publishable with no qualifications.

Example 2: Estimates of Proportions or Percentages of Persons Possessing a Characteristic

Suppose that the user estimates that 1,664 / 5,042 = 33.0% of employees in the Quebec Region, who had worked in the same building for at least one year, felt that there were services which had deteriorated compared to one year ago. How does the user determine the coefficient of variation of this estimate?

1) Refer to the coefficient of variation table for the QUEBEC REGION.

2) Because the estimate is a percentage which is based on a subset of the total population (i.e., employees who had worked in the same building for at least one year), it is necessary to use both the percentage (33.0%) and the numerator portion of the percentage (1,664) in determining the coefficient of variation.

3) The numerator, 1,664 does not appear in the left-hand column (the "Numerator of Percentage" column) so it is necessary to use the figure closest to it, namely 1,700. Similarly, the percentage estimate does not appear as any of the column headings, so it is necessary to use the percentage closest to it, 35.0%.

National Tenant Satisfaction Survey (NTSS) 2002 - 2003

Approximate Sampling Variability Tables for Quebec (excluding National Capital Region)

NUMERATOR OF PERCENTAGI	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	********	61.5	61.2	60.2	58.6	57.0	55.3	53.5	51.7	49.8	47.9	43.7	33.8	19.5
20	********	43.5	43.3	42.6	41.5	40.3	39.1	37.8	36.6	35.2	33.8	30.9	23.9	13.8
30	********	35.5	35.3	34.8	33.8	32.9	31.9	30.9	29.9	28.8	27.6	25.2	19.5	11.3
40	********	30.7	30.6	30.1	29.3	28.5	27.6	26.8	25.9	24.9	23.9	21.8	16.9	9.8
.														
.														
.														
1400	********	********	********	*******	********	********	********	4.5	4.4	4.2	4.0	3.7	2.9	1.7
1500	********	********	********	*******	********	********	********	4.4	4.2	4.1	3.9	3.6	2.8	1.6
1600	********	********	********	*******	********	********	********	*******	4.1	3.9	3.8	3.5	2.7	1.5
1700	********	********	********	*******	********	********	********	*******	4.0	3.8	3.7	3.4	2.6	1.5
1800	********	********	********	*******	********	********	********	*******	3.9	3.7	3.6	3.3	2.5	1.5
1900	********	********	********	*******	********	********	********	*******	********	3.6	3.5	3.2	2.5	1.4
.														
.														
.														
4500	********	********	********	*******	********	********	********	*******	********	********	*******	********	********	0.9
5000	********	********	********	*******	********	********	********	*******	********	********	*******	********	********	0.9
5500	********	********	********	*******	********	********	********	*******	********	********	*******	********	********	0.8

NOTE: FOR CORRECT USAGE OF THESE TABLES PLEASE REFER TO MICRODATA DOCUMENTATION

4) The figure at the intersection of the row and column used, namely 3.8% is the coefficient of variation to be used.

5) So the approximate coefficient of variation of the estimate is 3.8%. The finding that 33.0% of employees in the Quebec Region, who had worked in the same building for at least one year and felt that there were services which had deteriorated compared to one year ago, can be published with no qualifications.

Example 3: Estimates of Differences Between Aggregates or Percentages

Suppose that a user estimates that 49,337/ 83,622 = 59.0% of employees in the National Capital Region and Nunavut would like to see improvements to their physical work environment, while 5,318 / 9,669 = 55.0% of employees in the Western Region would like to see improvements to their physical work environment. How does the user determine the coefficient of variation of the difference between these two estimates?

1) Using the NATIONAL CAPITAL REGION AND NUNAVUT and the WESTERN REGION coefficient of variation tables in the same manner as described in Example 1 gives the CV of the estimate for employees in the National Capital Region and Nunavut as 0.6% and the CV of the estimate for employees in the Western Region as 1.1%.

National Tenant Satisfaction Survey (NTSS) 2002 - 2003

Approximate Sampling Variability Tables for National Capital Region and Nunavut

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	82.4	82.0	81.6	80.4	78.2	76.0	73.7	71.4	69.0	66.5	63.9	58.3	45.2	26.1
20	58.3	58.0	57.7	56.8	55.3	53.8	52.1	50.5	48.8	47.0	45.2	41.2	31.9	18.4
30	47.6	47.4	47.1	46.4	45.2	43.9	42.6	41.2	39.8	38.4	36.9	33.7	26.1	15.1
40	41.2	41.0	40.8	40.2	39.1	38.0	36.9	35.7	34.5	33.2	31.9	29.2	22.6	13.0
.														
.														
35000	********	********	*******	********	********	*******	********	********	********	********	********	1.0	0.8	0.4
40000	********	********	*******	********	********	*******	********	********	********	********	********	0.9	0.7	0.4
45000	********	********	*******	********	********	*******	********	********	********	********	********	********	0.7	0.4
50000	********	********	*******	********	********	*******	********	********	********	********	********	********	0.6	0.4
55000	********	********	*******	********	********	*******	********	********	********	********	********	********	0.6	0.4
60000	********	********	*******	********	********	*******	********	********	********	********	********	********	********	0.3
70000	********	********	*******	********	********	*******	********	********	********	********	********	********	********	0.3

NOTE: FOR CORRECT USAGE OF THESE TABLES PLEASE REFER TO MICRODATA DOCUMENTATION

National Tenant Satisfaction Survey (NTSS) 2002 - 2003
Approximate Sampling Variability Tables for Western

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	********	45.9	45.7	45.0	43.8	42.6	41.3	40.0	38.6	37.2	35.8	32.7	25.3	14.6
20	********	32.5	32.3	31.8	31.0	30.1	29.2	28.3	27.3	26.3	25.3	23.1	17.9	10.3
30	********	26.5	26.4	26.0	25.3	24.6	23.8	23.1	22.3	21.5	20.7	18.9	14.6	8.4
40	********	23.0	22.9	22.5	21.9	21.3	20.7	20.0	19.3	18.6	17.9	16.3	12.6	7.3
50	********	20.5	20.4	20.1	19.6	19.0	18.5	17.9	17.3	16.6	16.0	14.6	11.3	6.5
60	********	18.8	18.7	18.4	17.9	17.4	16.9	16.3	15.8	15.2	14.6	13.3	10.3	6.0
70	********	17.4	17.3	17.0	16.6	16.1	15.6	15.1	14.6	14.1	13.5	12.3	9.6	5.5
:														
4500	********	********	********	********	*******	********	*******	********	*******	********	********	1.5	1.2	0.7
5000	********	********	********	********	*******	********	*******	********	*******	********	********	********	1.1	0.7
5500	********	********	********	********	*******	********	*******	********	*******	********	********	********	1.1	0.6
6000	********	********	********	********	*******	********	*******	********	*******	********	********	********	1.0	0.6
6500	********	********	********	********	*******	********	*******	********	*******	********	********	********	1.0	0.6
7000	********	********	********	********	*******	********	*******	********	*******	********	********	********	********	0.6
:														

NOTE: FOR CORRECT USAGE OF THESE TABLES PLEASE REFER TO MICRODATA DOCUMENTATION

2) Using Rule 3, the standard error of a difference $\left(\hat{d} = \hat{X}_1 - \hat{X}_2\right)$ is:

$$\sigma_{\hat{d}} = \sqrt{\left(\hat{X}_1\alpha_1\right)^2 + \left(\hat{X}_2\alpha_2\right)^2}$$

where $\hat{X}_1$ is estimate 1 (National Capital Region and Nunavut), $\hat{X}_2$ is estimate 2 (Western Region), and α_1 and α_2 are the coefficients of variation of $\hat{X}_1$ and $\hat{X}_2$ respectively.

That is, the standard error of the difference $\hat{d}$ = 0.590 - 0.550 = 0.040 is:

$$\begin{aligned}\sigma_{\hat{d}} &= \sqrt{\left[(0.590)(0.006)\right]^2 + \left[(0.550)(0.011)\right]^2} \\ &= \sqrt{(0.00001253) + (0.00003660)} \\ &= 0.0070\end{aligned}$$

3) The coefficient of variation of $\hat{d}$ is given by $\sigma_{\hat{d}} / \hat{d}$ = 0.0070 / 0.040 = 0.175

4) So the approximate coefficient of variation of the difference between the estimates is 17.5%. The difference between the estimates is considered marginal and Statistics Canada recommends this estimate be flagged with the letter M (or some similar identifier) and be accompanied by a warning to caution subsequent users about the high levels of error associated with the estimate.

Example 4: Estimates of Ratios

Suppose that the user estimates that 5,318 employees in the Western Region would like to see improvements to their physical work environment, while 49,337 employees in the National Capital Region and Nunavut would like to see improvements to their physical work environment. The user is interested in comparing the estimate of Western Region employees versus that of the National Capital Region and Nunavut employees in the form of a ratio. How does the user determine the coefficient of variation of this estimate?

1) First of all, this estimate is a ratio estimate, where the numerator of the estimate $\left(\hat{X}_1\right)$ is the number of employees in the Western Region who would like to see improvements to their physical work environment. The denominator of the estimate $\left(\hat{X}_2\right)$ is the number of employees in the National Capital Region and Nunavut who would like to see improvements to their physical work environment.

2) Refer to the coefficient of variation tables for the WESTERN REGION and the NATIONAL CAPITAL REGION AND NUNAVUT.

3) The numerator of this ratio estimate is 5,318. The figure closest to it is 5,500. The coefficient of variation for this estimate is found by referring to the first non-asterisk entry on that row in the WESTERN REGION CV table, namely, 1.1%.

4) The denominator of this ratio estimate is 49,337. The figure closest to it is 50,000. The coefficient of variation for this estimate is found by referring to the first non-asterisk entry on that row in the NATIONAL CAPITAL REGION AND NUNAVUT CV table, namely, 0.6%.

5) So the approximate coefficient of variation of the ratio estimate is given by Rule 4, which is:

$$\alpha_{\hat{R}} = \sqrt{{\alpha_1}^2 + {\alpha_2}^2}$$

where α_1 and α_2 are the coefficients of variation of $\hat{X}_1$ and $\hat{X}_2$ respectively. That is:

$$\begin{aligned}\alpha_{\hat{R}} &= \sqrt{(0.011)^2 + (0.006)^2} \\ &= \sqrt{0.000121 + 0.000036} \\ &= 0.013\end{aligned}$$

6) The obtained ratio of Western Region versus National Capital Region and Nunavut employees who would like to see improvements to their physical work environment is 5,318 / 49,337 which is 0.11:1 (to be rounded according to the rounding guidelines in Section 9.1). The coefficient of variation of this estimate is 1.3%, which is releasable with no qualifications.

10.2 How to Use the Coefficient of Variation Tables to Obtain Confidence Limits

Although coefficients of variation are widely used, a more intuitively meaningful measure of sampling error is the confidence interval of an estimate. A confidence interval constitutes a statement on the level of confidence that the true value for the population lies within a specified range of values. For example, a 95% confidence interval can be described as follows:

> If sampling of the population is repeated indefinitely, each sample leading to a new confidence interval for an estimate, then in 95% of the samples the interval will cover the true population value.
>
> Using the standard error of an estimate, confidence intervals for estimates may be obtained under the assumption that under repeated sampling of the population, the various estimates obtained for a population characteristic are normally distributed about the true population value. Under this assumption, the chances are about 68 out of 100 that the difference between a sample estimate and the true population value would be less than one standard error, about 95 out of 100 that the difference would be less than two standard errors, and about 99 out of 100 that the differences would be less than three standard errors. These different degrees of confidence are referred to as the confidence levels.
>
> Confidence intervals for an estimate, $\hat{X}$, are generally expressed as two numbers, one below the estimate and one above the estimate, as $\left(\hat{X}-k, \hat{X}+k\right)$ where k is determined depending upon the level of confidence desired and the sampling error of the estimate.
>
> Confidence intervals for an estimate can be calculated directly from the Approximate Sampling Variability Tables by first determining from the appropriate table the coefficient of variation of the estimate $\hat{X}$, and then using the following formula to convert to a confidence interval ($CI_{\hat{x}}$):
>
> $$CI_{\hat{x}} = \left(\hat{X} - t\hat{X}\alpha_{\hat{x}}, \hat{X} + t\hat{X}\alpha_{\hat{x}}\right)$$
>
> where $\alpha_{\hat{x}}$ is the determined coefficient of variation of $\hat{X}$, and
>
> $t =$ 1 if a 68% confidence interval is desired;
> $t =$ 1.6 if a 90% confidence interval is desired;
> $t =$ 2 if a 95% confidence interval is desired;
> $t =$ 2.6 if a 99% confidence interval is desired.

Note: Release guidelines which apply to the estimate also apply to the confidence interval. For example, if the estimate is not releasable, then the confidence interval is not releasable either.

10.2.1 Example of Using the Coefficient of Variation Tables to Obtain Confidence Limits

A 95% confidence interval for the estimated proportion of employees in the Quebec Region who had worked in the same building for at least one year and felt that there were services which had deteriorated compared to one year ago (from Example 2, Section 10.1.1) would be calculated as follows:

$\hat{X}$ = 33.0% (or expressed as a proportion 0.330)

t = 2

$\alpha_{\hat{X}}$ = 3.8% (0.038 expressed as a proportion) is the coefficient of variation of this estimate as determined from the tables.

$CI_{\hat{x}}$ = {0.330 - (2) (0.330) (0.038), 0.330 + (2) (0.330) (0.038)}

$CI_{\hat{x}}$ = {0.330 - 0.025, 0.330 + 0.025}

$CI_{\hat{x}}$ = {0.305, 0.355}

With 95% confidence it can be said that between 30.5% and 35.5% of employees in the Quebec Region who had worked in the same building for at least one year felt that there were services which had deteriorated compared to one year ago.

10.3 How to Use the Coefficient of Variation Tables to Do a T-test

Standard errors may also be used to perform hypothesis testing, a procedure for distinguishing between population parameters using sample estimates. The sample estimates can be numbers, averages, percentages, ratios, etc. Tests may be performed at various levels of significance, where a level of significance is the probability of concluding that the characteristics are different when, in fact, they are identical.

Let $\hat{X}_1$ and $\hat{X}_2$ be sample estimates for two characteristics of interest. Let the standard error on the difference $\hat{X}_1$ - $\hat{X}_2$ be $\sigma_{\hat{d}}$.

If $t = \dfrac{\hat{X}_1 - \hat{X}_2}{\sigma_{\hat{d}}}$ is between -2 and 2, then no conclusion about the difference between the characteristics is justified at the 5% level of significance. If however, this ratio is smaller than -2 or larger than +2, the observed difference is significant at the 0.05 level. That is to say that the difference between the estimates is significant.

10.3.1 Example of Using the Coefficient of Variation Tables to Do a T-test

Let us suppose that the user wishes to test, at 5% level of significance, the hypothesis that there is no difference between the proportion of employees in the National Capital Region and Nunavut who would like to see improvements to their physical work environment and the proportion of employees in the Western Region who would like to see improvements to their physical work environment. From Example 3, Section 10.1.1, the standard error of the difference between these two estimates was found to be 0.0070. Hence,

$$t = \frac{\hat{X}_1 - \hat{X}_2}{\sigma_{\hat{d}}} = \frac{0.590 - 0.550}{0.0070} = \frac{0.040}{0.0070} = 5.71$$

Since t = 5.71 is greater than 2, it must be concluded that there is a significant difference between the two estimates at the 0.05 level of significance.

10.4 Coefficient of Variation Tables

National Tenant Satisfaction Survey (NTSS) 2006

Approximate Sampling Variability Tables - Atlantic

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	********	70.7	70.3	69.2	67.4	65.5	63.5	61.5	59.4	57.3	55.0	50.2	38.9	22.5
20	********	50.0	49.7	48.9	47.6	46.3	44.9	43.5	42.0	40.5	38.9	35.5	27.5	15.9
30	********	40.8	40.6	40.0	38.9	37.8	36.7	35.5	34.3	33.1	31.8	29.0	22.5	13.0
40	********	35.3	35.2	34.6	33.7	32.7	31.8	30.7	29.7	28.6	27.5	25.1	19.4	11.2
50	********	31.6	31.4	31.0	30.1	29.3	28.4	27.5	26.6	25.6	24.6	22.5	17.4	10.0
60	********	28.8	28.7	28.3	27.5	26.7	25.9	25.1	24.3	23.4	22.5	20.5	15.9	9.2
70	**********	26.6	26.2	25.5	24.7	24.0	23.2	22.5	21.6	20.8	19.0	14.7	8.5	
80	**********	24.9	24.5	23.8	23.1	22.5	21.7	21.0	20.2	19.4	17.8	13.8	7.9	
90	**********	23.4	23.1	22.5	21.8	21.2	20.5	19.8	19.1	18.3	16.7	13.0	7.5	
100	**********	22.2	21.9	21.3	20.7	20.1	19.4	18.8	18.1	17.4	15.9	12.3	7.1	
150	**********	17.9	17.4	16.9	16.4	15.9	15.3	14.8	14.2	13.0	10.0	5.8		
200	**********	15.5	15.1	14.6	14.2	13.8	13.3	12.8	12.3	11.2	8.7	5.0		
250	**********	13.8	13.5	13.1	12.7	12.3	11.9	11.5	11.0	10.0	7.8	4.5		
300	**********	12.6	12.3	12.0	11.6	11.2	10.8	10.5	10.0	9.2	7.1	4.1		
350	**********	11.4	11.1	10.7	10.4	10.0	9.7	9.3	8.5	6.6	3.8			
400	**********	10.7	10.4	10.0	9.7	9.4	9.1	8.7	7.9	6.1	3.6			
450	**********	10.0	9.8	9.5	9.2	8.9	8.5	8.2	7.5	5.8	3.3			
500	**********	9.5	9.3	9.0	8.7	8.4	8.1	7.8	7.1	5.5	3.2			
600	**********	8.7	8.5	8.2	7.9	7.7	7.4	7.1	6.5	5.0	2.9			
700	**********	7.8	7.6	7.4	7.1	6.8	6.6	6.0	4.6	2.7				
750	**********	7.6	7.3	7.1	6.9	6.6	6.4	5.8	4.5	2.6				
1,000	**********	6.4	6.1	5.9	5.7	5.5	5.0	3.9	2.2					
1,500	**********	5.0	4.9	4.7	4.5	4.1	3.2	1.8						
2,000	**********	4.0	3.9	3.6	2.8	1.6								
3,000	**********	2.9	2.2	1.3										
4,000	**********	1.9	1.1											
5,000	**********	1.0												

NOTE: For correct usage of these tables, please refer to the microdata documentation.

National Tenant Satisfaction Survey (NTSS) 2006

Approximate Sampling Variability Tables - Quebec (excluding National Capital Region)

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	********	96.8	96.3	94.8	92.3	89.7	87.0	84.3	81.4	78.4	75.4	68.8	53.3	30.8
20	********	68.5	68.1	67.1	65.3	63.4	61.5	59.6	57.6	55.5	53.3	48.7	37.7	21.8
30	********	55.9	55.6	54.8	53.3	51.8	50.2	48.7	47.0	45.3	43.5	39.7	30.8	17.8
40	********	48.4	48.2	47.4	46.2	44.9	43.5	42.1	40.7	39.2	37.7	34.4	26.6	15.4
50	********	43.3	43.1	42.4	41.3	40.1	38.9	37.7	36.4	35.1	33.7	30.8	23.8	13.8
60	********	39.5	39.3	38.7	37.7	36.6	35.5	34.4	33.2	32.0	30.8	28.1	21.8	12.6
70	********	36.6	36.4	35.8	34.9	33.9	32.9	31.9	30.8	29.7	28.5	26.0	20.1	11.6
80	**********		34.1	33.5	32.6	31.7	30.8	29.8	28.8	27.7	26.6	24.3	18.8	10.9
90	**********		32.1	31.6	30.8	29.9	29.0	28.1	27.1	26.1	25.1	22.9	17.8	10.3
100	**********		30.5	30.0	29.2	28.4	27.5	26.6	25.7	24.8	23.8	21.8	16.9	9.7
150	**********		**********	24.5	23.8	23.2	22.5	21.8	21.0	20.3	19.5	17.8	13.8	7.9
200	**********		**********	21.2	20.6	20.1	19.5	18.8	18.2	17.5	16.9	15.4	11.9	6.9
250	**********		**********	19.0	18.5	17.9	17.4	16.9	16.3	15.7	15.1	13.8	10.7	6.2
300	**********		**********	17.3	16.9	16.4	15.9	15.4	14.9	14.3	13.8	12.6	9.7	5.6
350	**********		**********	16.0	15.6	15.2	14.7	14.2	13.8	13.3	12.7	11.6	9.0	5.2
400	**********		**********	14.6	14.2	13.8	13.3	12.9	12.4	11.9	10.9	8.4	4.9	
450	**********		**********	13.8	13.4	13.0	12.6	12.1	11.7	11.2	10.3	7.9	4.6	
500	**********		**********	13.1	12.7	12.3	11.9	11.5	11.1	10.7	9.7	7.5	4.4	
600	**********		**********	11.9	11.6	11.2	10.9	10.5	10.1	9.7	8.9	6.9	4.0	
700	**********		**********	11.0	10.7	10.4	10.1	9.7	9.4	9.0	8.2	6.4	3.7	
750	**********		**********	10.4	10.0	9.7	9.4	9.1	8.7	7.9	6.2	3.6		
1,000	**********		**********	9.0	8.7	8.4	8.1	7.8	7.5	6.9	5.3	3.1		
1,500	**********		**********	6.9	6.6	6.4	6.2	5.6	4.4	2.5				
2,000	**********		**********	5.8	5.5	5.3	4.9	3.8	2.2					
3,000	**********		**********	4.0	3.1	1.8								
4,000	**********		**********	2.7	1.5									
5,000	**********		**********	1.4										
6,000	**********		**********	1.3										

NOTE: For correct usage of these tables, please refer to the microdata documentation.

National Tenant Satisfaction Survey (NTSS) 2006

Approximate Sampling Variability Tables - National Capital Region and Nunavut

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	115.3	114.7	114.2	112.4	109.4	106.3	103.2	99.9	96.5	93.0	89.3	81.5	63.2	36.5
20	81.5	81.1	80.7	79.5	77.4	75.2	72.9	70.6	68.2	65.7	63.2	57.7	44.7	25.8
30	66.6	66.3	65.9	64.9	63.2	61.4	59.6	57.7	55.7	53.7	51.6	47.1	36.5	21.1
40	57.6	57.4	57.1	56.2	54.7	53.2	51.6	49.9	48.2	46.5	44.7	40.8	31.6	18.2
50	51.6	51.3	51.1	50.3	48.9	47.6	46.1	44.7	43.2	41.6	40.0	36.5	28.2	16.3
60	47.1	46.8	46.6	45.9	44.7	43.4	42.1	40.8	39.4	38.0	36.5	33.3	25.8	14.9
70	********	43.4	43.2	42.5	41.4	40.2	39.0	37.7	36.5	35.1	33.8	30.8	23.9	13.8
80	********	40.6	40.4	39.7	38.7	37.6	36.5	35.3	34.1	32.9	31.6	28.8	22.3	12.9
90	********	38.2	38.1	37.5	36.5	35.4	34.4	33.3	32.2	31.0	29.8	27.2	21.1	12.2
100	********	36.3	36.1	35.5	34.6	33.6	32.6	31.6	30.5	29.4	28.2	25.8	20.0	11.5
150	********	29.6	29.5	29.0	28.2	27.5	26.6	25.8	24.9	24.0	23.1	21.1	16.3	9.4
200	********	25.7	25.5	25.1	24.5	23.8	23.1	22.3	21.6	20.8	20.0	18.2	14.1	8.2
250	********	22.9	22.8	22.5	21.9	21.3	20.6	20.0	19.3	18.6	17.9	16.3	12.6	7.3
300	********	21.0	20.8	20.5	20.0	19.4	18.8	18.2	17.6	17.0	16.3	14.9	11.5	6.7
350	********	19.4	19.3	19.0	18.5	18.0	17.4	16.9	16.3	15.7	15.1	13.8	10.7	6.2
400	********	18.1	18.1	17.8	17.3	16.8	16.3	15.8	15.3	14.7	14.1	12.9	10.0	5.8
450	********	17.1	17.0	16.8	16.3	15.9	15.4	14.9	14.4	13.9	13.3	12.2	9.4	5.4
500	********	16.2	16.1	15.9	15.5	15.0	14.6	14.1	13.6	13.1	12.6	11.5	8.9	5.2
600	********	14.8	14.7	14.5	14.1	13.7	13.3	12.9	12.5	12.0	11.5	10.5	8.2	4.7
700	**********	13.6	13.4	13.1	12.7	12.3	11.9	11.5	11.1	10.7	9.7	7.5	4.4	
750	**********	13.2	13.0	12.6	12.3	11.9	11.5	11.1	10.7	10.3	9.4	7.3	4.2	
1,000	**********	11.4	11.2	10.9	10.6	10.3	10.0	9.6	9.3	8.9	8.2	6.3	3.6	
1,500	**********	9.2	8.9	8.7	8.4	8.2	7.9	7.6	7.3	6.7	5.2	3.0		
2,000	**********	7.9	7.7	7.5	7.3	7.1	6.8	6.6	6.3	5.8	4.5	2.6		
3,000	**********	6.5	6.3	6.1	6.0	5.8	5.6	5.4	5.2	4.7	3.6	2.1		
4,000	**********	5.5	5.3	5.2	5.0	4.8	4.6	4.5	4.1	3.2	1.8			
5,000	**********	4.9	4.8	4.6	4.5	4.3	4.2	4.0	3.6	2.8	1.6			
6,000	**********	4.5	4.3	4.2	4.1	3.9	3.8	3.6	3.3	2.6	1.5			
7,000	**********	4.0	3.9	3.8	3.6	3.5	3.4	3.1	2.4	1.4				
8,000	**********	3.8	3.6	3.5	3.4	3.3	3.2	2.9	2.2	1.3				
9,000	**********	3.5	3.4	3.3	3.2	3.1	3.0	2.7	2.1	1.2				
10,000	**********	3.3	3.2	3.1	2.9	2.8	2.6	2.0	1.2					
12,500	**********	2.9	2.8	2.7	2.6	2.5	2.3	1.8	1.0					
15,000	**********	2.6	2.5	2.4	2.3	2.1	1.6	0.9						
20,000	**********	2.1	2.0	1.8	1.4	0.8								

NOTE: For correct usage of these tables, please refer to the microdata documentation.

National Tenant Satisfaction Survey (NTSS) 2006

Approximate Sampling Variability Tables - Ontario (excluding National Capital Region)

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	********	102.8	102.3	100.7	98.1	95.3	92.5	89.5	86.5	83.3	80.1	73.1	56.6	32.7
20	********	72.7	72.4	71.2	69.3	67.4	65.4	63.3	61.2	58.9	56.6	51.7	40.0	23.1
30	********	59.4	59.1	58.2	56.6	55.0	53.4	51.7	49.9	48.1	46.2	42.2	32.7	18.9
40	********	51.4	51.2	50.4	49.0	47.6	46.2	44.8	43.2	41.7	40.0	36.5	28.3	16.3
50	********	46.0	45.8	45.1	43.9	42.6	41.3	40.0	38.7	37.3	35.8	32.7	25.3	14.6
60	**********		41.8	41.1	40.0	38.9	37.7	36.5	35.3	34.0	32.7	29.8	23.1	13.3
70	**********		38.7	38.1	37.1	36.0	34.9	33.8	32.7	31.5	30.3	27.6	21.4	12.4
80	**********		36.2	35.6	34.7	33.7	32.7	31.6	30.6	29.5	28.3	25.8	20.0	11.6
90	**********		34.1	33.6	32.7	31.8	30.8	29.8	28.8	27.8	26.7	24.4	18.9	10.9
100	**********		32.4	31.9	31.0	30.1	29.2	28.3	27.3	26.4	25.3	23.1	17.9	10.3
150	**********		26.0	25.3	24.6	23.9	23.1	22.3	21.5	20.7	18.9	14.6	8.4	
200	**********		22.5	21.9	21.3	20.7	20.0	19.3	18.6	17.9	16.3	12.7	7.3	
250	**********		20.1	19.6	19.1	18.5	17.9	17.3	16.7	16.0	14.6	11.3	6.5	
300	**********		17.9	17.4	16.9	16.3	15.8	15.2	14.6	13.3	10.3	6.0		
350	**********		16.6	16.1	15.6	15.1	14.6	14.1	13.5	12.4	9.6	5.5		
400	**********		15.5	15.1	14.6	14.2	13.7	13.2	12.7	11.6	9.0	5.2		
450	**********		14.6	14.2	13.8	13.3	12.9	12.4	11.9	10.9	8.4	4.9		
500	**********		13.9	13.5	13.1	12.7	12.2	11.8	11.3	10.3	8.0	4.6		
600	**********		12.3	11.9	11.6	11.2	10.8	10.3	9.4	7.3	4.2			
700	**********		11.4	11.1	10.7	10.3	10.0	9.6	8.7	6.8	3.9			
750	**********		11.0	10.7	10.3	10.0	9.6	9.2	8.4	6.5	3.8			
1,000	**********		9.2	9.0	8.6	8.3	8.0	7.3	5.7	3.3				
1,500	**********		7.1	6.8	6.5	6.0	4.6	2.7						
2,000	**********		5.7	5.2	4.0	2.3								
3,000	**********		3.3	1.9										
4,000	**********		1.6											

NOTE: For correct usage of these tables, please refer to the microdata documentation.

National Tenant Satisfaction Survey (NTSS) 2006

Approximate Sampling Variability Tables – Western (includes Northwest Territories)

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	********	84.7	84.3	83.0	80.8	78.5	76.1	73.7	71.2	68.6	65.9	60.2	46.6	26.9
20	********	59.9	59.6	58.7	57.1	55.5	53.8	52.1	50.4	48.5	46.6	42.6	33.0	19.0
30	********	48.9	48.7	47.9	46.6	45.3	44.0	42.6	41.1	39.6	38.1	34.8	26.9	15.5
40	********	42.4	42.1	41.5	40.4	39.2	38.1	36.9	35.6	34.3	33.0	30.1	23.3	13.5
50	********	37.9	37.7	37.1	36.1	35.1	34.1	33.0	31.9	30.7	29.5	26.9	20.9	12.0
60	********	34.6	34.4	33.9	33.0	32.0	31.1	30.1	29.1	28.0	26.9	24.6	19.0	11.0
70	********	32.0	31.9	31.4	30.5	29.7	28.8	27.9	26.9	25.9	24.9	22.8	17.6	10.2
80	********	29.9	29.8	29.3	28.6	27.8	26.9	26.1	25.2	24.3	23.3	21.3	16.5	9.5
90	**********	28.1	27.7	26.9	26.2	25.4	24.6	23.7	22.9	22.0	20.1	15.5	9.0	
100	**********	26.7	26.2	25.5	24.8	24.1	23.3	22.5	21.7	20.9	19.0	14.7	8.5	
150	**********	21.8	21.4	20.9	20.3	19.7	19.0	18.4	17.7	17.0	15.5	12.0	7.0	
200	**********	18.6	18.1	17.6	17.0	16.5	15.9	15.3	14.7	13.5	10.4	6.0		
250	**********	16.6	16.2	15.7	15.2	14.7	14.2	13.7	13.2	12.0	9.3	5.4		
300	**********	15.2	14.7	14.3	13.9	13.5	13.0	12.5	12.0	11.0	8.5	4.9		
350	**********	14.0	13.7	13.3	12.9	12.5	12.0	11.6	11.1	10.2	7.9	4.6		
400	**********	13.1	12.8	12.4	12.0	11.7	11.3	10.9	10.4	9.5	7.4	4.3		
450	**********	12.0	11.7	11.4	11.0	10.6	10.2	9.8	9.0	7.0	4.0			
500	**********	11.4	11.1	10.8	10.4	10.1	9.7	9.3	8.5	6.6	3.8			
600	**********	10.4	10.1	9.8	9.5	9.2	8.9	8.5	7.8	6.0	3.5			
700	**********	9.7	9.4	9.1	8.8	8.5	8.2	7.9	7.2	5.6	3.2			
750	**********	9.3	9.1	8.8	8.5	8.2	7.9	7.6	7.0	5.4	3.1			
1,000	**********	7.8	7.6	7.4	7.1	6.9	6.6	6.0	4.7	2.7				
1,500	**********	6.2	6.0	5.8	5.6	5.4	4.9	3.8	2.2					
2,000	**********	5.2	5.0	4.9	4.7	4.3	3.3	1.9						
3,000	**********	4.0	3.8	3.5	2.7	1.6								
4,000	**********	3.0	2.3	1.3										
5,000	**********	2.1	1.2											
6,000	**********	1.9	1.1											
7,000	**********	1.0												

NOTE: For correct usage of these tables, please refer to the microdata documentation.

National Tenant Satisfaction Survey (NTSS) 2006

Approximate Sampling Variability Tables – Pacific (includes Yukon)

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	********	47.6	47.4	46.7	45.4	44.1	42.8	41.5	40.1	38.6	37.1	33.9	26.2	15.1
20	********	33.7	33.5	33.0	32.1	31.2	30.3	29.3	28.3	27.3	26.2	23.9	18.5	10.7
30	**********		27.4	26.9	26.2	25.5	24.7	23.9	23.1	22.3	21.4	19.5	15.1	8.7
40	**********		23.7	23.3	22.7	22.1	21.4	20.7	20.0	19.3	18.5	16.9	13.1	7.6
50	**********		21.2	20.9	20.3	19.7	19.2	18.5	17.9	17.3	16.6	15.1	11.7	6.8
60	**********		19.1	18.5	18.0	17.5	16.9	16.4	15.8	15.1	13.8	10.7	6.2	
70	**********		17.6	17.2	16.7	16.2	15.7	15.1	14.6	14.0	12.8	9.9	5.7	
80	**********		16.5	16.1	15.6	15.1	14.7	14.2	13.6	13.1	12.0	9.3	5.4	
90	**********		15.6	15.1	14.7	14.3	13.8	13.4	12.9	12.4	11.3	8.7	5.0	
100	**********		14.8	14.4	14.0	13.5	13.1	12.7	12.2	11.7	10.7	8.3	4.8	
150	**********		11.7	11.4	11.1	10.7	10.3	10.0	9.6	8.7	6.8	3.9		
200	**********		10.2	9.9	9.6	9.3	9.0	8.6	8.3	7.6	5.9	3.4		
250	**********		9.1	8.8	8.6	8.3	8.0	7.7	7.4	6.8	5.2	3.0		
300	**********		8.1	7.8	7.6	7.3	7.0	6.8	6.2	4.8	2.8			
350	**********		7.5	7.2	7.0	6.8	6.5	6.3	5.7	4.4	2.6			
400	**********		7.0	6.8	6.6	6.3	6.1	5.9	5.4	4.1	2.4			
450	**********		6.4	6.2	6.0	5.8	5.5	5.0	3.9	2.3				
500	**********		6.1	5.9	5.7	5.5	5.2	4.8	3.7	2.1				
600	**********		5.4	5.2	5.0	4.8	4.4	3.4	2.0					
700	**********		5.0	4.8	4.6	4.4	4.0	3.1	1.8					
750	**********		4.6	4.5	4.3	3.9	3.0	1.7						
1,000	**********		3.9	3.7	3.4	2.6	1.5							
1,500	**********		2.1	1.2										
2,000	**********		1.9	1.1										

NOTE: For correct usage of these tables, please refer to the microdata documentation.

National Tenant Satisfaction Survey (NTSS) 2006

Approximate Sampling Variability Tables - Canada

NUMERATOR OF PERCENTAGE	ESTIMATED PERCENTAGE													
	0.1%	1.0%	2.0%	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%	70.0%	90.0%
10	105.5	105.0	104.5	102.9	100.1	97.3	94.4	91.4	88.3	85.1	81.8	74.6	57.8	33.4
20	74.6	74.3	73.9	72.7	70.8	68.8	66.8	64.6	62.4	60.2	57.8	52.8	40.9	23.6
30	60.9	60.6	60.3	59.4	57.8	56.2	54.5	52.8	51.0	49.1	47.2	43.1	33.4	19.3
40	52.7	52.5	52.2	51.4	50.1	48.7	47.2	45.7	44.2	42.5	40.9	37.3	28.9	16.7
50	47.2	47.0	46.7	46.0	44.8	43.5	42.2	40.9	39.5	38.1	36.6	33.4	25.9	14.9
60	43.1	42.9	42.7	42.0	40.9	39.7	38.5	37.3	36.1	34.7	33.4	30.5	23.6	13.6
70	39.9	39.7	39.5	38.9	37.8	36.8	35.7	34.6	33.4	32.2	30.9	28.2	21.9	12.6
80	37.3	37.1	36.9	36.4	35.4	34.4	33.4	32.3	31.2	30.1	28.9	26.4	20.4	11.8
90	35.2	35.0	34.8	34.3	33.4	32.4	31.5	30.5	29.4	28.4	27.3	24.9	19.3	11.1
100	********	33.2	33.0	32.5	31.7	30.8	29.9	28.9	27.9	26.9	25.9	23.6	18.3	10.6
150	********	27.1	27.0	26.6	25.9	25.1	24.4	23.6	22.8	22.0	21.1	19.3	14.9	8.6
200	********	23.5	23.4	23.0	22.4	21.8	21.1	20.4	19.7	19.0	18.3	16.7	12.9	7.5
250	********	21.0	20.9	20.6	20.0	19.5	18.9	18.3	17.7	17.0	16.4	14.9	11.6	6.7
300	********	19.2	19.1	18.8	18.3	17.8	17.2	16.7	16.1	15.5	14.9	13.6	10.6	6.1
350	********	17.8	17.7	17.4	16.9	16.4	16.0	15.5	14.9	14.4	13.8	12.6	9.8	5.6
400	********	16.6	16.5	16.3	15.8	15.4	14.9	14.5	14.0	13.5	12.9	11.8	9.1	5.3
450	********	15.7	15.6	15.3	14.9	14.5	14.1	13.6	13.2	12.7	12.2	11.1	8.6	5.0
500	********	14.9	14.8	14.5	14.2	13.8	13.4	12.9	12.5	12.0	11.6	10.6	8.2	4.7
600	********	13.6	13.5	13.3	12.9	12.6	12.2	11.8	11.4	11.0	10.6	9.6	7.5	4.3
700	********	12.6	12.5	12.3	12.0	11.6	11.3	10.9	10.6	10.2	9.8	8.9	6.9	4.0
750	********	12.1	12.1	11.9	11.6	11.2	10.9	10.6	10.2	9.8	9.4	8.6	6.7	3.9
1,000	**********	10.4	10.3	10.0	9.7	9.4	9.1	8.8	8.5	8.2	7.5	5.8	3.3	
1,500	**********	8.5	8.4	8.2	7.9	7.7	7.5	7.2	6.9	6.7	6.1	4.7	2.7	
2,000	**********	7.3	7.1	6.9	6.7	6.5	6.2	6.0	5.8	5.3	4.1	2.4		
3,000	**********	5.9	5.8	5.6	5.5	5.3	5.1	4.9	4.7	4.3	3.3	1.9		
4,000	**********	5.1	5.0	4.9	4.7	4.6	4.4	4.3	4.1	3.7	2.9	1.7		
5,000	**********	4.5	4.4	4.2	4.1	3.9	3.8	3.7	3.3	2.6	1.5			
6,000	**********	4.1	4.0	3.9	3.7	3.6	3.5	3.3	3.0	2.4	1.4			
7,000	**********	3.8	3.7	3.6	3.5	3.3	3.2	3.1	2.8	2.2	1.3			
8,000	**********	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.6	2.0	1.2			
9,000	**********	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.5	1.9	1.1			
10,000	**********	3.1	3.0	2.9	2.8	2.7	2.6	2.4	1.8	1.1				
12,500	**********	2.8	2.7	2.6	2.5	2.4	2.3	2.1	1.6	0.9				
15,000	**********	2.4	2.4	2.3	2.2	2.1	1.9	1.5	0.9					
20,000	**********	2.0	2.0	1.9	1.8	1.7	1.3	0.7						

NOTE: For correct usage of these tables, please refer to the microdata documentation.

11.0 Weighting

The final weights are based on the inverse of the initial probability that the telephone number was selected in the sample in addition to some adjustments. The following steps were made to derive the final weight.

Step 1:
The initial weight (WEIGHT1) is calculated as:

$$WEIGHT1 = \frac{Number\ of\ telephone\ numbers\ on\ the\ frame\ within\ the\ stratum}{Number\ of\ telephone\ numbers\ in\ the\ sample\ within\ the\ stratum}$$

For example, if the frame contained 500 telephone numbers in a given stratum and was sampled at a rate of 20%, 100 telephone numbers would be selected. In this example, WEIGHT1 = 500 / 100 = 5. Every person in the sample in this stratum, "represents" a total of 5 people in the population in this stratum.

Step 2:
An adjustment to account for non-response to the survey, out-of-scope telephone numbers on the frame and the fact that some employees have more than one telephone number is calculated as:

$$A1 = \frac{\sum the\ initial\ weights\ of\ all\ sample\ units}{\sum the\ initial\ weights\ of\ respondents, out-of-scope\ units\ and\ duplicates}$$

Step 3:
An adjustment to account for the fact that one telephone number could be linked to several employees. Question SI_Q04 asked the respondent how many people were using the selected telephone number. The second adjustment uses the response to SI_Q04 to adjust the final weight to account for this one telephone number to many employees relationship.

Step 4:
The final weight is calculated as:

$$FINAL\ WEIGHT = WEIGHT1 * A1 * SI_Q04$$

This weight is required in order to produce meaningful estimates from the survey data.

12.0 Questionnaire

The National Tenant Satisfaction Survey questionnaire was used from August to December 2006 to collect the information for the survey. The file NTSS2006_QuestE.pdf contains the English questionnaire.

Appendix A

The following was provided to interviewers to help them code appropriate responses to questions WS_Q05, BSER_Q02 and BSER_Q04.

	Description	Include	Exclude
1. Air Quality	Air quality including: circulation or movement of air; ventilation; odours.	• air quality • air circulation • air movement • ventilation • odours • stuffiness • amount of fresh air • drafts • stale or musty air	• temperature *(see 2. Temperature)* • humidity *(see 2. Temperature)* • odours from perfumes used by co-workers • allergens
2. Temperature	Temperature or thermal comfort including: heating; air conditioning; humidity.	• temperature • thermal comfort • too hot or too cold • heating • air conditioning • humidity • adjustment of indoor temperature to outdoor temperature changes	• air quality/circulation/ventilation *(see 1. Air Quality)* • capacity for personal temperature control
3. Office - Size/Layout	Size and layout of individual offices/workstations and support areas (i.e. shared workspace for meetings, storage, printing, copying, reception, etc.). Includes: arrangement/configuration of workstations and furniture; size of workstations and support areas; functionality of office design.	• floor plan • arrangement or configuration of workstations, partitions and furniture • workstations and support areas too small or too crowded • proximity to co-workers/team members	• furniture repairs/replacement *(see 19. Furniture)* • ergonomics of furniture *(see 19. Furniture)* • size of desk surface *(see 19. Furniture)* • inadequate furniture *(see 19. Furniture)* • not enough file cabinets *(see 19. Furniture)* • aesthetics of office design
4. Cleaning - Office Areas	Cleaning of individual offices/workstations and support areas (i.e. shared workspace for meetings, storage, printing, copying, reception, etc.). Cleaning includes: washing of wall and floor surfaces; dusting; vacuuming; garbage removal; recycling.	• spot cleaning/washing of walls and floors • dusting • vacuuming • garbage removal • emptying of recycling bins	• cleaning of desks and computer screens in offices/workstations • cleaning of appliances (microwaves, refrigerators) in support area

	Description	Include	Exclude
5. Cleaning - Washrooms	Cleaning of washrooms including: cleaning of toilets, sinks, floors, walls, mirrors; replacement of soap, toilet paper and paper towels; removal of garbage.	• cleaning of toilets, sinks, floors, walls, mirrors • replacement of soap, toilet paper and paper towels • removal of garbage • odours related to cleaning or lack of cleaning • cleaning products	• inadequacy of washroom facilities • condition/age of washroom fixtures • washroom modernization • poor ventilation *(see 1. Air Quality)*
6. Cleaning - Common Use Areas	Cleaning of common use areas such as lobbies, stairwells, elevators, public corridors, cafeterias. Cleaning includes: washing of wall and floor surfaces; dusting; vacuuming; garbage removal.	• cleaning of wall and floor surfaces • dusting • vacuuming • garbage removal • cleaning products	• cleaning of office/workstations or support areas *(see 4. Cleaning – Office Areas)*
7. Office – Privacy / Noise	Privacy and noise levels within the office area or workspace related to: office enclosure (i.e. floor to ceiling partitions, open concept); availability of private meeting/phone call area; soundproofing; noise from photocopiers, printers.	• no partitions • no area for private meetings or phone calls • soundproofing • noise from photocopiers, printers, surrounding work activities • need for walls or door	• noise from building/mechanical systems *(see 13. Building System Noise)*
8. Lighting - Natural	Natural light coming through windows or skylights (sun).	• not enough natural light • no windows • glare from natural light coming through windows or skylights (sun)	• artificial lighting (overhead and task lighting) *(see Lighting - 9. Overhead or 10. Task)*
9. Lighting - Overhead	Overhead or area lighting in the ceiling or walls to illuminate individual offices/workstations, support areas and common use areas.	• too dark • too bright • glare • flickering	• natural lighting from windows *(see 8. Lighting – Natural)*
10. Lighting - Task	Special lights over or on the immediate work area such as a desk, drafting or laboratory table.	• too dark • too bright • glare • flickering	• natural lighting from windows *(see 8. Lighting – Natural)*
11. Elevators	Elevator reliability, speed, service record (i.e. frequency of repairs)	• elevator unreliable • elevator too slow • elevator frequently breaks down/out of service	• cleaning of elevators *(see 6. Cleaning - Common Use Areas)*

	Description	Include	Exclude
12. Drinking Water	Quality and availability of drinking water in the building.	• quality and availability of drinking water in the building • taste of drinking water	• plumbing problems • hot and cold water for washing • maintenance of drinking water fountains *(see 6. Cleaning – Common Use Areas)*
13. Building System Noise	Sound produced from building/mechanical systems including: furnaces, fans, air conditioning, etc.	• noise level of building/mechanical systems, furnaces, fans, air conditioning	• noise from photocopiers, printers and other work-related machinery *(see 7. Office – Privacy)* • noise from repair/construction projects
14. Food Services	Food services and related facilities including: quality and variety of food; hours, location, size of cafeteria.	• food quality and variety • cost of food • cafeteria hours • cafeteria location or size	• cleaning of cafeteria *(see 6. Cleaning – Common use areas)*
15. Parking	Availability and location of parking for employees.	• availability of parking • location of parking • cost of parking	• security *(see 16. Building Security)* • availability of bike racks • maintenance of parking areas (snow removal, etc.)
16. Building Security	Physical security of people and their belongings in the building: control of entrances by guards and security access systems; dark corridors; unoccupied space; after hours building access.	• control of entrances by guards and security access systems • dark corridors • unoccupied space • after hours building access	• demeanor of security personnel
17. Shower Facilities	Shower facilities including: availability of showers in the building; number of showers; cleaning and condition of showers.	• availability of showers • no showers or not enough showers • cleaning of showers • condition of shower facilities • repairs to shower facilities	• washroom facilities *(see 5. Cleaning- Washrooms)*
18. Interior Finishes	Repair/maintenance of base building finishes including: flooring (e.g. carpet, tile, linoleum); wall treatments/coverings (e.g. paint, wallpaper); ceiling finishes (e.g. tiles, paint); window coverings (e.g. blinds, curtains, solar film).	• worn, torn, frayed carpets • chipped, cracked flooring (e.g. tiles or linoleum) • chipped, peeling paint • peeling, torn wallpaper • chipped, cracked, broken plaster or drywall • broken, soiled ceiling tiles • broken blinds, shades, curtain hardware • torn, stained curtains • peeling solar film on windows	• furniture repairs *(see 19. Furniture)*

	Description	Include	Exclude
19. Furniture	Furniture in workstation or support areas (i.e. shared workspace for meetings, storage, printing, copying, reception, etc.) including: appropriateness of furniture; adequate storage or work surface; ergonomics (effective and safe design of furniture); condition of furniture (state of repair).	• inappropriate furniture • inadequate storage or work surface • ergonomics (effective/safe design) of furniture • broken or damaged furniture • size of furniture • need for new furniture • modernization of furniture	• moveable partitions between workstations *(see 7. Office Privacy/Noise)*
20. Accessibility of building for people with disabilities	Access and use of building by people with disabilities including: exterior walkways on building property; drop-off area and parking facilities; entrances; elevators; stairs; ramps; washrooms; drinking fountains; public telephones; tactile signage; cafeterias; lunchrooms and vending machines.	Access to: • exterior walkways on building property • drop-off area and parking facilities • entrances • elevators • stairs • ramps • washrooms • drinking fountains • public telephones • tactile signage • cafeterias, lunchrooms and vending machines in public/common use areas	• special furniture or computer needs for persons with disabilities (see 19. Furniture)
21. Other	Everything not listed previously	Everything not listed previously	