



Microdata User Guide

National Apprenticeship Survey

2007



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Table of Contents

1.0	Introduction	5
2.0	Background	7
3.0	Objectives	9
4.0	Concepts and Definitions.....	11
4.1	Definitions.....	11
5.0	Survey Methodology.....	38
5.1	Population Coverage	38
5.2	Sampling Frame	38
5.3	Sample Design	39
5.3.1	Stratification and Selection.....	39
5.3.2	Sample Allocation	40
5.3.3	Sample Size	42
5.3.4	Additional Sample.....	43
6.0	Data Collection	44
7.0	Data Processing	45
7.1	Data Capture	45
7.2	Editing	45
7.3	Coding of Open-ended Questions.....	46
7.4	Imputation	46
7.5	Creation of Derived Variables	46
7.6	Weighting	46
8.0	Data Quality	47
8.1	Response Rates	47
8.2	Survey Errors	49
8.2.1	The Frame	49
8.2.2	Data Collection	50
8.2.3	Data Processing	50
8.2.4	Non-response	50
8.2.5	Measurement of Sampling Error	52
9.0	Guidelines for Tabulation, Analysis and Release.....	53
9.1	Rounding Guidelines	53
9.2	Sample Weighting Guidelines for Tabulation	54
9.3	Definitions of Types of Estimates: Categorical and Quantitative	54
9.3.1	Categorical Estimates.....	54
9.3.2	Quantitative Estimates	54
9.3.3	Tabulation of Categorical Estimates.....	55
9.3.4	Tabulation of Quantitative Estimates.....	55
9.4	Guidelines for Statistical Analysis	55
9.5	Coefficient of Variation Release Guidelines	56
9.6	Release Cut-off's for the NAS	58
10.0	Approximate Sampling Variability Tables	59
10.1	How to Use the Coefficient of Variation Tables for Categorical Estimates	60
10.1.1	Examples of Using the Coefficient of Variation Tables for Categorical Estimates.....	61
10.2	How to Use the Coefficient of Variation Tables to Obtain Confidence Limits.....	64
10.2.1	Example of Using the Coefficient of Variation Tables to Obtain Confidence Limits	65
10.3	How to Use the Coefficient of Variation Tables to Do a T-test.....	66
10.3.1	Example of Using the Coefficient of Variation Tables to Do a T-test.	66
10.4	Coefficients of Variation for Quantitative Estimates.....	67
10.5	Coefficient of Variation Tables	67
11.0	Weighting	68
12.0	National Apprenticeship Survey Questionnaire	71
13.0	Record Layout with Univariate Frequencies	71
14.0	Derived variables	71

1.0 Introduction

The National Apprenticeship Survey (NAS) was conducted by Statistics Canada in 2007 with the cooperation and support of Human Resources and Social Development Canada. This manual has been produced to facilitate the manipulation of the microdata file of the survey results.

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

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2.0 Background

Apprenticeship programs in Canada are the responsibility of the provinces and territories. In several jurisdictions, apprenticeship programs are being reorganized to improve their effectiveness, cost efficiency, and overall accountability. Partnership between industries and apprenticeship programs within each jurisdiction allow for the development of a comprehensive set of occupational standards relating to curricula, examinations, certification, new methods of training delivery, and enhanced access to designated groups.

Most recent surveys were administered in 1990 and in 1995. In recent years, new information on apprentices has become important and necessary for decisions makers and stakeholders in various sectors of the economy.

The 2007 NAS was a telephone survey done by Statistics Canada to gather information on the training and employment experiences of apprentices across Canada. The sample population for the survey was randomly selected from a list of people who were registered as apprentices with their provincial or territorial authorities during the period of 2002 to 2004. A total sample of 30,000 respondents was targeted.

Survey respondents were selected based on apprenticeship status in 2002, 2003 or 2004 as reported by provincial or territorial jurisdictions. The three groups of apprentices were:

- Long-term continuers: people who were still registered apprentices in 2004 *and* who had registered as apprentices in 1999 or earlier (in the same trade as 2004) *and* who had not earned their certification by 2004.
- Completers: people who had been registered apprentices *and* had completed their apprenticeship programs (with or without certification) at some point during 2002 to 2004.
- Discontinuers: people who had been registered apprentices at some point in the past *and* had discontinued their apprenticeship programs between 2002 and 2004.

In the context of the survey itself, respondents confirmed their apprenticeship status by answering a set of screening questions at the beginning of the NAS questionnaire. Their status in 2007 determined the sequence of questions they were subsequently asked.

The screening questions used to categorize respondents were designed to help capture information about the various pathways followed by people pursuing trade qualifications through apprenticeship programs. While the apprenticeship programs are typically structured with two types of required training (in-class and on-the-job) followed by exams and certification, apprenticeship is a flexible system with many entry points and routes to completion. Some people work in a trade for a number of years before registering and taking their in-class training. Others, who have enough work experience, may challenge the examination *without* registering as apprentices or completing in-class training thus becoming trade qualifier. This accounts for the presence in the survey results of less traditional pathways to become a journey person like the discontinuers with certification.

The last apprenticeship survey, the 1995 National Apprenticed Trades Survey (NATS), focused only on two groups of apprentices: “completers,” those who had completed their apprenticeship programs; and “discontinuers,” those who had dropped out of their programs before completion.

The 2007 survey included additional components and questions designed to address new issues and research topics related to the current context of apprenticeship in Canada. The survey also added a new group of apprentices, “long-term continuers,” those who had remained in their programs for one and a half the expected time or longer mainly to try to understand why some apprentices take longer to complete their apprenticeship programs. Thus the survey focused on three groups:

- ❑ Long-term continuers,
- ❑ Completers – those who completed the program during 2002 to 2004, and
- ❑ Discontinuers – those who dropped out of their program during 2002 to 2004.

Expanding on the previous survey, the 2007 NAS aimed to investigate the factors affecting apprentices’ completion and certification, and to measure their transition to the labour market. The specific objectives were to better understand:

- ❑ why some registered apprentices do not complete their programs,
- ❑ how completion affects the labour market outcome of trainees, and
- ❑ why some apprentices take much longer than expected to complete their programs.

Between January and May 2007, the survey collected information from the three groups of apprentices. Each group was asked a common set of questions as well as a separate set of questions specific to their situations. The questions focused on the following areas.

- ❑ Pre-apprenticeship educational, training, and work experiences
- ❑ Experiences concerning technical training and work as an apprentice
- ❑ Reasons why discontinuers do not complete their program
- ❑ Difficulties encountered during apprenticeship
- ❑ Experience with the certification process
- ❑ Employment since the apprenticeship program
- ❑ General social-demographic characteristics

About half of the 1995 questionnaire content was considered to be still relevant to the current context of apprenticeship programs and was adapted for use in the 2007 NAS. In addition the 2007 survey included a component on apprentice mobility to respond to the emerging issue of apprentices migrating from one jurisdiction to another during or after their programs, and a component to examine the apprenticeship experiences of newcomers to Canada.

The data presented in this report will allow reviewers to compare labour outcomes for discontinuers and completers, identify reasons for interest and obstacles to registration, study barriers to completion by trade, and analyze the perception of the apprentice on their in-class and on-the-job training. It will also help answer questions about the mobility of apprentices during and after their programs

3.0 Objectives

This survey was aimed at understanding the factors affecting apprentices' completion and certification and measuring the transition to the labour market of apprentices who completed and/or certified or dropout of their apprenticeship program.

Underlying this global objective was the need to:

- compare labor outcomes for completers and discontinuers
- study barriers to completion, depending on trades
- examine mobility of apprentices during and after their apprenticeship programs

4.0 Concepts and Definitions

This chapter outlines concepts and definitions of interest to the users. The concepts and definitions used in the National Apprenticeship Survey (NAS) are given below.

4.1 Definitions

A

Ability	Expertise in performing successfully a task or set of tasks. This expertise may have been acquired with or without formal training or study and may be related to a specific trade, occupation, or profession. It may be measured using various instruments.
Academic Qualifications	Requirements for entry into a designated trade that involves a period of formal study in a recognized educational institution or equivalent. In most circumstances academic qualifications can be documented.
Accreditation	A process by which a government department, agency or association grants public recognition to training program that meets a predetermined set of standards.
Apprentice	A person who works in a trade, occupation or craft under an agreement or contract and is registered with the Apprenticeship Authority. The apprentice learns the knowledge, skills, tools and materials of the trade, occupation or craft through on-the-job training and technical instruction under the supervision of a certified journeyman.
Apprentice On-the-Job Training Standards/Progress Record Book (Logbook)	A document issued to registered apprentices in which acquired skills, courses completed, and time worked at a trade or occupation are recorded.
Apprenticeship	A structured system of supervised training leading to certification in a designated trade, occupation or craft. It is systematic programs of on-the-job training supplemented by technical instruction in which an apprentice gains experiential learning and develop skills.
Apprenticeship Accreditation	A process by which an agency or association grants public recognition to a training establishment, program of study or service which meets pre-determined standards.

Apprenticeship Advisory Board – Provincial/Territorial	A provincial or territorial government appointed Board whose primary function is to advise the Minister responsible for labour market matters on issues related to training and certification of people in designated trades.
Apprenticeship Contract/Agreement	A document signed by the employer, sponsor, or joint apprenticeship training committee and apprentice, outlining the conditions and responsibilities of both parties to the terms of apprenticeship. The agreement may be co-signed by the government department or agency that has responsibility for the <i>Apprenticeship Act</i> and regulations.
Apprenticeship Program Outline	A list of topics and performance objectives to be learned during each period of an apprenticeship program's technical training.
Apprenticeship Registration	A formal process requiring an individual to meet all the requirements for apprenticeship, including signing an apprenticeship contract, agreement or memorandum of understanding with an employer.
Apprenticeship Technical Training	A period of training/instruction provided to apprentices in a classroom setting away from the job site. The emphasis is on teaching the theory component of the trade or occupation, reinforced where appropriate, with shop/lab training. This training is intended to supplement the on-the-job training.
Apprenticeship Term	The normal length of time required for a person to attain journeyperson status from the time of registration as an apprentice and is usually a combination of both formal training and work experience. The length of time is generally expressed in years and hours per year or in hours.
Apprenticeship Training	Industry training that combines work-based training and experience with components of technical training leading to provincial/territorial and/or national industry training credentials (e.g. Red Seal) for trades-related occupations.
Assessment	The process of reviewing and evaluating competencies and qualifications for the purpose of determining whether or not a candidate has fulfilled the requirements to be eligible to practice an occupation. This process could include testing or examinations. The main purpose is to measure candidates against a pre-determined occupational or educational standard.

Assessment criteria A standard of performance that a learner must reach in order to demonstrate the achievement of a specified element of learning.

B

Basic Skills A minimum level of essential technical skills required to work in a trade to become an apprentice, and upon which proficiency in the trade is built.

Block Release Training A method by which apprentices are released by their employers to attend technical training for a specified period (block) each year, usually five to eight weeks.

Bridging Program A program of study, a course, or set of courses or activities designed specifically to provide practitioners from one jurisdiction with the skills and knowledge required for entry into a trade or profession in another jurisdiction. A bridging program is an example of an accommodation mechanism that complements the competencies or qualifications earned outside the jurisdiction.

C

Canadian Apprenticeship Forum (CAF) The Canadian Apprenticeship Forum - Forum canadien sur l'apprentissage (CAF-FCA) is a diverse, not-for-profit organization that brings together the key participants who make up the Canadian apprenticeship community. This dynamic partnership works within the Canadian labour market and strives to make a difference within that community.

Canadian Council of Directors of Apprenticeship (CCDA) A national body comprised of the provincial and territorial government officials responsible for managing and directing apprenticeship programs and two federal government representatives. The mission of the Council is to facilitate the mobility of the apprentices and journeypersons in Canada through the establishment of uniform standards in training and examinations as confirmed by a Red Seal endorsement.

Certificate of Apprenticeship A document issued to a person who has successfully completed a formalized apprenticeship training program.

Certificate of Qualification	A certificate issued to a candidate who has successfully completed an apprenticeship program or has met all the requirements of a trade <i>and</i> has attained the prescribed pass mark on the certification examination to qualify as a journeyperson in that trade.
Certificate of Qualification Examination	Standardized provincial or territorial exam that is normally written upon completion of an Industry Training Program. The successful completion of this exam leads to the issuance of a provincial or territorial Certificate of Qualification.
Certification	The acquisition of a Certificate of Qualification.
Challenge Exam	A method of assessment to award credit for previously acquired learning. It measures learning through a variety of written and non-written evaluation methods, including examinations and demonstrations.
Challenge/Exemption	An authorization exempting someone from a normal requirement.
Common Core	The tasks in a National Occupational Analysis that have been identified by the industry as being performed by workers in at least 70 percent of the provinces and territories that have the trade or occupation designated for apprenticeship under the Interprovincial Standards Red Seal Program.
Common Sequencing	The arranging of learning materials in an order for delivery by a number.
Community College	A post-secondary educational institution offering programs related to liberal arts, technical and trades training (including pre-apprentice pre-employment and in-school technical training for apprentices).
Competency	A measurable level skill, and/or knowledge to perform occupation-specific tasks and duties.
Competency Assessment	Measurement of skills, knowledge, and behaviours obtained through formal or non-formal education, work experience, or other means, with the purpose of establishing individual's possession of requirements for a trade or profession. Competency assessments may be in the form of examinations or task-based performance testing.

Competency-Based Learning	Training aimed at acquiring discrete sets of associated task-based skills and knowledge that, in combination, make up the performance requirements of an occupation, profession, or trade.
Competency Profile	A curriculum component that graphically and logically delineates an occupation into a performance-based framework comprising major duties, tasks, and sub-tasks. Competency profiles are typically developed with input from practitioners who work in the occupation.
Completion of Apprenticeship	The fulfilment of training requirements, both technical and on-the-job, by registered apprentices. Graduates of an apprenticeship program applicable to the trade and the province and territory will be issued a Certificate of Apprenticeship. In most cases, they will also receive a Certificate of Qualification.
Compulsory Apprenticeship	A requirement in which people entering or working in a designated trade must possess a Certificate of Qualification or register as apprentices with the provincial or territorial authorities. Those working in the trade prior to the compulsory requirement may be exempted by provincial or territorial legislation.
Compulsory Certification	A requirement in which people entering or working in a designated trade must possess a Certificate of Qualification or be registered as apprentices in order to practice in the trade. See also <i>Voluntary Certification</i> .
Continuing Competence	The ability over time to integrate and apply the knowledge, skills, judgment, and personal attributes required to practice an occupation safely and ethically. Occupational bodies may require members to verify that they have met continuing competence standards.
Cooperative Education	A program for those enrolled in a school or community college who, through a cooperative arrangement between the training institution and employers, receives part of their instruction in the institution and part on-the-job through an employment agreement.
Core Curriculum	The portion of a curriculum developed to the occupational tasks common to a specific trade in the provinces and territories.

Correspondence Study	A systematic method of distance learning or training consisting of a series of sequentially organized lessons or assignments conducted and maintained through the postal service, electronic mail or a similar service.
Course	A single unit of study offered by educational institutions.
Course Outline	A brief description of the objectives, content and application of a specific program of study. It outlines the material to be learned in major, minor and unit groups in sufficient detail to ensure an understanding of the scope of the program. It may also include an evaluation profile.
Credentialing	Pertaining to the recognition of qualifications through the issuance of formal documentation.
Criterion	An objective and measurable indicator relating to skill level, knowledge, and/or competency.
Curriculum	A structured outline of learning organized into course(s) or work experiences that assist in the development of learners' knowledge and skills. It is a comprehensive term that includes such elements as task analyses, competency profiles/charts, course outlines, learning/teaching objectives and lesson plans.
Curriculum Resources	Resource materials developed to establish the standards for and facilitate the training of apprentices and journeypersons. Resource materials include, but are not limited to, skill profile charts, occupational analyses, apprenticeship program outlines, journey-person upgrading and updating course outlines, trade/occupation manuals and modularized learning resource materials.
D	
DACUM	An acronym for 'Developing a Curriculum', a model used in competency-based training for developing the learning activities that generate specific skills required by an occupation.
DACUM Chart	A listing of skills or competencies in a specific trade or occupation organized and presented in a chart format. The list is prepared using the DACUM (developing a curriculum) method for analyzing a trade or occupation. DACUM involves bringing together practitioners of a trade under the leadership of trained facilitator.

Day Release Training Technical training for apprentices where employers release apprentices from work for one day to attend in-school training (usually one day a week).

Designated Apprenticesable Trade A trade that has been formally recognized through provincial or territorial legislation for apprenticeship training and certification. The requirements for in-school and on-the-job training as well as level and certification examinations are outlined in the trade regulations.

Designated Red Seal Trade A trade or occupation that has been designated by the Canadian Council of Directors of Apprenticeship (CCDA) for inclusion in the Interprovincial Standards "Red Seal" Program. The training and certification is based on a national occupational standard, and provinces and territories participating in the program for that trade or occupation are permitted to affix a Red Seal to the certificates of candidates who meet the standard. Refer also to the definition herein for Interprovincial (IP) Examination.

Discontinuer An apprentice who terminates involvement in an apprenticeship training program prior to completion.

E

Education Level - Trade/Vocational Trade/vocational training includes pre-employment or pre-apprenticeship and skill upgrading courses lasting three months or more, but does not include block release apprenticeship training, basic training for skill development, language training and job readiness training.

Education/Entrance Requirements The level of formal education or other criteria such as an examination or assessment process that an individual must possess prior to becoming an apprentice or attending technical training. While these requirements may vary from trade to trade and province to province, Canadian Council of Directors of Apprenticeship (CCDA) advises that most employers require prospective apprentices to have a grade 12 education.

Employer	A person, corporation, partnership, unincorporated association, or a municipal, provincial or other public authority eligible to sign an Apprenticeship Agreement with an apprentice.
Entrance Requirements	A set of criteria stipulating length, level, and scope of education, or other types of training, or experience, for eligibility to enter an academic institution, trade, or profession. May include stipulated minimal levels or achievement and/or minimal scores on examinations.
Equivalency	In the context of industry training refers to the process of demonstrating that an individual has completed a requirement of an <i>Industry Training Program</i> outside of the traditional program. This may include demonstrating the equivalent of a specified number of work hours related to the program, or demonstrating the completion of technical training equivalent to a technical training component of an Industry Training Program.
Essential Skills	Essential Skills are the "enabling skills" that help people perform the tasks required by their occupation and other activities of daily life. They provide people with a foundation to learn other skills, and enhance their ability to adapt to workplace change. Essential Skills include: reading text, document use, writing, numeracy, oral communication, thinking, working with others, computer use and continuous learning.
Examination Item Bank	A collection or inventory of validated examination questions.
Examination Plan	An outline of specifications or proposed content of an examination. The plan is based on a National Occupational Analysis and will reflect the importance, frequency and complexity of tasks performed in a trade or occupation.
Examination Standards	A set of established standards for a trade and that meet provincial or interprovincial criteria. They include: <ol style="list-style-type: none">occupational standards;acceptable development criteria and administrative procedures; and,other factors that contribute to quality examinations.

F

Fixed Entry/Open Exit Training	A system of training based on specific performance criteria where progress in learning is measured in terms of demonstrated skills and knowledge and where an apprentice or other learner is allowed to progress through and exit a course of instruction at a rate determined by his or her own capabilities. This training system is also referred to as the Modified Block Release training system. Learning is usually supported by the use of modularized learning resource materials and the services of a facilitator/instructor.
Flexible/Distance Education	Formal training delivery methods that enable registered apprentices and other learners to complete a course of study utilizing current communications technologies and may include some traditional classroom-based instruction. Some examples of current communication technologies being utilized to reduce the periods of formal classroom instruction include the Internet, interactive computer-based training and video conferencing.
Forum of Labour Market Ministers (FLMM)	A forum comprised of the provincial/Territorial, territorial ministers and the federal minister with responsibility for reviewing work and setting priorities for federal-provincial/territorial and interprovincial cooperation on labour market issues. The forum is supported through a set of committees at various levels, including: ministers, deputy ministers, senior officials and working groups.
Funding for Apprenticeship Training	The costs associated with the training of an apprentice. Wages are paid during the on-the-job period by the employer. The cost of the technical portion of training is, in most cases, shared between the provincial or territorial government and the federal government, while in others they are paid in total by one party. Employers and apprentices contribute to the cost of institutional training.

G

**Grandparenting
(Acquired Rights)**

The recognition of a person's work experience in a trade prior to the trade being designated for training and certification or a designated trade being declared for compulsory certification. The recognition may be in the form of granting the Certificate of Qualification without examination, a permit to work at a trade for a specified or indefinite period or other forms that permit the person to continue working in the trade in the same capacity as before its designation or certification.

H

Hour Release Training

Technical training for apprentices whereby they are released from work by their employers to attend technical training for a number of hours per day, usually one day a week.

**Human Resources and
Social Development
Canada (HRSDC)**

This is the Federal Department that has responsibility for providing the secretariat services for the Interprovincial Standards (Red Seal) Program including the translation, printing and distribution of interprovincial examinations. The department is also responsible for the development and distribution of National Occupational Analyses.

I

**Individualized
Instruction**

Instruction focused on a single learner (as opposed to a group of learners) and considers the learner's existing skills, abilities, needs, learning preferences and rate of learning. Individualized instruction is usually accomplished through modular delivery of training.

**Industry Trade Advisory
Committee**

Committee appointed to represent the interests of an equal number of employers and labour, on a committee off designated by a provincial or territorial agency, to offer advice and make recommendations regarding apprenticeship and journeyperson training and certification standards. Representatives are knowledgeable in the trade or occupation and are seen as the primary vehicle for ensuring industry has a voice in the development and delivery of apprenticeship training.

Industry Training	<p>A broad strategy used to provide individuals with the competencies and attendant credentials required to work in industry. The defining features of industry training, within the context of the Industry Training Authority's (ITA) mandate, are:</p> <ol style="list-style-type: none">1. Occupational competencies and standards for each occupation are <u>defined by industry</u> and approved (recognized and/or accredited) by the Industry Training Authority under the provisions of the Industry Training Authority Act;2. Demonstration of defined competencies and standards by individuals results in the awarding of a <u>credential</u> by ITA and/or its designates;3. The training methodologies, while varied and flexible, normally comprise a component of <u>work-based learning and/or experience</u> that enables individuals to practically acquire and/or apply skills and knowledge.
In-School Training	<p>A period of training/instruction usually provided to apprentices in a classroom setting. The emphasis is on teaching the theory component of the trade, and is intended to supplement on-the-job training.</p>
Internship	<p>A period of practical, supervised, on-the-job training designated to give the learner the required skills and knowledge for entry into a trade or profession, supplementing a period of formal study. An intern is an advanced student or recent graduate in a professional field who is getting practical experience under the supervision of an experienced worker.</p>
Interprovincial Common Core Curriculum Standard (ICCS)	<p>The identification of standards within the technical training component of an apprenticeship program commonly accepted across jurisdictions.</p>
Interprovincial Computerized Examination Management System (ICEMS)	<p>A system intended to manage the inter-provincial standards Red Seal examination development process, Computer technology is used to store and selectively retrieve examination items from a bank, automate the process of examinations and track examination candidates.</p>
Interprovincial Red Seal Examination	<p>A standardized interprovincial examination available in a Red Seal trades. The successful completion of an Interprovincial Red Seal Examination leads to a Red Seal endorsement which is affixed to the provincial Certificate of Qualification.</p>

ICEMS Steering Committee A committee comprised of representatives with involvement in the Interprovincial Standards Red Seal Program whose mandate is to oversee the development and implementation of the ICEMS initiative.

Interprovincial Standards Examination Committee (ISEC) A working group of the Canadian Council of Directors of Apprenticeship (CCDA) comprised of staff responsible for the development of certification examinations within the provinces and territories. It includes two representatives from the federal department of Human Resources and Social Development. ISEC oversees the development and administration of interprovincial examinations.

Interprovincial Standards Red Seal Program A program designated to bring together provincial, territorial and federal governments to achieve increased workforce mobility by establishing common standards for certification in individual trades and occupations. Elements of the program are the National Occupational Analyses and the interprovincial examinations. The program is complementary to provincial and territorial certification programs and administered by the Canadian Council of Directors of Apprenticeship (CCDA). It is also referred to as the Red Seal Program.

J

Journeyperson A formally certified, fully skilled worker whose combined work experience and training satisfy all the requirements demanded of those who practice in a designated trade.

Journeyperson Certification Only A provision of prevailing provincial/territorial legislation that provides for the certification of persons at the journeyperson level only but makes no provision for the registration and training of persons as apprentices. This provision is often incorporated to reduce barriers to the mobility of qualified workers.

**Journey person
Certification –
Compulsory**

A prevailing provincial/territorial legislation requirement in which persons entering or working in a designated trade or occupation must possess a Certificate of Qualification or be registered as apprentices, in order to work or practice in that trade or occupation. Those working in the trade or occupation prior to the compulsory requirement may be eligible for exemption from this requirement by the provincial/territorial authorities. In some jurisdictions, the Certification Program is referred to as the Trades Qualification (TQ) Program.

**Journey person
Certification – Voluntary**

A provision of prevailing provincial/territorial legislation that provides a voluntary opportunity for eligible journeypersons working in a specific designated trade or occupation to become certified. In some jurisdictions, the certification program is referred to as the Trades Qualification (TQ) Program.

L

Labour Market

An expression of the interaction that occurs between the supply of labour by the potential workers and the demand for workers by employers.

**Legislation –
Apprenticeship**

The provincial and territorial Acts and Regulations governing the administration of apprenticeship and related programs, including the training and certification of apprentices and tradespersons.

Licence

Document entitling its holder to have the exclusive right to practice a trade or profession, and signifying that the licence-holder meets competency and other requirements for practice.

Licensing

Some “licensed” professions may only be practiced by holders of a licence in the specific field of practice. A licence is required to perform procedures reserved for members of the licensing body. A licence signifies that the regulatory body has examined the holder’s credentials and that the holder meets the standards established by it and has undertaken to comply with and apply the standards in force in the profession, occupation, or trade. A licence also entitles the holder to use a reserved title.

Licensing, Certification or Registration	A formal recognition that a person has attained a standard of proficiency in a set of knowledge, skills and abilities required to practice a trade or occupation.
Licensure	Procedures for determining eligibility, granting licences, and protecting the public with respect to the practice of the trade or profession requiring a licence. Licensure denotes to the public that the person who has been granted the licence has the competence needed to provide for the public's protection.
Linkages/Credit	The relationship between training courses and programs in high schools, community colleges and technical institutions and the apprenticeship program. The programs are linked to permit the granting of apprenticeship credits for skills and knowledge acquired prior to enrolling in apprenticeship. <i>See also Prior Learning Assessment and Recognition (PLAR) and Accreditation.</i>
Logbook	A booklet issued to registered apprentices in which acquired skills, knowledge and time worked at a trade are recorded. The name given to the book may differ between provinces and territories.
M	
Maintenance	The process of renewing standards, updating curricula and upgrading professional/occupational training of certificate and licence holders for the purposes of keeping their professional and occupational practice and standards current.
Mentorship	A service associated with educational programs and licensing/registration processes, through which individuals obtain ongoing advice and assistance from persons experienced in their field of study or occupation.
Modular Training	A training program organized and delivered in distinct units or clusters of related materials. The modular training concept allows for individualized instruction and learning, and flexible completion times for apprentices. Competency or performance-based training programs use the modular concept in the organization of units of instruction.

Modularized Learning Resource Materials	Educational packages which include learning objectives, learning activities and self-assessment procedures designed to guide the learning of apprentices and journeypersons for a specific unit of training. Packages may be developed for use in individualized and/or instructor/facilitator driven settings and for apprentice training and/or journeyperson upgrading/updating.
Module	A self-contained unit of instruction that focuses on a single competency to be learned. Modules are normally used in self-paced instructional programs.
Mutual Recognition	Acceptance by appropriate authorities in two jurisdictions that the qualifications of their workers in a given occupation conform to one another's occupational standard without requiring the worker to undergo any additional assessment or training.
N	
National Occupational Analysis (NOA)	A document that details tasks and sub-tasks performed by workers in a trade or occupation. The National Occupational Analyses for Red Seal trades are developed by industry practitioners, under the guidance of the federal government and with the assistance of the provinces and territories. The National Occupational Analysis is used as the base document to develop an interprovincial Red Seal examination. The CCDA recognizes the occupational analysis as the national standard for the occupation.
National Occupational Classification (NOC)	A document that classifies all occupations in Canada. This system of coding is the basis for the organization of occupations in Job Futures.
National Standards	A set of standards that are established for Canada through a system of national occupational analyses developed by the industry in association with the provincial, territorial and federal governments. They permit standardization of training and certification programs, and the mobility of tradespersons.

O

Occupation	A set of skills that, with some variation, are similar in their main tasks or duties or in the type of work performed. The skills that comprise an occupation are considered together for the purposes of classification or setting of standards. The definition of an occupation may differ between provinces and territories in Canada or between countries.
Occupational Mobility	When, for whatever reason, an individual moves from one job to another without experiencing an extended period of unemployment.
Occupational Qualifications	Occupational qualifications mean the knowledge, skills, abilities and experience of an individual.
Occupational Requirement	Occupational requirement means a condition other than an occupational standard, imposed by a recognized body for the practice of an occupation.
Occupational Standard	Occupational standard means the skills, knowledge and abilities required for an occupation as established by a recognized body and against which the qualifications of an individual in that occupation are assessed.
On-the-Job Training	The component or portion of an apprenticeship training program where apprentices spend time working on the job site learning the skills of the trade under the supervision of a journeyperson.

P

Performance-Based Training	See Competency-Based Learning
Performance criterion	
Period of Articling/Internship	A period of practical, supervised, on-the-job training designed to supplement a period of formal study and give the practitioner the required skills and knowledge for entry into a trade or profession.
Portfolio	A formally presented document that describes learning achieved from prior experience, articulates learning objectives toward the specific course requirements of an educational institution or professional association or the requirements of an employer, and shows validation or proof through third-party documentation.
Practical Training	The part of apprenticeship training in which an apprentice works on a job site learning the skills of a designated trade under the supervision of a certified journeyman.
Practical Training Record Book	A component of the Apprentice Portfolio used to record tasks, sub-tasks and practical skill development verified by a certified journeyman, or designated trainer, and reviewed by the Apprenticeship Training Coordinator.
Pre-Apprenticeship Training	A program mainly of technical and general education, including a portion of trade practice, offered in high schools, vocational schools, community colleges and technical institutes and linked to an apprenticeship program through the credit system.
Pre-Employment Training	Courses providing intensive instruction for entrance into employment in a specific occupation. Depending on the jurisdiction, these courses may not necessarily be linked to apprenticeship training. In some jurisdictions, however, this term refers to all training leading to employment, including pre-apprenticeship training courses.
Pre-Employment Training – Compulsory	A compulsory pre-employment training course that must be completed prior to participating in an apprenticeship program for a specific designated trade or occupation.

Pre-Employment Training – Voluntary A pre-employment training course that can be taken on a voluntary basis and is not a prerequisite to entering into an apprenticeship program in a specific designated trade or occupation.

Prerequisite A level of competence or education required by a person for entrance to an apprenticeship program and to succeed in the subsequent levels of the program.

Prior Learning Assessment and Recognition (PLAR) A process under which recognition is extended towards completion of an apprenticeship for skills, knowledge or competencies that have been acquired experientially through work experience, previous education and training or self studies. The prior learning should articulate with the formal technical training or on-the-job training requirements for the trade or occupation in which the apprenticeship is to be served.

Professional Development Studies completed by individuals to enhance knowledge and skills in their fields of practice.

Program Development Officer A person in a jurisdiction who is responsible for developing and evaluating occupational training and certification programs, including interprovincial and other examination. In some jurisdictions, these people are called Curriculum and Examination Development Officers.

Program Standards Expectations of performance and achievement for certification in a particular trade. These standards include pass marks, quality assurance, program progression criteria and certification criteria.

Provincial Trade Advisory Committee (PTAC) The mandate of the Provincial-Territorial Advisory Committee is to advise and make recommendations to the Council on matters related to voluntary standardization and to promote cooperation and communication between the provinces, the territories and the Council (Standards Council of Canada --SCC).

Q

Qualification Possession of set(s) of skills and knowledge for entry into an occupation or an educational institution, or for practice of a profession or occupation.

R

Ratio

The number of apprentices a journeyperson is permitted to supervise. The procedure for establishing ratios may vary between jurisdictions, for example, the ratio may be set by regulation under the *Apprenticeship Act*, by the Apprenticeship Board or by individual trade advisory committees or boards. Ratios will vary from trade to trade and, in the absence of an established ratio, a ratio of one apprentice to one journeyperson is used.

Ratio – Journeyperson/ Apprentice

The number of qualified/certified journeypersons that an employer must employ in a designated trade or occupation in order to be eligible to register an apprentice as determined by prevailing provincial/territorial legislation, regulation, policy directive or bylaw issued by the responsible authority or agency. Ratio may be fixed for all employers or variable and can be adjusted by the responsible authority when taking into account an employer's ability to train. Generally, in the absence of an established ratio, a ratio of one apprentice to one journeyperson is used.

Recognized Training Programs

Programs that have been approved pursuant to a bylaw by the Industry Training Authority Board of Directors and lead to a Certificate of Qualification.

Red Seal

A nationally registered trademark symbol adopted for the Interprovincial Standards Program to signify interprovincial qualification of tradespersons at the journey-person level. It is affixed to the provincial and territorial Certificates of Apprenticeship and Qualifications of those apprentices and tradespersons who have met the national standard in a Red Seal trade. The Red Seal is a passport that allows the holder to work anywhere in Canada without having to write further examinations.

Red Seal Designated Trade

A trade that has been designated by the Canadian Council of Directors of Apprenticeship (CCDA) for inclusion in the Interprovincial Standards Program. The training and certification are based on a national occupational standard, and provinces and territories are permitted to affix a Red Seal to the certificates of candidates who meet the standard.

Registered Apprentice	A trainee who has met all the requirements for entrance into an apprenticeship program and who has signed an apprenticeship contract or agreement with an employer, sponsor or joint apprenticeship training committee. The term registered is now regularly being substituted for indentured.
Regulations	The formal rules by which the principles outlined in provincial and territorial Acts governing apprenticeship training are to be carried out. Each designated trade may have a set of regulations covering all aspects of training and certification.
Retraining	The training for the acquisition of new knowledge and skills related to a trade other than for which a person was originally trained.
S	
Scope of a Trade	The range or extent of skills required or tasks performed in a particular trade or occupation.
Sector Council	An organization that represents an industrial sector in terms of occupations, productivity, and viability of the industry.
Self-Paced Learning	The acquiring of knowledge and skills at a pace suitable to the individual learner.
Sequencing of Curriculum	The arranging of learning materials in a logical order for training activity.
Skill	The ability to perform tasks with a specific degree of proficiency.
Skill Level	A designation used to classify occupations in the National Occupational Classification by the level of training, education or experience required to perform an occupation.
Skill Profile Chart	A comprehensive portrayal of the major trade areas and associated tasks for a trade or occupation which an individual must successfully perform to meet job requirements. The profile may be presented in a graphical format e.g., DACUM chart or a narrative format.
Skill Type	A designation used to classify occupations in the National Occupational Classification by the industry or sector in which the majority of the occupations fall.

Skill Updating	The training required to bring a person's skill or set of skills up to date with new methods, technology and procedures required in the trade or occupation in which the person is currently employed or certified.
Specialization	A situation in which a person's training or work in a trade is concentrated or focused on a segment of the trade.
Sponsor	A person or body registered with the Industry Training Authority willing and able to ensure the trainee receives training and related practical experience in the tasks, activities and functions that are carried out in that occupation, and undertakes to attest that the trainee has met the established standards for the Industry Training Program.
Standard	A written description of characteristics which are deemed to be required by users of the standard. A standard serves as a benchmark or point of comparison and it allows the determination of the variability and quality of a product, process or service.
Standard Setting	The process of identifying the pertinent tasks, knowledge, and/or skills within an occupation, profession, trade, sub-specialty, etc., and establishing uniform achievement levels in the performance of those tasks.
Sub-Task	The smallest unit of the Occupational Analysis into which it is practical to divide any work activity. The complete set of sub-tasks and supporting knowledge and abilities describes a "Task".
Supporting Knowledge & Abilities	The element of skill and knowledge that an individual must acquire to adequately perform the task.
T	
Task	A work activity that is distinct, observable, performed within a limited period of time, and which leads to a product, service or decision.
Task Analysis	A systematic process of identifying and listing job tasks and analyzing the behaviour required to carry out a task with a view to identifying areas of difficulty and the appropriate training techniques and instructions necessary for successful learning.

Technical Training	The part of an apprenticeship training program that is delivered in-school, and includes theoretical aspects of the trade designed to supplement the skills acquired during on-the-job training. It makes up approximately 15 percent of the total apprenticeship training program.
Trade	An occupation for which a provincial or territorial apprenticeship program is available. Trade skills can best be learned through an apprenticeship.
Trade Advisory Board/Committee	A provincial or territorial group appointed to advise and make recommendations regarding apprenticeship training and certification in a designated trade. It is comprised of persons knowledgeable about the trade. Normally, an equal number of employee and employer representatives are appointed to a committee. Some jurisdictions have a single provincial or territorial for each trade, others have local or regional trade advisory committees in addition to the provincial committee. These committees are the primary vehicles for ensuring that the industry has a voice in the development and delivery of apprenticeship programs.
Trade Vocational	Higher level of education that may or may not require the completion of high school and may involve on-the-job training as part of the course requirements.
Trades Qualification	A process of Certification which recognizes workers with a minimum number of years and hours of documented experience in a trade. Workers can apply for certification and write a certification exam for trades qualification.
Trade Qualifier	A Trade Qualifier is an individual who has amassed sufficient practical work experience to meet the established criteria to attempt the certification journey level (provincial or interprovincial) examination. The criteria require relevant on-the-job experience of at least one year in excess of the apprenticeship term.
Train-the-Trainer Program	A program designed to provide training and coaching skills to journeypersons responsible for the workplace training and supervision of apprentices.
Training	The acquisition of knowledge or skills by the performance of tasks under the direct supervision of a person who has already acquired the knowledge or skill. Training can occur on the job or in a formal setting.

Training Course	A period of on-the-job practical training, usually supervised, within a compulsory program of technical or vocational training. May be required in addition to general qualifications for access to a trade, occupation, or profession. May constitute additional training or retraining.
Training Delivery Method – Block Release	Refers to a training delivery method by which apprentices are released from work by their employers to attend prescribed full time in-school technical training for a specified period (usually three to ten weeks, once each year).
Training Delivery Method – Individualized	A single learner focused (as opposed to a group of learners) method of providing apprenticeship technical training instruction utilizing current communications technologies and/or a facilitator/instructor in a classroom, shop or lab. Jurisdictions that are moving to an individualized course method of instruction will show only the total hours of training as opposed to a number of periods and total weeks of instruction. Modularized learning resource materials are often used to support this type of training delivery.
Training Institution	A public or private college or post-secondary institute that provides training services.
Training Manual	A guide for the use of training staff, showing in detail the subject areas and behavioural objectives to be achieved, methods of instruction, equipment and materials to be used, the form of records to be kept and the tests to be administered.

Training Standards	<p>A set of standards set within a trade or occupation to ensure apprentices receive training that will lead to certification at the journeyman level. They include:</p> <ul style="list-style-type: none">a) standards of in-school instruction<ul style="list-style-type: none">i) qualifications of instructors;ii) program development;iii) training aids, models and equipment;iv) facilities;v) ratio of apprentices to instructors; and,vi) other factors that contribute to quality training.b) standards of on-the-job training<ul style="list-style-type: none">i) qualifications of trainer;ii) variety and level of work available to the apprentice;iii) facilities and equipment;iv) monitoring of training by apprenticeship field staff;v) ratio of apprentices to journeymen; and,vi) other factors that contribute to quality training.
Transferable skill	<p>Skills acquired through various employment, volunteer and academic experiences that can be applied from one position to another.</p>
U	
Unit	<p>The basic component of technical training in a given trade. It may provide specific technical or complementary content that is delivered and completed in its entirety within one level of training.</p>
Unit Outline	<p>A document that lists unit learning objectives, detailed content and exam plans.</p>
V	
Validation	<p>A process whereby industry, under the guidance of Program Development Officers and through provincial and territorial trade advisory boards/committees, reviews and confirms relevant program material (e.g., occupational analyses and examinations) for validity, content and accuracy.</p>
Vocational Counselling	<p>Engaging in career planning with individuals through a process of informing them about various opportunities for education, training and work.</p>

Voluntary Certification

A situation in which certification is available in a designated trade, but there is no legislated requirement that apprentices in a trade should be registered, or that workers engaged in the trade should be certified journeypersons.

5.0 Survey Methodology

The National Apprenticeship Survey (NAS) of 2007 is a cross-sectional survey designed to collect data from Canadian apprentices.

5.1 Population Coverage

This survey targets registered apprentices in the ten provinces and the three territories for three types (statuses) of apprentices and only for certain reference years. The three targeted statuses are long-term continuers, completers and discontinuers. The target population was determined in two steps: at frame creation and at collection.

First, there is the target population at the time of creation of the frame. For this survey, it was decided to target only long-term continuers from the pool of all continuers. Long-term continuers were defined as all continuers as of December 31, 2004 that registered as apprentices in 1999 or earlier (in same trade as of 2004). Approximately 19% of the 2004 continuers meet this long-term continuer criterion. The targeted completers and discontinuers are those who completed or discontinued their apprenticeship training between 2002 and 2004, and are not registered in any apprenticeship training as of December 31, 2004.

Then, at time of collection, it was decided to keep in the target population those selected apprentices in the sample that said to have had some apprentice activities between 2000 and 2004. If they did not have any apprentice activities between these years, they were considered out-of-scope for this survey.

5.2 Sampling Frame

The sampling frame is based on lists of registered apprentices provided by the provincial and territorial jurisdictions for the targeted reference years (2002, 2003 and 2004). These lists contain all necessary information needed for the stratification and selection of the sample such as the status of the apprentice, registration year, trade or training program, apprentice's age and gender. As well, contact information was provided such as the apprentice's address and phone number. A second source of contact information was also provided for some jurisdictions.

An assessment of the frame was conducted to evaluate its coverage and the quality and uniformity of the information for the 12 jurisdictions that provided data (Nunavut data was unavailable for the survey). Linking of the apprentices from the three reference years was necessary in order to classify each apprentice in the right status group (long-term continuers, completers or discontinuers) and also to eliminate duplicates within and across jurisdictions. The table 5.1 shows the number of apprentices on the frame after the determination of apprentice's status and the removal of duplicates.

Table 5.1 Number of apprentices on frame by jurisdiction and frame status

Reporting Jurisdictions	Frame Status			
	Long-Term Continuers	Completers	Discontinuers	Total
Newfoundland and Labrador	2,430	545	2,255	5,230
Prince Edward Island	5	315	45	370
Nova Scotia	730	1,245	1,110	3,085
New Brunswick	365	1,300	1,295	2,960
Quebec	12,030	7,740	12,085	31,850
Ontario	19,650	14,410	13,740	47,795
Manitoba	530	2,160	1,635	4,325
Saskatchewan	510	2,390	2,005	4,905
Alberta	1,800	14,240	13,005	29,045
British Columbia	310	6,815	8,190	15,315
Yukon	35	65	85	190
N.W.T.	20	110	180	310
Canada	38,405	51,340	55,630	145,375

Note: numbers have been rounded to the nearest five.

5.3 Sample Design

A one-phase stratified sample was designed for this survey and, based on the budget allocated for the survey, a total sample of 30,000 respondents was targeted. The major goal of the design was ensuring, when possible, that domains of interest to analysts would be well represented in the survey while remaining within the constraints of the budget. Among other things, analysts will be interested in estimating counts, proportions, means and medians (e.g., age, training duration, salary) within each domain of interest. Within each jurisdiction, domains of interest are the status of the apprentice at time of collection (the final status) and the seven major trade groups as established in the Registered Apprentice Information System (RAIS). At the national level, red seal trades (there are 45 red seal trades) and gender were also domains of interest. As women represent a very small proportion of all apprentices, it would not be possible to compute estimates by gender within all provincial/territorial domains, whereas it would be possible at the national level.

5.3.1 Stratification and Selection

As estimates are required by jurisdiction, apprentice status and major trade group, the frame is stratified using these three domains (variables). The 12 jurisdictions (10 provinces and 2 territories) consist of the first stratification level. Then, within each jurisdiction, the frame is stratified by the three targeted status groups for this survey: long-term continuers, completers and discontinuers. The status of the apprentices on the frame (which will, from now on, be referred to as the frame status) is used for stratification. It represents the status of the apprentices, as of December 31st 2004, as indicated by the reporting province. However, the status of the apprentices at the time of collection (in 2007), which is referred to as the final status, is the status of interest for this survey. It is expected that many apprentices would have a different final status in comparison to their frame status. These differences could be due to frame errors or, more probably, to real changes of status between 2004 and 2007. This issue will need to be taken into account when allocating the sample. Finally, within each jurisdiction and frame status, the frame is stratified by the seven main trade groups. While this stratification could have resulted in $12 \times 3 \times 7 = 252$ strata, in fact the result is 231 strata as some of these main trade groups are not represented in some jurisdictions.

As well, it was indicated that estimations are desired at the national level by Red Seal and for women. Other level of explicit strata could have been created using these two variables but, since the number of apprentices is very small in many Red Seal trades and

for women within the main strata, it was decided to use an implicit stratification by Red Seal and by gender. Instead of adding another level of stratification, the list of apprentices would be sorted by Red Seal and Gender within each explicit stratum then a systematic sample of apprentices is selected within each explicit stratum. This approach ensures having a good representation of all Red Seal trades and both Genders in the sample. Creating explicit strata at that level would have led to very small strata that could potentially create problems at the estimation stage of the survey (weighting and variance estimation). Also, concerning gender, women are of a particular interest as they are a rare population among apprentices. However, they are concentrated in a few trade groups and it was expected that these trade groups would be well-represented in the sample using the explicit stratification. In summary the stratification is as follows (between parentheses is the number of categories for each variable):

Explicit Stratification: Province/territory (12) x Frame Status (3) x Main Trade Group (7)
Implicit Stratification: Red Seal (45) and Gender (2)

5.3.2 Sample Allocation

The targeted sample of 30,000 respondents was allocated to the explicit strata in order to reach a minimum precision for all domains of interest. No specific precision was indicated by the clients. Therefore, it was suggested to aim for a CV of 33.3% for an estimated proportion of 10% in as many strata as possible. This corresponds approximately to a CV of 16.6% for an estimated proportion of 25%. However, in large provinces the precision of estimates within each stratum is expected to be much greater than that. The sample was allocated in four steps:

- i. Allocation by final status (expected status at time of collection)
- ii. Allocation by frame status
- iii. Allocation at the stratum level
- iv. Adjustments for tracing and response rates

i. Allocation by final status

Analysts were interested in the status of apprentices at the time of the interview (final status) and not really in the status of apprentices on the frame. As well, they have indicated that they would like to have a higher proportion of completers, followed by discontinuers and a smaller proportion of long-term continuers. The distribution 20-50-30 (20% of long-term continuers, 50% of completers and 30% of discontinuers) by final status was targeted for this survey.

ii. Allocation by frame status

As the sample is stratified by the frame status and not the final status, some calculation had to be made in order to meet the 20-50-30 distribution by final status requirement. This calculation needed to take into account the expected status change rates as well as the expected response rates by status. Table 5.2 shows the expected status change rates as estimated using the Registered Apprenticeship Information System (RAIS) data.

Table 5.2 Expected change rates of the status of apprentices between frame and collection (based on RAIS data)

Frame Status	Final Status (at time of collection)		
	Long-term Continuer	Completer	Discontinuer
Long-term Continuer	70.0 %	10.0%	20.0%
Completer	0.1%	99.9%	0.0%
Discontinuer	10.1%	1.3%	88.6%

It is expected that almost all completers on the frame will still be considered completers at time of collection, but it is expected that a proportion of long-term continuers and discontinuers on the frame will change status at time of collection. For example, it is expected that 10% of the long-term continuers will have completed their apprenticeship program at time of collection, whereas 20% of them will have discontinued.

The response rates are expected to vary between apprentice status and it has to be taken into account when distributing the sample by status. These response rates are presented in step (iv). After all the calculations, the distribution of 20-50-30 based on the final status means that a distribution of approximately 19-37-44 is needed based on the frame status. That is the raw sample should contain 19% of long-term continuers, 37% of completers and 44% of discontinuers.

iii. Allocation at the stratum level

The next step of the allocation consists of allocating the sample of 30,000 respondents using a proportional allocation based on the population count by stratum, but by making sure to allocate a minimum number of cases within each stratum in order to meet the requirement in terms of precision. Note that in many strata, there were not enough apprentices in order to reach the calculated minimum number of cases, and consequently, all cases were selected in the sample in these strata (take-all strata). Also, it was observed that overall sampling fractions were very high (over 75%) in some combinations of province and frame status. For simplicity, it was decided to set these groups of strata to take-all strata. Therefore, all apprentices on the frame for the following jurisdictions and frame statuses were selected in the sample (i.e., census of apprentices):

Long-term continuers:	Prince Edward Island, Nova Scotia, New Brunswick, Manitoba, Saskatchewan, British Columbia, Yukon, Northwest Territories
Completers:	Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Yukon, Northwest Territories
Discontinuers:	Prince Edward Island, Nova Scotia, New Brunswick, Manitoba, Saskatchewan, Yukon, Northwest Territories

iv. Adjustments for expected response rates

In order to reach the targeted number of respondents presented in the previous section, the sample needed to be inflated to take into account the expected out-of-scope and response rates. Using the 1995 National Apprenticed Trades Survey (NATS) results as a guideline, completion rates of 60% for completers and 31% for discontinuers were assumed. The completion rate represents the expected number of respondents divided by the raw sample selected. The non-completed portion of the sample is made of the usual type of nonrespondents (refusals, untraced, no contact, etc.) as well as those persons that are out-of-scope for the survey (never been apprentices or were not apprentices within the targeted reference period for the survey). Long-term continuers were not surveyed in the 1995 survey, and it was decided to assume the same completion rate as for completers (60%).

5.3.3 Sample Size

Following the allocation strategy described in Section 5.3.2, Table 5.3a shows the total number of cases allocated by jurisdictions and frame status (sample size at collection), and Table 5.3b shows the expected number of respondents.

Table 5.3a Collection Sample Size by Jurisdiction and Frame Status

Jurisdictions	Long-term Continuers	Completers	Discontinuers	Total
Newfoundland and Labrador	1,435	545	1,965	3,945
P.E.I.	5	315	45	370
Nova Scotia	730	1,245	1,110	3,085
New Brunswick	365	1,300	1,295	2,960
Quebec	2,855	3,180	4,820	10,850
Ontario	4,510	5,635	5,620	15,760
Manitoba	530	1,335	1,635	3,500
Saskatchewan	510	1,410	2,005	3,925
Alberta	1,080	5,515	5,305	11,900
British Columbia	310	3,035	3,770	7,110
Yukon	35	65	85	190
N.W.T.	20	110	180	310
Canada	12,375	23,700	27,830	63,905

Notes:

1. The grey shading represents a take-all cell.
2. Numbers have been rounded to the nearest five.

Table 5.3b Expected Number of Respondents by Jurisdiction and Frame Status

Jurisdictions	Long-term Continuers	Completers	Discontinuers	Total
Newfoundland and Labrador	600	410	600	1,610
P.E.I.	0	195	15	215
Nova Scotia	340	800	395	1,535
New Brunswick	200	810	400	1,410
Quebec	1,345	2,095	1,660	5,100
Ontario	2,055	3,645	2,065	7,765
Manitoba	275	835	515	1,625
Saskatchewan	275	885	615	1,775
Alberta	625	3,385	1,585	5,595
British Columbia	245	1,835	1,070	3,150
Yukon	20	40	30	90
N.W.T.	15	65	50	130
Canada	6,000	15,000	9,000	30,000

Note: numbers have been rounded to the nearest five.

5.3.4 Additional Sample

A much higher than expected out of scope rate was observed in some strata during the first half of collection. There were 4 major strata affected:

- Discontinuers in Newfoundland and Labrador
- Long-term Continuers in Newfoundland and Labrador
- Long-term Continuers in Quebec
- Long-term Continuers in Ontario

Consequently, it was decided to add sample to make up for the expected loss of respondents compared to the number expected before collection. This increase resulted in Newfoundland and Labrador discontinuers being a take all stratum. The overall collection sample size increased by 3,935 and our expected distribution of respondents became slightly less than initial expectations. Note that we would have needed to add approximately 1,000 more cases to Ontario long term continuers but, this was not feasible due to operational reasons. Table 5.4 shows the total collection sample after this addition.

Table 5.4 Adjusted Collection Sample Size by Jurisdiction and Frame Status

Jurisdictions	Long-term Continuers	Completers	Discontinuers	Total
Newfoundland and Labrador	1,825	545	2,255	4,625
P.E.I.	0	315	45	365
Nova Scotia	730	1,245	1,110	3,085
New Brunswick	365	1,300	1,295	2,960
Quebec	3,615	3,180	4,820	11,610
Ontario	7,010	5,635	5,620	18,260
Manitoba	530	1,335	1,635	3,500
Saskatchewan	510	1,410	2,005	3,925
Alberta	1,080	5,515	5,305	11,900
British Columbia	310	3,035	3,770	7,110
Yukon	35	65	85	190
N.W.T.	20	110	180	310
Canada	16,020	23,700	28,120	67,840

Note: numbers have been rounded to the nearest five.

Note that a small number of cases were not sent into collection as no contact information was available on the frame for these cases.

6.0 Data Collection

Data for the National Apprenticeship Survey was collected by regional office staff during the period from January to May 2007 using computer assisted telephone interviews (CATI). These regional offices are located in Edmonton, Winnipeg, Toronto, Sturgeon Falls, Sherbrooke and Halifax. Before collection, representatives from Statistics Canada made subject matter training presentations to regional office staff. They also monitored interviews during the beginning of collection. Please also see 8.2.2.

7.0 Data Processing

The main output of the NAS is a “clean” microdata file. It should be noted that there is no “Public Use” Microdata Files (PUMF) produced for this survey. This chapter presents a brief summary of the processing steps involved in producing this file.

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. From each of the Statistics Canada Regional Offices, the response data are transmitted over a secure line to Statistics Canada Head Office in Ottawa for further processing.

Some editing is done directly at the time of the interview. Where the information entered is out of range (too large or small) of expected values, or inconsistent with the previous entries, the interviewer is prompted, through message screens on the computer, to modify the information. However, for some questions interviewers have the option of bypassing the edits, and of skipping questions if the respondent does not know the answer or refuses to answer. Therefore, the response data are subjected to further edit and imputation processes once they arrive in head office.

7.2 Editing

The first stage of survey processing undertaken at head office was the replacement of any “out-of-range” values on the data file with blanks. This process was designed to make further editing easier.

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 Open-ended Questions

A few data items on the questionnaire were recorded by interviewers in an open-ended format. These written responses of apprentices were later manually coded by Statistics Canada's head office staff.

7.4 Imputation

Imputation is the process that supplies valid values for those variables that have been identified for a change either because of invalid information or because of missing information. The new values are supplied in such a way as to preserve the underlying structure of the data and to ensure that the resulting records will pass all required edits. In other words, the objective is not to reproduce the true microdata values, but rather to establish internally consistent data records that yield good aggregate estimates.

We can distinguish between three types of non-response. Complete non-response is when the respondent does not provide the minimum set of answers. These records are dropped and accounted for in the weighting process (see Chapter 11.0). Item non-response is when the respondent does not provide an answer to one question, but goes on to the next question. These are usually handled using the "not stated" code or are imputed. Finally, partial non-response is when the respondent provides the minimum set of answers but does not finish the interview. These records can be handled like either complete non-response or multiple item non-response.

In the case of the NAS, donor imputation was used to fill in missing data for item and partial non-response. Further information on the imputation process is given in Chapter 8.0 (Data Quality).

7.5 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. Please see attached document.

7.6 Weighting

The principle behind estimation in a probability sample such as the NAS 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 full-time at time of collection in 2007 is to be estimated, it is done by selecting the records referring to those individuals in the sample with that characteristic and summing the weights entered on those records.

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

8.0 Data Quality

8.1 Response Rates

This chapter presents the response rates for the National Apprenticeship Survey of 2007. Survey response rates are measures of the effectiveness of the population being sampled and the collection process. They are also a good indicator of the quality of the estimates produced.

In-scope records are records that met all criteria in the target population as defined in Section 5.1. It should be noted that a high proportion of the sample was found to be out-of-scope for this survey. A respondent is a person for whom there is usable minimal information on the questionnaire. Cases where the apprentices did not go far enough in the questionnaire or where crucial questions were not answered, were deemed non-responding units. An unresolved apprentice is a person for whom the in-scope status could not be determined (mostly all nonrespondents).

Table 8.1 presents the response rates for the NAS 2007. The following two types of response rates are presented in that table:

Response rate at collection =

$$\frac{\text{Number of responding apprentices}}{\text{Number of in-scope apprentices at collection}}$$

Where, Number of in-scope apprentices at collection =
Number of resolved in-scope apprentices + Number of unresolved apprentices

Response rate at estimation =

$$\frac{\text{Number of responding apprentices}}{\text{Estimated number of in-scope apprentices}}$$

Where, Estimated number of in-scope apprentices =
Number of resolved in-scope apprentices +
Estimated number in-scope apprentices from unresolved apprentices

To estimate the number of in-scope apprentices from the unresolved apprentices, a logistic regression model was fitted over all resolved units (in-scope and out-of-scope) using their characteristics on the frame. Using this model, the scope status of each unresolved unit was predicted and all predicted in-scope units made up for the estimated number of in-scope apprentices from the unresolved apprentices.

Table 8.1 Response Rates by Province / Territory and Frame Status for the NAS 2007

Jurisdictions by Frame Status	Total Sample Size	In-scope at Collection	Responding Apprentices	Response Rate at collection	Response Rate at estimation
Newfoundland and Labrador	4,624	3,588	1,531	42.7%	57.0%
Long-term Continuers	1,826	1,409	652	46.3%	57.3%
Completers	544	514	365	71.0%	72.1%
Discontinuers	2,254	1,665	514	30.9%	49.3%
Prince Edward Island	364	293	201	68.6%	75.0%
Long-term Continuers	2	1	1	100.0%	100.0%
Completers	317	255	178	69.8%	76.7%
Discontinuers	45	37	22	59.5%	62.9%
Nova Scotia	3,084	2,487	1,818	73.1%	78.5%
Long-term Continuers	729	602	467	77.6%	80.8%
Completers	1,247	1,153	912	79.1%	80.5%
Discontinuers	1,108	732	439	60.0%	72.7%
New Brunswick	2,960	2,561	1,696	66.2%	72.0%
Long-term Continuers	364	345	228	66.1%	67.5%
Completers	1,302	1,249	985	78.9%	79.6%
Discontinuers	1,294	967	483	49.9%	61.9%
Quebec	11,612	9,205	5,815	63.2%	70.3%
Long-term Continuers	3,614	2,765	1,934	69.9%	75.9%
Completers	3,179	2,879	2,088	72.5%	74.5%
Discontinuers	4,819	3,561	1,793	50.4%	61.2%
Ontario	18,261	14,707	7,237	49.2%	61.3%
Long-term Continuers	7,010	4,959	1,804	36.4%	55.0%
Completers	5,633	5,303	3,647	68.8%	70.5%
Discontinuers	5,618	4,445	1,786	40.2%	53.1%
Manitoba	3,500	3,016	1,758	58.3%	65.4%
Long-term Continuers	528	448	279	62.3%	67.2%
Completers	1,336	1,285	922	71.8%	72.8%
Discontinuers	1,636	1,283	557	43.4%	55.3%
Saskatchewan	3,925	3,479	1,918	55.1%	61.1%
Long-term Continuers	509	461	284	61.6%	64.8%
Completers	1,412	1,358	916	67.5%	68.5%
Discontinuers	2,004	1,660	718	43.3%	52.6%
Alberta	11,900	10,894	5,534	50.8%	56.5%
Long-term Continuers	1,079	1,044	700	67.0%	68.0%
Completers	5,517	5,334	3,333	62.5%	63.6%
Discontinuers	5,304	4,516	1,501	33.2%	42.5%
British Columbia	7,112	6,243	2,860	45.8%	53.8%
Long-term Continuers	309	291	149	51.2%	53.8%
Completers	3,033	2,866	1,708	59.6%	61.7%
Discontinuers	3,770	3,086	1,003	32.5%	44.2%
Yukon	189	177	78	44.1%	48.8%
Long-term Continuers	35	33	13	39.4%	48.1%
Completers	67	66	40	60.6%	60.6%
Discontinuers	87	78	25	32.1%	37.3%
Northwest Territories	310	295	126	42.7%	46.5%
Long-term Continuers	19	18	4	22.2%	26.7%
Completers	112	110	63	57.3%	57.8%
Discontinuers	179	167	59	35.3%	40.1%
Canada	67,841	56,945	30,572	53.7%	62.3%
Long-term Continuers	16,024	12,376	6,515	52.6%	64.6%
Completers	23,699	22,372	15,157	67.7%	69.3%
Discontinuers	28,118	22,197	8,900	40.1%	51.9%

8.2 Survey Errors

The estimates derived from this survey are based on a sample of apprentices. 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, observation of interviewers to detect problems of questionnaire design or misunderstanding of instructions, 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

As indicated in Section 5.2, the sampling frame is based on lists of registered apprentices provided by the provincial and territorial jurisdictions for the targeted reference years. The quality of the frame was evaluated upon reception as well as after collection.

The availability of the contact information on the frame was very good. Only a very small number of apprentices did not have any useful contact information. If these cases were selected in the sample, they were not sent to collection but they were treated as nonrespondents and accounted in the survey weights.

There is an important coverage difference for Quebec in comparison to other provinces. In Quebec, almost only the construction trades are represented on the NAS frame. The list of apprentices for the construction trades was provided by “la Commission de construction du Québec” (CCQ). Emploi-Québec (EQ) provided a list for 4 non-construction trades but this list was incomplete (no completers for 3 of the 4 trades). Therefore, only one trade (industrial electrician) was kept on the NAS frame from the EQ list of apprentices. Therefore, comparisons of estimates between the province of Quebec and other provinces should be avoided unless the comparison is made with similar trades.

The coverage of the frame was also evaluated by comparing with the Registered Apprentices Information Survey (RAIS) database. Some differences were found but only a few can be classified into coverage issues. First, it is believed that there is a undercoverage of continuers (and consequently long-term continuers) for P.E.I.. As well, there is a possible undercoverage for Alberta as we found significantly more registered apprentices in the RAIS database than on the list of apprentices provided by Alberta. The number of long-term continuers for Quebec and Ontario is believed to be overestimated on the NAS frame as there is abnormally a high number of apprentices active in 2004 (continuers) that registered more than 10 years ago.

At the collection stage, there was one major issue concerning the quality of the frame. A much higher number of apprentices than expected were found to be out-of-scope for this survey. They were out-of-scope because they said they never been an apprentice or they had been an apprentice but not within the targeted reference years. Table 8.2 shows the out-of-scope rates observed at collection (calculated from resolved units only).

Table 8.2 Out-of-scope Rates by Jurisdiction and Frame Status

Frame jurisdiction	Long-term Continuers	Completers	Discontinuers	Total
Newfoundland and Labrador	38.5%	7.5%	52.8%	39.9%
Prince Edward Island	NA	25.8%	26.7%	26.1%
Nova Scotia	21.3%	9.3%	45.9%	24.6%
New Brunswick	7.6%	5.0%	40.0%	18.8%
Quebec	30.1%	12.4%	40.2%	28.7%
Ontario	52.4%	8.2%	39.0%	32.5%
Manitoba	22.0%	5.1%	38.1%	21.2%
Saskatchewan	14.1%	5.5%	31.9%	18.6%
Alberta	4.7%	5.1%	33.8%	15.2%
British Columbia	10.6%	8.8%	40.0%	23.1%
Yukon	13.3%	2.4%	25.7%	13.2%
Northwest Territories	20.0%	3.0%	16.2%	10.3%
Canada	35.0%	7.8%	39.3%	25.7%

8.2.2 Data Collection

Interviewer training consisted of reading the NAS Supervisor's Manual, Procedures Manual and Interviewer's Manual, practicing with the NAS Frequently Asked Questions and Answers as well as training cases on the computer, 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. The collection period ran from January to May of 2007.

8.2.3 Data Processing

Data processing of the NAS was done in a number of steps including verification, coding, editing, imputation, estimation, confidentiality, etc. At each step a picture of the output files is taken and an easy verification can be made comparing files at the current and previous step. This greatly improved the data processing stage.

8.2.4 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, no member of the household was able to provide the information, or the respondent refused to participate in the survey. Total non-response was handled by adjusting the weight 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. In partial and item non-response cases, donor imputation was

performed for certain variables. The variables imputed were the wages and salaries related variables of the Labour Force (LF) and Most Recent Job (MR) modules.

All imputation involved donors that were selected using a score function. For each item non-response or partial non-response records (also called recipient records), we compared certain characteristics to characteristics from all the donors. When the characteristics were the same between a donor and the recipient, a value was added to the score of that donor. The donor with the highest score was deemed the “closest” donor and was chosen to fill in missing pieces of information of the non-respondents. If there was more than one donor with the highest score, a random selection occurred. The pool of donors was made up in such a way that the imputed value assigned to the recipient, in conjunction with other non-imputed items from the recipient would still pass the edits.

Table 8.3 shows the variables imputed in the LF and MR modules as well as the imputation rate.

Table 8.3 LF and MR variables imputed and Imputation rates

Variable	# of records Inscope	# of records Imputed	% imputed
LFQ60	20,573	210	1.0%
LFQ62	20,573	101	0.5%
LFQ63	20,573	59	0.3%
LFQ64	20,573	302	1.5%
LFQ66	20,558	1,745	8.5%
LFQ67	20,558	4	0.0%
LFQ68	20,558	913	4.5%
LFQ69	20,558	832	4.0%
MRQ60	2,018	49	2.4%
MRQ62	2,018	20	1.0%
MRQ63	2,018	20	1.0%
MRQ64	2,018	43	2.1%
MRQ66	2,018	147	7.3%
MRQ67	2,018	3	0.1%
MRQ68	2,018	65	3.4%
MRQ69	2,018	82	3.9%

In addition, 4 derived variables are using these imputed variables. The calculation of the hourly wage for the job held on the week prior to the interview (HRLYWLF) and the calculation of the annual earnings from the job held in the week prior to the interview (JOBINCLF) uses the LF variables listed above while the calculation of the hourly wage for the most recent job (HRLYWMR) and the calculation of the annual earnings from the most recent job (JOBINCMR) uses the MR variables listed above. For more information on these derived variables, please refer to section 14.

The NAS imputation process worked well and helped to fill incomplete responses with the experience of other respondents with similar or identical characteristics. This will add to the number of units used in any analysis performed by researchers.

8.2.5 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 survey results, one estimates that 10.3% of completers and discontinuers are without a job and looking for a job and this estimate is found to have a standard error of 0.0016. Then the coefficient of variation of the estimate is calculated as:

$$\left(\frac{0.0016}{0.103} \right) \times 100 \% = 1.6 \%$$

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, analyzing, 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 NAS was not self-weighting. When producing simple estimates including the production of ordinary statistical tables, users must apply the proper survey weights.

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.

9.3 Definitions of Types of Estimates: Categorical and Quantitative

Before discussing how the NAS data can be tabulated and analyzed, it is useful to describe the two main types of point estimates of population characteristics which can be generated from the microdata file for the NAS.

9.3.1 Categorical Estimates

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 persons who have a Certificate of Qualification or the proportion of working persons that are self-employed 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: Do you have a Certificate of Qualification as a < name of trade >?
R: Yes / No

Q: At your job last week, were you a paid worker or self-employed?
R: Paid worker / Self-employed / Unpaid family worker

9.3.2 Quantitative Estimates

Quantitative estimates are estimates of totals or of means, medians and other measures of central tendency of quantities based upon some or all of the members of the surveyed population. They also specifically involve estimates of the form \hat{X} / \hat{Y} where \hat{X} is an estimate of surveyed population quantity total and \hat{Y} is an estimate of the number of persons in the surveyed population contributing to that total quantity.

An example of a quantitative estimate is the average number of hours a week usually worked at their job. The numerator is an estimate of the total number of hours a week usually worked and its denominator is the number of persons that had a job last week.

Examples of Quantitative Questions:

Q: How many hours a week do you usually work at this job?

R: |_|_|_| hours

Q: How many times did you write the Certificate of Qualification exam?

R: |_|_| attempts

9.3.3 *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:

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

9.3.4 *Tabulation of Quantitative Estimates*

Estimates of quantities can be obtained from the microdata file by multiplying the value of the variable of interest by the final weight for each record, then summing this quantity over all records of interest. For example, to obtain an estimate of the total number of hours a week usually worked at their job, multiply the value reported in LFQ64 by the final weight for the record, then sum this value over all records with LFQ64 <= 130 (have answered this question).

To obtain a weighted average of the form \hat{X} / \hat{Y} , the numerator (\hat{X}) is calculated as for a quantitative estimate and the denominator (\hat{Y}) is calculated as for a categorical estimate. For example, to estimate the average number of hours a week usually worked at their job,

- estimate the total number of hours (\hat{X}) as described above,
- estimate the number of persons (\hat{Y}) in this category by summing the final weights of all records with LFQ64 <= 130, then
- divide estimate a) by estimate b) (\hat{X} / \hat{Y}).

9.4 *Guidelines for Statistical Analysis*

The NAS is based upon a complex sample design, with stratification, multiple stages of selection, and unequal probabilities of selection of respondents. 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 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 weight divided by the AVERAGE weight;
- 4) perform the analysis for these respondents using the RESCALED weight.

However, because the stratification and clustering 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 estimates from the NAS, 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. If this number is less than 5, the weighted estimate should be considered to be of unacceptable quality.

For weighted estimates based on sample sizes of 5 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 rounded weighted 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	<p>Estimates have a sample size of 5 or more, and low coefficients of variation in the range of 0.0% to 16.5%.</p> <p>No warning is required.</p>
2) Marginal	<p>Estimates have a sample size of 5 or more, and high coefficients of variation in the range of 16.6% to 33.3%.</p> <p>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.</p>
3) Unacceptable	<p>Estimates have a sample size of less than 5, or very high coefficients of variation in excess of 33.3%.</p> <p>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:</p> <p>“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.”</p>

9.6 Release Cut-off's for the NAS

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 presented 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 40 people possessing a given characteristic in Newfoundland and Labrador 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 explain the correct procedure to be used for ratios.

Province/Territory (FR_PROV)	Acceptable CV 0.0% to 16.5%	Marginal CV 16.6% to 33.3%	Unacceptable CV > 33.3%
Newfoundland and Labrador	55 & over	15 to < 55	under 15
Prince Edward Island	20 & over	5 to < 20	under 5
Nova Scotia	15 & over	5 to < 15	under 5
New Brunswick	20 & over	5 to < 20	under 5
Quebec	130 & over	35 to < 130	under 35
Ontario	145 & over	35 to < 145	under 35
Manitoba	40 & over	10 to < 40	under 10
Saskatchewan	45 & over	15 to < 45	under 15
Alberta	150 & over	40 to < 150	under 40
British Columbia	130 & over	35 to < 130	under 35
Yukon	40 & over	15 to < 40	under 15
Northwest Territories	50 & over	15 to < 50	under 15
Canada	125 & over	35 to < 125	under 35

Status of apprentice in 2007 (STAT07)	Acceptable CV 0.0% to 16.5%	Marginal CV 16.6% to 33.3%	Unacceptable CV > 33.3%
Long-term Continuer	140 & over	35 to < 140	under 35
Completer	110 & over	30 to < 110	under 30
Discontinuer	140 & over	35 to < 140	under 35

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 and the adjustment for nonresponse. 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 province which were used to produce the Approximate Sampling Variability Tables for the NAS.

Province/Territory (FR_PROV)	Design Effect	Sample Size	Population
Newfoundland and Labrador	1.43	1,531	3,077
Prince Edward Island	1.35	201	268
Nova Scotia	1.08	1,818	2,363
New Brunswick	1.20	1,696	2,350
Quebec	1.18	5,815	22,919
Ontario	1.17	7,237	31,272
Manitoba	1.14	1,758	3,447
Saskatchewan	1.15	1,918	3,908
Alberta	1.23	5,534	23,936
British Columbia	1.22	2,860	11,078
Yukon	1.22	78	169
Northwest Territories	1.35	126	269
Canada	1.40	30,572	105,057

Status of apprentice in 2007 (STAT07)	Design Effect	Sample Size	Population
Long-term Continuer	1.39	7,581	28,242
Completer	1.33	18,318	59,302
Discontinuer	1.39	4,673	17,714

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 5, 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 Approximate 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.

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

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.

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 the proportion of working persons that are self-employed is more reliable than the estimated number of self-employed persons. (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 a particular sex or age group), 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.

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 ($\hat{d} = \hat{X}_1 - \hat{X}_2$) is:

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

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.

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 working persons and the numerator is the number of self-employed persons.

In the case where the numerator is not a subset of the denominator, as for example, the ratio of the number of self-employed males as compared to the number of self-employed females, 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 ($\hat{R} = \hat{X}_1 / \hat{X}_2$) 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.

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 NAS are included to assist users in applying the foregoing rules.

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

Suppose that a user estimates that 18,077 apprentices had difficulty finding an employer who was taking on apprentices when starting their program. 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 (18,077) 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 20,000.
- 3) The coefficient of variation for an estimated aggregate is found by referring to the first non-asterisk entry on that row, namely, 1.2%.
- 4) So the approximate coefficient of variation of the estimate is 1.2%. The finding that there were 18,077 (to be rounded according to the rounding guidelines in Section 9.1) apprentices who had difficulty finding an employer who was taking on apprentices when starting their program is publishable with no qualifications.

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

Suppose that the user estimates that $6,445 / 18,077 = 35.7\%$ of apprentices who had difficulty finding an employer when starting their program, reported the main reason to be that there was no work in the trade at that time. How does the user determine the coefficient of variation of this estimate?

- 1) Refer to the coefficient of variation table for CANADA.
- 2) Because the estimate is a percentage which is based on a subset of the total population (i.e., apprentices with difficulty finding an employer), it is necessary to use both the percentage (35.7%) and the numerator portion of the percentage (6,445) in determining the coefficient of variation.
- 3) The numerator, 6,445, 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 5,000. 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%.
- 4) The figure at the intersection of the row and column used, namely 2.1% is the coefficient of variation to be used.
- 5) So the approximate coefficient of variation of the estimate is 2.1%. The finding that 35.7% of apprentices who had difficulty finding an employer reported the main reason to be that there was no work in the trade at that time can be published with no qualifications.

Example 3: Estimates of Differences Between Aggregates or Percentages

Suppose that a user estimates that $6,080 / 16,848 = 36.1\%$ of male apprentices who had difficulty finding an employer when starting their program, reported the main reason to be that there was no work in the trade at that time, while $364 / 1,229 = 29.6\%$ of female apprentices who had difficulty finding an employer when starting their program, reported the main reason to be that there was no work in the trade at that time. How does the user determine the coefficient of variation of the difference between these two estimates?

- 1) Using the CANADA coefficient of variation table in the same manner as described in Example 2 gives the CV of the estimate for men as 2.1%, and the CV of the estimate for women as 7.7%.
- 2) Using Rule 3, the standard error of a difference ($\hat{d} = \hat{X}_1 - \hat{X}_2$) is:

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

where \hat{X}_1 is estimate 1 (women), \hat{X}_2 is estimate 2 (men), 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 $\hat{d} = 0.361 - 0.296 = 0.065$ is:

$$\begin{aligned}\sigma_{\hat{d}} &= \sqrt{[(0.361)(0.021)]^2 + [(0.296)(0.077)]^2} \\ &= \sqrt{(0.000575) + (0.000519)} \\ &= 0.024\end{aligned}$$

- 3) The coefficient of variation of \hat{d} is given by $\sigma_{\hat{d}} / \hat{d} = 0.024 / 0.065 = 0.369$
- 4) So the approximate coefficient of variation of the difference between the estimates is 36.9%. The difference between the estimates is considered unacceptable and Statistics Canada recommends this estimate not be released. However, should the user choose to do so, the estimate should be flagged with the letter U (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 2,319 males apprentices received training to become a cook, while 1,136 females apprentices received training to become a cook. The user is interested in comparing the estimate of men versus women 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 (\hat{X}_1) is the number of males apprentices who received training to become a cook. The denominator of the estimate (\hat{X}_2) is the number of females apprentices who received training to become a cook.
- 2) Refer to the coefficient of variation table for CANADA.
- 3) The numerator of this ratio estimate is 2,319. The figure closest to it is 2,500. The coefficient of variation for this estimate is found by referring to the first non-asterisk entry on that row, namely, 3.6%.
- 4) The denominator of this ratio estimate is 1,136. The figure closest to it is 1,000. The coefficient of variation for this estimate is found by referring to the first non-asterisk entry on that row, namely, 5.8%
- 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:

- 6) The obtained ratio of males apprentices versus females apprentices who received training to become a cook is 2,319 / 1,136 which is 2.03 (to be rounded according to the rounding guidelines in Section 9.1). The coefficient of variation of this estimate is 6.8%, which makes the estimate releasable with no qualifications.

Example 5: Estimates of Differences of Ratios

Suppose that the user estimates that the ratio of males apprentices received training to become a cook, to females apprentices received training to become a cook is 1.73 for Ontario while it is 2.62 for Alberta. The user is interested in comparing the two ratios to see if there is a statistical difference between them. How does the user determine the coefficient of variation of the difference?

- 1) First calculate the approximate coefficient of variation for the Ontario ratio (\hat{R}_1) and the Alberta ratio (\hat{R}_2) as in Example 4. The approximate CV for the Ontario ratio is 10.7% and 17.6% for Alberta.
- 2) Using Rule 3, the standard error of a difference ($\hat{d} = \hat{R}_1 - \hat{R}_2$) is:

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

where α_1 and α_2 are the coefficients of variation of \hat{R}_1 and \hat{R}_2 respectively. That is, the standard error of the difference $\hat{d} = 1.73 - 2.62 = -0.89$ is:

$$\begin{aligned}\sigma_{\hat{d}} &= \sqrt{[(1.73)(0.107)]^2 + [(2.62)(0.176)]^2} \\ &= \sqrt{(0.0343) + (0.2126)} \\ &= 0.497\end{aligned}$$

- 3) The coefficient of variation of \hat{d} is given by $\sigma_{\hat{d}} / \hat{d} = 0.497 / (-0.89) = -0.558$.
- 4) So the approximate coefficient of variation of the difference between the estimates is 55.8%. The difference between the estimates is considered unacceptable and Statistics Canada recommends this estimate not be released. However, should the user choose to do so, the estimate should be flagged with the letter U (or some similar identifier) and be accompanied by a warning to caution subsequent users about the high levels of error, associated with the estimate.

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 difference 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 $(\hat{X} - k, \hat{X} + k)$ 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 ($CI_{\hat{x}}$):

$$CI_{\hat{x}} = (\hat{X} - t\hat{X}\alpha_{\hat{x}}, \hat{X} + t\hat{X}\alpha_{\hat{x}})$$

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 apprentices having difficulty finding an employer who reported the main reason to be that there was no work in the trade at that time, (from Example 2, Section 10.1.1) would be calculated as follows:

$$\hat{X} = 35.7\% \text{ (or expressed as a proportion } 0.357)$$

$$t = 2$$

$\alpha_{\hat{x}} = 2.1\%$ (0.021 expressed as a proportion) is the coefficient of variation of this estimate as determined from the tables.

$$CI_{\hat{x}} = \{0.357 - (2) (0.357) (0.021), 0.357 + (2) (0.357) (0.021)\}$$

$$CI_{\hat{x}} = \{0.357 - 0.015, 0.357 + 0.015\}$$

$$CI_{\hat{x}} = \{0.342, 0.372\}$$

With 95% confidence it can be said that between 34.2% and 37.2% of apprentices who had difficulty finding an employer when starting their program, reported the main reason to be that there was no work in the trade at that time.

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 $t = \frac{\hat{X}_1 - \hat{X}_2}{\sigma_{\hat{d}}}$ 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 male apprentices having difficulty

finding an employer who reported the main reason to be that there was no work in the trade at that time and the proportion of female apprentices having difficulty finding an employer who reported the main reason to be that there was no work in the trade at that time. From Example 3, Section 10.1.1, the standard error of the difference between these two estimates was found to be 0.024. Hence,

$$t = \frac{\hat{X}_1 - \hat{X}_2}{\sigma_{\hat{d}}} = \frac{0.361 - 0.296}{0.024} = \frac{0.065}{0.024} = 2.71$$

Since $t = 2.71$ 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 Coefficients of Variation for Quantitative Estimates

For quantitative estimates, special tables would have to be produced to determine their sampling error. Since most of the variables for the NAS are primarily categorical in nature, this has not been done.

As a general rule, however, the coefficient of variation of a quantitative total will be larger than the coefficient of variation of the corresponding category estimate (i.e., the estimate of the number of persons contributing to the quantitative estimate). If the corresponding category estimate is not releasable, the quantitative estimate will not be either. For example, the coefficient of variation of the total number of attempts to the Certificate of Qualification exam would be greater than the coefficient of variation of the corresponding proportion of persons that have attempted the exam. Hence, if the coefficient of variation of the proportion is unacceptable (making the proportion not releasable), then the coefficient of variation of the corresponding quantitative estimate will also be unacceptable (making the quantitative estimate not releasable).

Coefficients of variation of such estimates can be derived as required for a specific estimate using a technique known as pseudo replication. This involves dividing the records on the microdata files into subgroups (or replicates) and determining the variation in the estimate from replicate to replicate. Users wishing to derive coefficients of variation for quantitative estimates may contact Statistics Canada for advice on the allocation of records to appropriate replicates and the formulae to be used in these calculations.

10.5 Coefficient of Variation Tables

Coefficient of variation (CV) tables were created for: Canada, each of the provinces and each of the three status of apprentices (long-term continuers, completers and discontinuers). Please refer to NAS07_CVTables.pdf for the coefficient of variation tables.

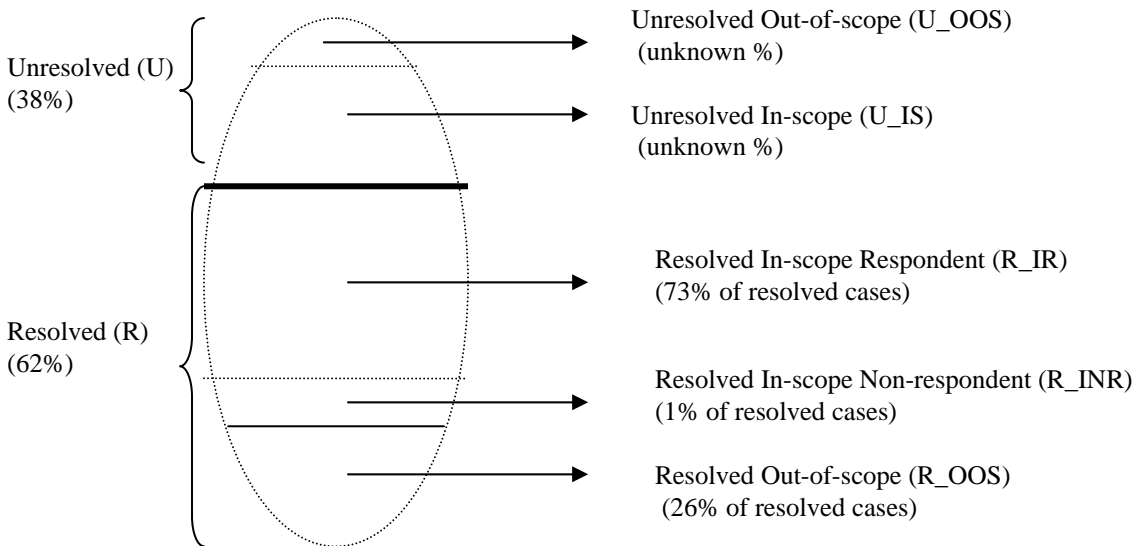
11.0 Weighting

The National Apprenticeship Survey (NAS) is a probability survey. As is the case with any probability survey the sample is selected to represent a reference population - the apprenticeship population - at a specific date within the context of the survey as accurately as possible. Each unit in the sample must therefore represent a certain number of units in the population. If the frame used was perfect (covering exactly the population of interest) and all selected units were traced, contacted and completed the survey, then the design weight assigned to each unit would represent accurately and exactly the number of apprentices in the target population. In this situation, using this weight would yield unbiased estimates. However, this is not the case when surveys are faced with non-response and imperfect frames. Weight adjustments are traditionally used to compensate for these different issues. Response patterns have to be studied carefully to appropriately correct for non-response. It was observed that non-response did not occur randomly or uniformly within the population since different response rates were obtained for different sub-populations. The use of appropriate techniques will correct non-response bias that may be introduced. Similarly, it was observed that the out-of-scope status did not occur randomly within the population and was observed at very high rate as presented in Table 8.2 in Section 8.2.

This section describes how the sampling weights of NAS were calculated. This survey can be viewed as a two-phase sample where the first phase is the sample selection by stratum and the second phase is a combined adjustment for nonresponse and out-of-scope.

The NAS sample can be divided into several groups according to the results of collection (see Diagram 1). First, the sample is divided into resolved (R) and unresolved (U) units. For NAS a resolved unit is one where enough information was obtained during collection to determine whether or not a unit was in-scope or out-of-scope for this survey. All unresolved units are nonrespondents at collection. Then, within each of the two groups, the sample can be divided into in-scope (I) or out-of-scope (OOS). Finally, resolved in-scope units can be divided into respondents (R) or nonrespondents (NR). The resolved units represent 62% of the sample while the unresolved units represent 38%. The unresolved units are comprised of the unresolved in-scope units (U_IS) and the unresolved out-of-scope units (U_OOS) with unknown proportions. The resolved units are comprised of three groups, the resolved in-scope respondents (R_IR) which form 73% of the resolved units, the resolved in-scope non-respondents (R_INR) which form only 1% of the resolved units, and the resolved out-of-scope units (R_OOS) which form 26% of the resolved cases.

Diagram 1



There are several key issues concerning weighting for the NAS. One issue is that we do not know the in-scope/out-of-scope status of the unresolved units. As we know that 26% of the resolved units are out-of-scope, we suspect that a significant proportion of the unresolved units are also out-of-scope. It is also possible that being out-of-scope might be a factor for being unresolved (non-ignorable non-response) but, it is very difficult to assess. As the out-of-scope units are not part of the population of interest, they will not be included in the calculation of survey estimates (total, mean, ratio, etc.). However, they have an impact on the variability of these estimates due to uncertainty of the target population or domain totals.

Therefore, it is important to estimate as accurately as possible the proportion of the unresolved units that are out-of-scope in order that the sum of the weights of the in-scope portion reflects as much as possible the true totals of the target population and domains within it. Another issue is that no known counts of the target population are available, and therefore no calibration to known totals is possible. For all these reasons, the weights were calculated in three steps.

Step 1. Selection weight

At the time of selection, an initial design weight was assigned to each apprentice, as the inverse of its probability of selection. Since the NAS design is stratified with simple random sampling within strata, the probability of selection of the apprentice i in stratum h is:

$$\pi_{ih}^{(1)} = \frac{n_h}{N_h}$$

where, n_h and N_h denote respectively the sample and population size of stratum h .

Therefore, the first phase weight is:

$$w_{ih}^{(1)} = \frac{1}{\pi_{ih}^{(1)}}$$

Step 2. Predict the scope status of the unresolved units by modelling the probability of being in-scope or out-of-scope.

This step consists of calculating the probability of being in-scope (or out-of-scope) for each unresolved unit. Using the resolved cases for which the status was determined as the analysis data, a logistic regression model was built using variables on the frame as explanatory variables (such as province, frame status, trade, registration year, age and sex). Using the probability from the logistic model, the scope status of each unresolved units was predicted. Then, the unresolved units can be divided in two groups: predicted in-scope unresolved (U_PI) and predicted out-of-scope unresolved (U_POOS).

Step 3. Non-response adjustment

After step 2, all cases can be classified as either in-scope or out-of-scope. Therefore, a typical nonresponse adjustment (second phase adjustment) can be applied on the in-scope units only. For that purpose, response homogeneity groups (RHGs) were formed. RHGs are determined through a combination of logistic regression to predict the probability of being a respondent and then using a clustering procedure based on the modelled probability of response.

For apprentice i in RHG g the nonresponse adjustment is:

$$\pi_{ig}^{(2)} = \frac{\sum_i w_{ih}^{(1)} I_{ig}}{\sum_i w_{ih}^{(1)} I_{ig} I_{ir}}$$

Where I_{ig} equal 1 if apprentice i is in-scope and in RHG g ; equal 0 otherwise.

I_{ir} equal 1 if apprentice i is respondent and in RHG g ; equal 0 otherwise.

Therefore, the final weight is:

$$w_i^{(2)} = w_{ih}^{(1)} \times \pi_{ig}^{(2)}$$

Note that for the purpose of variance estimation, RHGs and final weights were also created for out of scope cases.

12.0 National Apprenticeship Survey Questionnaire

Please refer to file "NAS_Quest_E.doc" to see the questionnaire.

13.0 Record Layout with Univariate Frequencies

Please refer to file "NAS_Codebook_E.doc" to see the record layout with univariate counts (codebook).

14.0 Derived variables

Please refer to file "NAS Derived Variables.doc" to see the description of the derived variables.