TAC ATC

Synthesis of Practice

Census Place of Work/ Modal Choice Variables

Transportation Association of Canada
Association des transports du Canada

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Abstract

The publication summarizes best practices for the use of the place of work and modal choice variables collected in the Census of Canada and draws from related experience in this country, the United States and Australia.

The place of work variable provides a means of relating the locations of the census respondent's place of residence and place of work, and how these change over time. The modal choice variable records the usual means of travel to work.

The synthesis of practice describes the two variables and their relationship to the census. The structure of the census questions is described and compared with similar questions from the American and Australian censuses.

Transportation planners, urban planners, policy makers, developers and financial analysts in both the public and private sectors are expected to use the new publication when they consider the location and timing of new transportation infrastructure, land development, investment in new businesses and social and fiscal policies, among other issues.

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Résumé

Cette publication résume les meilleures pratiques d'utilisation desdites variables recueillies à la faveur du Recensement du Canada. Concrètement, la publication s'inspire des expériences en la matière du Canada, des États-Unis et de l'Australie.

La variable concernant le lieu de travail permet d'établir des corrélations entre les lieux de résidence et de travail d'un répondant et de discerner tout changement à ce titre. La variable concernant le choix du mode de transport vise le moyen de déplacement habituellement utilisé pour se rendre au travail.

Cette synthèse des pratiques décrit les deux variables précitées et leurs interrelations avec le processus de recensement. Plus précisément, l'ouvrage analyse la structure des questions ici visées du Recensement du Canada et établit une comparaison avec les questions analogues de recensement utilisées aux États-Unis et en Australie.

Les planificateurs des réseaux de transport, les urbanistes, les décideurs, les développeurs et les analystes financiers des secteurs public et privé trouveront dans cette nouvelle publication de l'information fort utile à plusieurs égards : considérations géographiques et temporelles de l'instauration d'une nouvelle infrastructure de transport, aménagement du territoire, investissements dans de nouvelles entreprises, politiques sociales et fiscales, etc.

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Renseignements supplémentaires

FOREWORD

There is always a delay before the best and most current information is transferred into common use. The practical value of new information results only after dissemination and technology transfer mechanisms enable practitioners to transform that information into knowledge, and then to use that knowledge to solve problems or implement improved practices.

In the transportation sector, working professionals are always faced with problems for which solutions already exist, either in published reports or in the undocumented experience and practice of others working in the field. The volume of information being produced in the world today makes it very difficult to keep apprised on the most current data and practices. In Canada, the sharing of information is further complicated by the decentralized jurisdictional responsibility for transportation and vast geographical distances. The TAC Synthesis of Practice series has been initiated to help alleviate the problem by compiling and disseminating state of the art information on topics of current interest to the Canadian transportation community.

For each topic selected, the project objectives are:

1. To locate and assemble all relevant information on the topic.
2. To identify the most current practices for addressing problems within the scope of the topic.
3. To identify all relevant ongoing research on the topic.
4. To learn what problems remain largely unsolved.
5. To organize, evaluate, synthesize, and document the useful information that is acquired.
6. To evaluate the effectiveness of the synthesis after it has been in the hands of its users for a period of time.

The Transportation Association of Canada is a national association with a mission to promote the provision of safe, efficient, effective, and environmentally sustainable transportation services in support of Canada's social and economic goals. Within Canada as a whole, TAC's primary focus is on roadways and their strategic linkages and interrelationships with other components of the transportation system. Within urban areas, TAC's primary focus in on the movement of people, goods and services, and its relationship with land use patterns. TAC is a neutral forum for gathering or exchanging ideas, information, and knowledge in support of technical guidelines and best practices.

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The Consultant wishes to thank the members of the study's Steering Committee and the TAC Project Manager, the names of whom are provided on the forthcoming page. The guidance and comments of the Steering Committee members are gratefully acknowledged.

The Consultant also wishes to thank the organizers and presenters of the *Applied Uses of Census Place of Work Data*, a one-day seminar held in Mississauga, Ontario on 20 October 2000, for permission to reference the presentations in this report.

The contents of this report, however, remain the responsibility of the Consultant and may not necessarily reflect the official positions of the individual Steering Committee members or their respective organizations.

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TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION 1

1.1 PURPOSE OF THIS DOCUMENT 1

1.2 WHAT ARE THE PLACE OF WORK / MODAL CHOICE VARIABLES? 1

1.3 OUTLINE OF THIS SYNTHESIS OF PRACTICE 1

CHAPTER 2 - OVERVIEW OF THE VARIABLES 3

2.1 CANADA 3

2.2 UNITED STATES 5

2.3 AUSTRALIA 6

CHAPTER 3 - CATEGORIZATION 9

CHAPTER 4 - CASE STUDY APPLICATIONS 11

4.1 INTRODUCTION 11

4.2 TRANSPORTATION PLANNING 11

4.3 SOCIO-ECONOMIC ANALYSES 18

CHAPTER 5 - SYNTHESIS OF POTENTIAL USES 23

5.1 EMERGING INFLUENCES 23

5.2 POTENTIAL APPLICATIONS 24

5.3 CONCLUSION 27

APPENDICES

A. THE 1996 PLACE OF WORK / MODAL CHOICE STANDARD TABULATIONS

B. THE 1996 PLACE OF WORK / MODAL CHOICE CUSTOM TABULATIONS PREPARED FOR THE TAC CONSORTIUM (sample)

C. BIBLIOGRAPHY

page #

EXECUTIVE SUMMARY

This Synthesis of Practice summarizes 'best practices' regarding the use of the Census Place of Work and Modal Choice variables. It is intended for use by transportation planners, urban planners, policy makers, developers and financial analysts in both the public and private sectors, as they consider the location and timing of new transportation infrastructure, land development, investment in new businesses, social and fiscal policies, etc.

The Place of Work and Modal Choice variables are collected in the Census of Canada. Both variables are part of the so-called long form, which is distributed to every fifth household. The Place of Work variable records the respondent's usual place of employment. It thus provides a means of relating the spatial locations of the respondent's place of residence and place of work, and how these change over time. The Modal Choice variable records the usual means used to go to work (car, public transit, etc.). It thus provides information in people's travel choices for the important home-to-work trip, for all parts of the country. The Place of Work variable has been included in most Censuses since 1971 (and in all Censuses since 1991). The Modal Choice variable was introduced in the 1996 Census. Both are included in the 2001 Census.

The richness of the Census data base, and the potential to link the Place of Work and Modal Choice variables to other Census information, provides a powerful and cost-effective means of analyzing both the night-time (residential) and daytime (workplace) populations. The data allow uniform coverage across Canada, thus allowing comparison among cities.

The Synthesis of Practice describes the two variables and their relationship to the Census of Canada. The structure of the questions are described and compared with similar questions from the Censuses of the United States (which adds additional, related questions) and Australia (which has similar phrasing but in a different institutional and fiscal environment).

Best practices are drawn from Canadian, American and Australian experience. The best practices are categorized into two main groups; namely, transportation planning and socio-economic analyses. The practices are described in the form of case studies. The importance of these applications is that – while they ultimately address planning decisions for new public or private investment or for new policies – they provide decision-makers with more complete information and a more complete understanding of the context within which the decision must be made.

This is particularly evident in the closing chapter of the Synthesis, which examines possible roles for the Place of Work and Modal Choice variables in addressing emerging influences and applications. These influences range from changing analytical needs to the globalization of the economy, to planning for healthy communities and new schools and services. In this sense, the availability of such a rich data source can allow policy makers and planners, in both the public and private sectors, to be pro-active in anticipating and meeting tomorrow's demands.

CHAPTER 1 - Introduction

1.1 PURPOSE OF THIS DOCUMENT

Statistics Canada engaged Delcan Corporation to prepare a synthesis of 'best practices' regarding the use of the Census Place of Work / Modal Choice variables by public and private agencies. This report constitutes the 'best practices' report and as part of the TAC Synthesis and Practice series, is intended for distribution across Canada. The report will serve as a road map for existing users to expand their applications and for potential users to start using the data.

The report is based upon, and draws from, a survey of the potential market for the two variables. Delcan prepared this 'market survey' for internal use by Statistics Canada, to aid them in identifying the user community. To maintain the confidentiality of the survey respondents, the first report has a limited circulation. However, the main relevant points are included in this Synthesis of Practice. The Transportation Association of Canada (TAC) administered both studies on behalf of Statistics Canada.

Existing applications of Place of Work / Modal Choice variable data are categorized in the report as case studies. We have drawn from Canadian experience, as well as American and Australian applications. The non-Canadian applications provide useful references under different institutional and cost-recovery environments, and – together with Canadian practice – provide some indications regarding future directions.

1.2 WHAT ARE THE PLACE OF WORK / MODAL CHOICE VARIABLES?

The Census of Canada is conducted every five years (the last being in 1996 and the next being in 2001) through distribution of questionnaires to every household in Canada. All households receive a basic set of questions.

Every fifth household also receives a set of additional questions. These questions address a variety of topics, including education, work activities, ethno-cultural activities, housing and income.

Among these are two questions relating specifically to where people work - the **Place of Work** variable - and mode of transportation to work – **the Modal Choice** variable. These questions are the focus of this study.

1.3 OUTLINE OF THIS SYNTHESIS OF PRACTICE

This report comprises four additional chapters:

Chapter 2 provides a brief overview of the Place of Work / Modal Choice data collected in each of Canada, United States and Australia.

Chapter 3 explains how the applications of the variables have been categorized within the report.

Chapter 4 details particular applications of the variables in the form of case studies.

Chapter 5 closes the report with a synthesis of emerging needs and potential applications, derived from the aforementioned market survey upon which this report is based.

Three appendices accompany the report:

Appendix A lists the 1996 standard Place of Work tabulations.

Appendix B lists the 1996 custom tabulations that were provided for the TAC-led consortium (see Section 2.1 below).

Appendix C is a bibliography of relevant source material, for further reference.

CHAPTER 2 - Overview of the Variables

Chapter 2 provides a brief overview of the Census data, specifically the *Place of Work* data in Canada. For comparison, a similar review is provided of the corresponding *Journey to Work* data in the United States and Australia. These descriptions provide an introduction to subsequent chapters, which detail 'best practices' from the three countries.

2.1 CANADA

OVERVIEW OF THE CENSUS

The Place of Work and Modal Choice variables are included in the Census of Canada. Statistics Canada conducts the Census every five years. The Census profiles the demographic and socio-economic characteristics of all households in Canada. The Census thus provides a rich database that not only profiles the population in all parts of the country, but - by virtue of its history - also provides a means of measuring changes over time.

The Census is mandated by Federal statute, but also is used by the Provinces and Territories, as well as municipal governments, academia and the private sector as a primary data source. Accordingly, although its content is approved ultimately by the Federal Cabinet, Statistics Canada develops the content of each Census through extensive consultation with these other interests and users.

The 2001 Census takes place on 15 May 2001.

For a number of years, the Census has used two types of questionnaires.[1] The so-called 'short form' comprises seven basic questions: the respondent's name, sex, age, marital and common-law status, family and household relationships and mother tongue. The short form is distributed to four out of every five households in Canada (80%).

The 'long form' includes the seven basic questions, but also adds another 52 questions. It is distributed to every fifth household (i.e., 100% of Canadian households are asked the seven basic questions, while a 20% sample is asked the 52 additional questions).

The contents of the two forms are the same throughout the country. However, they may vary between Censuses as different needs arise. As noted, these needs are identified through a combination of Federal requirements and consultation.

THE PLACE OF WORK / MODAL CHOICE VARIABLES

As noted, the 52 additional questions in the long form address a variety of topics, including education, ethno-cultural activities, housing and income. The Place of Work and Modal Choice questions are included among a series of questions relating to the respondent's job or business.

The two questions (or variables) are described as follows:

- The **Place of Work** variable has been included in all Censuses but two since 1971 (the exceptions being 1976 and 1986). It records the usual place of employment. It thus provides a means of relating the spatial locations of the respondent's place of residence and place of work, and how these change over time.

- The **Modal Choice** variable was introduced in the 1996 Census. It records the usual travel means used to go to work (car, public transit, etc.). It thus provides information on people's travel choices for the important home-to-work trip, for all parts of the country. The inclusion of the variable in the 2001 Census enables comparisons of changes in modal use over time.

The wording of the Place of Work / Modal Choice questions in the 2001 Canadian Census form is as follows:

[1] Source of information: *Statistics Canada Website, 2001 Census content* (www.statcan.ca).

Question 46 - At what address did this person **usually** work **most of the time**?*

- *Worked at home (including farms)***
- *Worked outside Canada***
- *No fixed workplace address*
- *Worked at address specified below (includes street address, city/town/village, province/territory, and postal code)*

* Bold as per the actual text
** Question 47 (mode) is omitted if this response is chosen

Question 47 - How did this person **usually** get to work?* (*If this person used more than one method of transportation, **mark the one used for most of the travel distance**).*

- *Car, truck or van – as driver*
- *Car, truck or van – as passenger*
- *Public transit (e.g., bus, streetcar, subway, light-rail transit, commuter train, ferry)*
- *Walked to work*
- *Bicycle*
- *Motorcycle*
- *Taxicab*
- *Other method*

* Bold as per the actual text

Both variables are replicated from the 1996 Census. However, for 2001 the Place of Work question was extended to read "At what address did this person usually work *most of the time*?" (extension in italics; note also that the word "usually" is highlighted in bold type). There are also some minor changes and additions to the explanatory notes that accompany this variable. The responses are the same. The Modal Choice text (question 47) is the same as the 1996 version. (It should be noted that the question numbers changed between the two Censuses.)

It is important to note that – similar to previous Censuses - the two variables are included in a group (questions 40 to 48) that refers to the respondent's "job or business last week" (Sunday, 6 May to Saturday, 12 May 2001; i.e., the week preceding Census Day). There are two provisos:

- If the respondent did not work that week, the responses should describe the job of longest duration since 1 January 2000 (i.e., over the previous year and [approximately] one half).

- If the person held more than one job that week, the responses should describe the job at which he / she worked the most hours.

AVAILABLE TABULATIONS

Statistics Canada generates a series of 'standard' tabulations from each Census. These are issued as a matter of course. 'Custom' tabulations may be generated, at additional cost to the purchaser.

The Place of Work standard tabulations include Area Profiles, Basic Summary Tabulations, Nation Series and Dimensions Series. Some of these are provided for Place of Residence geographies. Others are provided for Place of Work geographies. Some data are provided as "flow tables" which count the number of people who live in one location and work in another (i.e., they link the Place of Residence and the Place of Work). The 1996 standard tabulations are listed in Appendix A. As of this writing, the 2001 standard tabulations have not yet been finalized. However, they are expected to be similar to the 1996 standard tabulations.

Current Treasury Board funding permits Statistics Canada to code Place of Work Census responses to the municipal level of geography only (i.e., to the census subdivision [CSD] level, which are legal municipal entities defined by the Provinces / Territories).

Custom tabulations also can be prepared. These can be cross-tabulations with other Census variables (i.e., in addition to those provided with the standard tabulations).

Custom tabulations also can be provided for more detailed geographies; notably, census tracts (CTs) which represent neighbourhood-like areas. The boundaries or delineation of CTs may change between Censuses, according to population growth and development.[2] For example, the

[2] A new definition, the dissemination unit, is worth noting. It is similar to the enumeration area, but is intended to

Ottawa-Hull census metropolitan area (CMA)[3] consisted of 27 CSDs and 217 CTs in 1996.

The cost of the custom cross-tabulations, coding to the CT level or lower (e.g., traffic zones – see Footnote 8, below) or the inclusion of the remainder of the data is borne by users.

By way of example, for several Censuses prior to 1996, the Ministry of Transportation of Ontario (MTO) developed a cost-sharing consortium with its municipalities, in order to fund the geo-coding of the Place of Work variable to the sub-municipal levels. At various times, municipalities and Provincial authorities across Canada also have aided in updating street network files (computerized centre-line depictions of urban road networks), which enabled data to be geo-coded to block-face levels.

For the 1996 Census, TAC worked with Statistics Canada to develop a national consortium of Provinces and Territories, representing 98% of the population, to fund the geo-coding of the Place of Work data to a sub-municipal level. The consortium generated $1.5 million for this purpose. All Provinces and Territories, except for Newfoundland and New Brunswick, participated. (Statistics Canada elected to fund the detailed coding of these Provinces, as well). The 1996 consortium was administered by TAC.

For the 2001 Census, Statistics Canada is developing a similar funding consortium. However, agreements are being developed directly with individual Provinces, Territories and municipalities.

Appendix B lists the custom tabulations that were provided to the 1996 TAC consortium. *These are provided for illustration only. They are meant to exemplify the type of information that could be provided, at cost to the user.* As summarized in Appendix B, the Place of Work and Modal Choice variables were cross-tabulated with other variables (including gender, industry, occupation, income, age, and language) to produce a series of static and flow custom tables. It is expected that similar tabulations will be provided to members of the 2001 funding consortium.

Public or private users can purchase additional custom tables, according to their particular data and geography requirements. For example, the TAC consortium linked the Place of Work and Modal Choice variables with age, sex, language, occupation, industry, work activity and income. Additional custom tables could link the Place of Work and Modal Choice variables with other Census variables, such as education, family status, etc.

2.2 UNITED STATES

THE QUESTIONNAIRE

In the United States, the Census is completed every ten years (most recently on 1 April 2000). On average, about one in every six households received the long form that poses additional questions to the short form on housing and demographics, including the Journey to Work. The additional variables of auto occupancy, departure time and trip time add a dimension that is not available currently in the Census of Canada.

The text of the Journey to Work variables from the 2000 US Census form is as follows:

Question 22 - At what location did the person work LAST WEEK? *(Note: if the person worked at more than one location, indicate location where he/she worked most last week).*

- *response includes information regarding street address, city/town, county/state (or foreign country), and ZIP Code*

have a stable definition. The dissemination unit can be aggregated to CTs and CSDs.

[3] The census metropolitan area delineates the boundaries of large urban areas, together with the adjacent urban and rural areas that have a high degree of social and economic integration with the central urban area.

CMAs necessarily correspond to legal boundaries. According to the 1996 *Census*, the Ottawa-Hull CMA comprised 1,010,498 people, making it the fourth-largest CMA in Canada (source: *1996 Canadian Census – Statistics Canada Catalogue Number 93-357-XPB*).

Question 23a - How did this person usually get to work LAST WEEK? (*Note: if the person usually used more than one method of transportation during the trip, select mode used for most of the distance).*

- *Car, truck or van*
- *Bus or trolley bus*
- *Streetcar or trolley car*
- *Subway or elevated*
- *Railroad*
- *Ferryboat*
- *Taxicab*
- *Motorcycle*
- *Bicycle*
- *Walked*
- *Worked at home*
- *Other method*

Question 23b - How many people, including the person, usually rode to work in the car, truck, or van LAST WEEK?

- *Drove alone*
- *2 people*
- *3 people*
- *4 people*
- *5 or 6 people*
- *7 or more people*

Question applicable only if response to Q23a was car, truck or van.

Question 24a - What time did the person usually leave home to go to work LAST WEEK?

- *time of day response*

Question 24b - How many minutes did it usually take this person to get from home to work LAST WEEK?

- *response in number of minutes*

The US Journey to Work Program, which has significant financial / technical support, is a cornerstone national database for American transportation planners. (Note that the US Census Bureau is augmenting the long form with a rolling sample (i.e., on-going) survey called the American Community Survey. The survey is providing users with timely demographic, housing, social, and economic data. The data will be updated every year, to allow temporal comparisons across states, communities, and population groups.

AVAILABLE TABULATIONS

The Census Transportation Planning Package (CTPP) is a set of special tabulations available for Traffic Analysis Zones (TAZs) that summarize Place of Residence, Place of Work, and the flow between home and work. To improve timeliness of delivery, the CTPP 2000 release will employ GIS applications to verify TAZ geography, code employer location and access data tabulations. These data were provided to the Census Bureau by local agencies (i.e., Metropolitan Planning Organizations[4]), incorporated into the Tiger/Line platform, and then sent back to the local agencies for verification. This significant preparatory work was aimed at making the journey to work available as soon as possible (Fall 2002). The 1990 CTPP was distributed at no cost by the Bureau of Transportation Statistics, an office of the US Department of Transportation. However, the distribution policy for the 2000 CTPP has not yet been determined.

2.3 AUSTRALIA

THE QUESTIONNAIRE

In Australia, the Census of Population and Housing is completed every five years (the last being in 1996 and the next being scheduled for 7 August 2001). Journey to Work tables are produced by the Australian Bureau of Statistics (ABS) for agencies in each State/Territory. The tables are derived from the respondent's enumeration address, employer's workplace and mode of travel questions.

[4] Metropolitan Planning Organizations (MPOs) are the agencies designated to coordinate regional transportation plans and establish priorities for transportation improvements, all as a prerequisite for the receipt of Federal funds for new infrastructure. There are approximately 340 MPOs.

The text of the Journey to Work variables for the 2001 Australian Census is as follows:

Question 37 - For the main job held *last week*, what was the person's workplace address?

- For persons who usually worked from home, provide home address.
- For persons with no fixed place of work:
  - If the person usually travels to a depot to start work, provide depot address
  - Otherwise write 'no fixed address'

Response includes information regarding street address, suburb or rural locality, city/town, state/territory, and postal code

Question 41 - How did the person get to work on Tuesday, 7 August 2001? (*Note: mark all relevant modes as applicable).*

- *Train*
- *Bus*
- *Ferry*
- *Tram (including Light Rail)*
- *Taxi*
- *Car – as driver*
- *Car – as passenger*
- *Truck*
- *Motorbike or motor scooter*
- *Bicycle*
- *Walked only*
- *Worked at home*
- *Other*
- *Did not go to work*

It can be noted that the place of work variable (question 37) includes a qualifier to account for persons with no fixed place of work, by asking if the person goes to a depot to start work. Question 41 (modal choice) accounts for multi-modal trips by asking respondents to mark all methods used.

AVAILABLE TABULATIONS

The ABS produces cross-tabulations of the Journey to Work data (i.e., origin, destination, travel mode) with other variables such as gender, age, occupation, and income. State transportation authorities are responsible for defining destination zone (DZN) codes that are implemented by the ABS in the coding of the Journey to Work data. These DZNs are geographical units designed to represent areas with working populations of at least 100 persons. The majority of destination zone codes are obtained by matching business / employer names and locations reported on Census forms with entries in the Census Business Directory.

Although DZNs aggregate to Statistical Local Area (SLA) boundaries, as do Collection Districts (CDs), the two have no further relationship. DZNs are based on an area's working population, while CDs are designed according to the number of residential dwellings in the area.

Since the 1986 Census, all products and services generated by the ABS have been priced in accordance with the Government's 'user-pays' policy. In this regard, individual State Transport Authorities sell Journey to Work data and pay a royalty back to the ABS.

CHAPTER 3 - Categorization

Chapter 3 introduces the categorization procedure for the case study applications described in the subsequent chapter.

The applications have been divided into two main streams: *Transportation Planning* and *Socio-Economic Analyses*. Those applications with a distinct transportation element have been categorized within the former stream, while those applications focussing on demographics and daytime population issues have been categorized within the later stream.

Within these two relatively broad streams, a number of categories have been defined as follows:

TRANSPORTATION PLANNING

- travel model validation
- transit operations
- transportation perspectives
- commuting patterns
- equity / allocation of finances
- legislative requirements

SOCIO-ECONOMIC ANALYSES

- policy planning
- land-use planning
- market analysis
- emergency response planning

In Chapter 4, a short description is provided for each category and, where available, supporting case studies are documented. The sources are noted, for reference regarding technical details, etc.

Note that there may be some cross-over between the two streams, as well as between categories.

It is also important to note that some of the applications based on the American experience may not be feasible in Canada at this time, given the relative robustness of the United States Journey to Work Program. However, as noted, these provide some indication for future directions.

CHAPTER 4 - Case Study Applications

4.1 INTRODUCTION

Chapter 4 details applications of the Place of Work and Modal Choice variables in the form of case studies. The case study applications have been drawn from the literature and correspondence gathered from sources in Canada, the United States and Australia. Statistics Canada also provided access to case studies in its possession.

As noted in Chapter 3, two main streams of applications have been defined, namely *Transportation Planning* and *Socio-Economic Analyses*. Within each of these streams, a number of categories have been defined (see gray shaded boxes) for which a *sample* of applications are presented. The applications are indicative of both typical and perhaps unique applications, are non-exhaustive, and for the most part, presented at a conceptual level. Additional information or details may be available from the source quoted following the description of the application.

4.2 TRANSPORTATION PLANNING

TRAVEL MODEL VALIDATION

Transportation planners are able to calibrate and validate home-based trip generation, trip distribution and mode choice components of travel demand models using Census data.

Census data can be combined with travel survey data to develop these models. The data sets are complementary. The Place of Work data can be used to enrich model estimation databases at both the home and work ends that are developed from the travel survey data. Also, Place of Work and Place of Residence linkage models may be developed to replace conventional trip distribution models.

There are many applications demonstrating how these data are used by transportation planners in validating travel models.[5] A selection follows.

Application: Calibration of the Peel Travel Demand Forecasting Model (Regional Municipality of Peel, Ontario)

The Regional Municipality of Peel (Planning Department) is currently re-calibrating its EMME/2 travel demand forecasting model using 1996 Census data. In combination with data from the 1996 Transportation Tomorrow Survey (TTS), 1996 Place of Residence and Place of Work data are being used in the calibration of the trip generation and trip distribution components of the typical four-stage model.

The trip generation module employs trip rates for both work and other trip purposes. Population and employment figures were generated using the 1996 custom Census tabulations provided to the TAC-led consortium and applied at the traffic zone level. The Place of Residence static table (Table 1) was used to determine population, and the Place of Work static table (Table 7) used for employment. Trip production and attraction rates were derived using the TTS data.

The trip distribution model is a Gravity Model with an exponential deterrence function (of auto and transit times). Place of Residence and Place of Work Census data from 1996, as well as 1996 TTS data, were used to determine the most appropriate origin-destination pairs of the feasible 281,000 combinations. This filtering of trip

[5] The Place of Work data are used to validate urban travel surveys. These surveys commonly use the household as the analytical basis. The sampling frame generally is drawn from residential telephone listings or municipal property assessment rolls. Once the survey results are expanded according to the sampling frames, many cities then use *Census* dwelling unit and population counts to validate the expanded data. Many origin-destination (O-D) surveys are timed to take place within six months of a *Census* (thereby providing somewhat contemporaneous results), but in other cases estimates and interpolations between *Censuses* must be made.

linkages reduced the number of entries in the trip distribution matrix by almost 80 percent.

Source: Warner, R. and N. Siddiqui, Regional Municipality of Peel Planning Department. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Demographic Forecasting Model (Montréal, Québec)

The travel forecasting model in Montréal is based on a disaggregate approach (i.e., individual trip level) that uses origin-destination survey data in its raw form. For each trip, there is a base year expansion factor that is derived from four sets of hypotheses:

- demographic evolution (age and gender distribution);
- activity status rate evolution (worker, student, at home);
- motorization rate (probability of having a vehicle at their disposal); and
- relocalization of work-poles (spatial evolution of the relative attractiveness of each pole).

The latter three hypotheses are largely derived on observations of trends and good judgement. The demographic forecasting model provides predictions for 155 sub-census sectors for Montréal, which is based on population cohorts and trends from the previous Census (including Place of Work data). The demographic forecasting model employs a procedure to account for the redistribution of population to neighbouring sectors when housing demand is expected to exceed capacity, as described next.

The "friendliness" of each sector to others is measured by a composite indicator that considers several dimensions: a geographic proximity trigger; a measure of auto travel time between the sectors; an index of transit level of service; age/income and ethno-linguistic structure of the migrants, the structure of housing; and spatial distribution of workplaces. All the dimensions are weighted and the end result is an indicator between 0 and 1, and the excess population from a sector is distributed across its "friends" in proportion to the index.

Source: Personal communication with P. Tremblay, Ministère des Transports du Québec, November 2000.

Application: Planning in Rutland County (Rutland County, Vermont)

The Rutland Regional Planning Commission (RRPC) has attempted to use Census data extensively to solve important transportation problems in the state. Some noteworthy applications by the RRPC include the following:

- Using CTPP data to reveal Journey to Work trip patterns by the dominant (and minor) modes region-wide. This application involved a simple extraction of the appropriate data from the CTPP data set and entry into commercial presentation software. These data confirmed the reliance of residents on the personal automobile for work trip travel.

- Using CTPP data to reveal Journey to Work town-to-town trip patterns (across all modes) region-wide. This application also involved straightforward extracts from the CTPP database, as well as the preparation of database files compatible with GIS software to prepare maps illustrating regional place-of-work patterns. The presentation of these data in this manner confirmed policy makers' intuitive understanding of the pattern of Journey to Work trips within the region.

- Using CTPP-based Journey to Work town-to-town trip table to improve calibration of the Region's traffic forecasting model. This third application represents an extension of the previous one. The origin-destination table (generated using the gravity model within QRS II) containing internal-internal and internal-external trips was "fratared" using the CTPP-based Journey to Work town-to-town trip table. As a result of this technique, differences between actual and estimated volumes at screenlines dropped from unacceptable to acceptable levels.

Source: Pierce, D., Census Data in Transportation Planning, Rutland County, Vermont, TRB Proceedings 13 - Decennial Census Data for

Transportation Planning: Case Studies and Strategies for 2000, p. 123.

Application: Salem-Keizer Travel Demand Model (Salem-Keizer, Oregon)

The CTPP has been used in several generations of the Salem Transportation Demand Model. These include calibration of a gravity-based trip distribution model for Home-Based work trips, trip generation (through calibration of household size and number of workers cross tabulation) and mode choice (calibrating the auto-ownership sub-model). Inter-city flows between Salem and surrounding cities have also been examined using CTPP data.

Source: Jaffe, M., Use of CTPP for Transportation Planning and Modeling in the Salem-Keizer (Oregon) MPO, CTPP 2000 Status Report – July 2000.

TRANSIT OPERATIONS

Transit operators can use Census data in transit route planning, captive rider analyses, performance analyses, and station market analyses.

Application: BC Transit Review of 1996 Census Place of Work Data (Victoria, British Columbia)

BC Transit completed a review of 1996 Census Place of Work data for the Victoria CMA in an effort to develop an understanding of the relationship between the workplace and residence, and how people travel between the two. This review assisted them in developing effective policies (transit included) to alleviate the costs of traffic congestion.

The review identified the following characteristics for the Victoria CMA:

- More people in Victoria's employed labour force work at home than do people in other urban regions in Canada;
- The use of non-automobile modes, such as transit, bicycle and walking, is increasing for work trips;
- Few people in the employed labour force live outside the CMA boundaries;
- Many people in the employed labour force in the urban core work in the same municipality as they live; and
- Commuting distances are relatively short.

Future growth initiatives, such as compact and mixed use development, will be implemented that support these positive aspects of the Greater Victoria Region.

Source: BC Transit Working Document – 1996 Census Place of Work Data, May 1998.

Application: OC Transpo Evaluation of Park and Ride Lot Locations (Ottawa, Ontario)

OC Transpo provides public transit services in Ottawa. In addition to operating an extensive bus system, OC Transpo has developed a system of Park and Ride lots at key gateways. The object is to intercept drivers closer to their homes, and provide a convenient transfer to rapid bus service while removing vehicles from congested urban roads.

Commuters who live outside the transit service area were identified as a specific market. Although extensive travel surveys have been conducted over time in the National Capital Region (most recently in 1995), many of these rural commuters lived outside the surveyed territory.

As a result, OC Transpo planners used Place of Work flow linkages to identify the potential market between rural homes and urban work places. Combined with the 1995 region-wide travel survey, planners were able to estimate accurately the demand for parking spaces at proposed new Park and Ride lots. The Place of Work data thus ensured that an important travel demand market, not otherwise captured, could be taken into account in the planning of new transit facilities.

Source: Information provided by OC Transpo, October 2000.

Application: Downtown Chicago Circulator System (Chicago, Illinois)

The Illinois Research and Academic Community used Census data to determine the potential users of a proposed light rail system connecting major traffic generating points and sub-areas in the greater Chicago downtown.

In order to garner political support for the rail system, it was necessary to demonstrate that downtown Chicago is a destination for all Chicago neighbourhoods. By aggregating the CTPP data into the 50 political wards, it was confirmed that downtown Chicago is an important destination for residents in the affluent neighbourhoods along Lake Michigan to the north, as well as for workers living in the minority neighbourhoods located south of the city core.

Source: Soot, S., Census Data Use in Illinois by Research and Academic Community, TRB Proceedings 13 - Decennial Census Data for Transportation Planning: Case Studies and Strategies for 2000, p. 12.

Application: Perth Metropolitan Railway Line (Perth, Australia)

In Perth, Australia, Journey to Work data were used to assess various options for the extension of the Perth Metropolitan Railway Line. Buffers of likely catchment areas were determined based on park and ride and origin-destination data.

Source: Personal communication with G. Chaperon, Western Australia Ministry of Planning, November 2000.

Application: Americans with Disabilities Act (United States)

In recognition of *the Americans with Disabilities Act*, states and local transit operators are required to provide service levels that are fully accessible to all segments of the population. Data from the Census that describe geographic distribution of persons with disabilities are used to develop and improve transportation services for this population.

TRANSPORTATION PERSPECTIVES

Census data are commonly used to identify emergent trends within transportation and socio-economic indicators. Trend analyses afford an opportunity for cross-sectional and cross-temporal review of conditions within and between metropolitan areas.

Application: Sustainable Transportation Indicators (Canada)

The Transportation Association of Canada (TAC) incorporated 1991 and 1996 Place of Work data in compiling their Urban Transportation Indicators Surveys for 15 of Canada's largest metropolitan areas. These surveys represent a means to track the progress of strategies that target the creation of more efficient and environmentally friendly cities.

The Place of Work data were used to determine employment by geographic area, normalize certain indicators, and provide consistency checks with other data sources.

Source: Irwin, N., L. Sims, B. Hollingworth and A. Pushkar, Urban Transportation Indicators 1996 Survey, Transportation Association of Canada, Ottawa, 1999.

Application: Definition of Common Geographies for Transportation Indicators (Canada)

In order to ensure that the TAC Urban Transportation Indicators for each city could be compared on a common basis, common definitions of urban areas, central business districts, etc., were required. Census data were used to develop a standardized and uniform set of definitions, thus replacing local definitions that varied from city to city. The CMA was used to define urban regions, within which the Existing Urban Area (the built-up area) was then defined as a function of census subdivision population, employment and densities. Next, the Place of Work data were used to define the central

business districts (CBD). The data were examined, at the census tract level, in two ways: first, to identify those industries most commonly found in a CBD; and, second, to locate areas of high employment and employment density. The CBD was then defined by assembling census tracts in order of employment density (and adjacency), to approximately 20% of the Existing Urban Area's employment. The result is a consistent set of definitions of urban activity that can be applied throughout Canada.

Source: Calladine, R., Region of Ottawa-Carleton. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Provincial Transportation Perspectives (Ontario)

The Ontario Ministry of Transportation (Data Management and Analysis Office) used Place of Work data to provide a general transportation perspective for the Province, which includes planning for future highway expansions.

The data were used to provide a better understanding of socio-economic changes and implications for future highway needs. This was accomplished by a review of employment trends between 1991 to 1996 that suggested many parts of Ontario were experiencing the following trends:

- an increase in the size of the labour force;
- a decrease in self-containment of cities;
- an increase in work-at-home;
- an increase in the number of workers with no fixed workplace;
- an increase in inter-CSD commuting distance

A review of commuter modal shares within the Province was also completed by comparing relevant data from a variety of sources, including the 1996 Census Place of Work data. The other sources of commuter modal share data were the 1996 Transportation Tomorrow Survey (Greater Toronto Area) and the 1995 National Capital Region Travel Survey (Ottawa - Hull). The findings indicated very similar modal shares among the sources, with auto travel dominant. This suggests both the robustness and reliability of the Place of Work data as reasonable indicators of modal share in the important commuter trip.

Using the 2001 Census data, the Ministry plans to conduct similar trend analyses that review and link modal choice, sectoral shifts in employment, employment growth, work at home and commuting patterns.

Source: Smith, D., Ministry of Transportation of Ontario, Transportation Planning Branch - Data Management and Analysis Office. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Capital Planning of Highway 401 Widening (Ontario)

The Ontario Ministry of Transportation (Data Management and Analysis Office) used Place of Work data to help justify a proposed widening of Highway 401 from Port Hope to Cobourg, in Central Ontario. Place of Work data were used to define the socio-economic role of the highway in terms of the number of people/jobs in the service area, amount of manufacturing activities (i.e., estimate truck traffic), potential use of facility by commuters, change in commuting patterns and economic activities.

Source: Smith, D., Ministry of Transportation of Ontario, Transportation Planning Branch - Data Management and Analysis Office. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

COMMUTING PATTERNS

Census Place of Work data may be used to help understand commuter activity. This may include assessing the changing role of public transportation, bicycle and walk commuting, trends in telecommuting (i.e., working at home), and neighbourhood travel studies.

Application: Golden Horseshoe Study (Ontario)

This region of southern Ontario is currently undergoing rapid and significant changes, which include increasing economic and social interdependencies between the various communities. The Ministry of Transportation of Ontario (Data Management and Analysis Office) used Place of Work data to identify land use trends and emerging issues related to urban growth and regional economies in the Greater Golden Horseshoe. Specifically, the data were used to determine employment levels (number of jobs in the area), the economic base (in terms of industry/occupation), commuting patterns (where do people live/work), job characteristics (full/part-time, income levels) and modal choice.

Source: Suokas, P., Ministry of Transportation of Ontario, Transportation Planning Branch - Data Management and Analysis Office. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Temporal Population Changes (Western Australia)

In the remote areas of the north-west portion of Western Australia, Journey to Work data were used to measure the effect of fly-in and fly-out activities on the local population. It is common practice for workers from major metropolitan areas to fly-in to work in remote mining areas for several weeks and then fly out.

Source: Personal communication with G. Chaperon, Western Australia Ministry of Planning, November 2000.

Application: Changing Role of Public Transportation (New South Wales, Australia)

The New South Wales (Australia) Department of Transportation (Transport Data Centre) examined trends in travel to work by Sydney residents since 1981 based on Journey to Work Census data. Of particular interest were the changing roles of public transport and the private car during this time. These changes were examined within the framework of changes in residential and workplace location (i.e., spatial distribution of the workforce), and changes in government policies concerning urban development, the environment, and the promotion of public transit.

The analysis indicated that the use of the car for the journey to work, especially by single occupants, is increasing. Public transport has maintained its patronage numbers for the journey to work, but with a decreased modal share. The shift towards greater consolidation and the improved balance of housing and jobs (as a result of government policies on urban consolidation and containment) appear not to have increased the use of public transportation. However, the rate of increase in trip lengths to work is dropping, which may be a result of urban consolidation.

In future studies, the Transport Data Centre expects to use the journey to work data to investigate travel times instead of travel distance. This examination will help them to better understand the validity of various policy concepts employed by the Government (i.e., jobs / housing balance and constant travel time budget) to improve the effectiveness and livability of cities in Australia.

Source: Internal document "Journey to Work Travel Patterns in Sydney 1981 – 1996", New South Wales Department of Transport (Transport Data Centre).

Application: Commuter Trends and Patterns for Hamilton-Wentworth (Hamilton, Ontario)

The Region of Hamilton-Wentworth[6] (Community Planning and Development Division) used Place of Work data from 1991 and 1996 to better understand commuter activity. Commuter patterns and trends are used by the Region as an indicator of sustainability.

The analysis indicated that Hamilton is still the major work destination for Regional residents, but that travel patterns are changing. Specifically, the study found that the City experienced an increase

[6] Now the City of Hamilton.

in reverse-commuting[7] to other destinations within the Region, as well as to the Greater Toronto Area. This trend demonstrates that despite a strengthening regional economy, employers are drawing on labour markets extending beyond municipal boundaries. The study points out that this has some important consequences, including: increased dependence on automobiles and growing demand for inter-Regional transit services.

The data also indicated that Hamilton-Wentworth has a commuter deficit, which means that the number of resident workers that leave the Region is greater than the number coming into the Region. This is indication of an under-supply of jobs in the home community and/or an imbalance between the skills of the local labour force and the types of jobs available. The role of working at home was found not to be a factor in determining the commuter deficit.

A number of further research requirements have been identified by the Region, including an investigation of why workers choose to find employment outside of the home community, the nature of trips that are combined with the work trip, and trips outside of the peak commuting hours.

Source: Scanlon, M.E., Region of Hamilton-Wentworth, Community Planning and Development Division. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

EQUITY / ALLOCATION OF FINANCES

The issue of 'who pays versus who uses' a transportation facility is not often addressed explicitly in transportation planning, one reason being that full-cost pricing for the use of such facilities generally does not exist. The Place of Work linkages and the Modal Choice data could potentially be used to allocate finances.

[7] Refers to trips in the opposite direction of the predominant direction of the typical commute trip.

Application: Apportion Toll Revenues

ommuter flow data can be used to apportion toll revenues according to the residential location of commuters.

Source: Purvis C., The Decennial Census and Transportation Planning: Planning for Large Metropolitan Areas, Decennial Census Data for Transportation Planning – Conference Proceedings 4, Transportation Research Board, Washington, DC, 1995; p. 64.

LEGISLATIVE REQUIREMENTS

In the United States, organizations such as the Department of Transportation (US DOT), as well as state and local planning organizations, rely on Census data to implement the requirements of the *Transportation Equity Act for the 21st Century* (TEA-21, preceded by ISTEA) and *the Clean Air Act Amendments* (CAAA).

Legislative enactments in the United States, specifically TEA-21 and the CAAA, place substantial new planning and analysis demands on states and metropolitan areas. Much of the required planning is focussed on the journey to work characteristics and how they affect air quality. The following provides a brief summary of how Census data are used to meet the provisions of the legislation.

No similar legislative requirements exist in Canada. However, the emerging importance of environmental sustainability and livability may compel planners to employ similar analytical methods as their American counterparts, with their concomitant data requirements.

Transportation Equity Act (United States)

- Comprehensive Planning – Comprehensive transportation planning processes must be completed on a statewide basis, as well as at the metropolitan level, in order to be considered for federal funding. Census data are typically used for travel forecasting and travel behaviour (i.e., tracking of travel times; peak hours of travel by mode, residence, work

location; rates of carpooling; public transit use).

- Transportation Improvement Program: Project Selection – TEA-21 requires that statewide and metropolitan plans address broad issues such as land development and demographic growth, effects of transportation facilities on population segments, and regional mobility and congestion levels. These plans must consider the social, economic, and environmental effects (including air quality) of transportation plans and programs (must be found to conform to the emission reduction schedules in a state implementation plan). Census data on commuter travel flows and travel behaviour patterns provide a baseline for such evaluations.

- Traffic Congestion Management – TEA-21 requires traffic congestion management systems to be developed. Journey to Work data are often used as a baseline to establish goals for increasing vehicle occupancy and for decreasing the number of single occupant vehicle (SOV) trips.

- Corridor Preservation – Planning frameworks must be developed for identification of transportation corridors needing capacity expansion. Census data provide the basis for defining these corridors, as well as number / characteristics of residents / jobs affected.

Clean Air Act Amendments (United States)

- The CAAA legislation requires that state and local public agencies prepare comprehensive vehicular travel and pollutant emission profiles (which require analysis of detailed household and worker characteristics, means of travel, commuting patterns, journey-to-work trip lengths). This process requires coordination of the state implementation plan and the comprehensive urban transportation planning process. Those facilities/projects proposed as part of a long-range transportation plan must be evaluated for their effect on air quality. Census data are typically used to forecast traffic volumes along specific routes, then translated into forecasted speeds and emissions.

4.3 SOCIO-ECONOMIC ANALYSES

POLICY PLANNING

Census data are the benchmark for many socio-economic demographic forecasts.

Application: Employment Patterns in the GTA (Regional Municipality of Peel, Ontario)

The Region Municipality of Peel is located in the Greater Toronto Area (GTA). The Region used Place of Work data to conduct analyses of GTA employment and labour force characteristics. Trends were identified in the employment and labour force (between 1981 and 1996) in terms of workforce size, composition, location, and the presence of home workers.

The analyses indicated that labour force growth exceeded the employment growth, and that major shifts in employment and labour force share have occurred amongst the various regions that comprise the GTA. For example, the manufacturing, construction and wholesale industry sectors have decreased in their overall share of employment while the service industry is increasing in importance.

Source: McElroy, M., Regional Municipality of Peel: Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Live / Work Relationships in Toronto (Toronto, Ontario)

The City of Toronto (Urban Development Services) used 1996 Place of Work data to examine the live/work relationships for major employment concentrations in the City. The assessment involved defining 25 geographic employment concentrations and identifying place of residence census tracts for the workers in each employment area. The results were mapped using an Index of Relative Concentration, which was computed as the product of [the percentage

of the census tracts resident labour force working in the employment area] and [the percentage of the employment area's workforce coming from the census tract].

Several key findings emerged from the analysis, including:

- the existence of a strong live / work relationship;
- cross boundary travel is greatest to the west;
- with the exception the downtown core and the Yonge Street corridor, public transit usage is low for cross boundary travel; and
- public transit usage is relatively high within the City for all employment areas.

Source: Bekkering, M., City of Toronto. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Discrimination of Minority Populations (Toronto, Ontario)

In North America, Journey to Work and Place of Work data have been used to identify patterns of discrimination in hiring among minorities and other population groups within labour markets.

One particular study examined immigrant women's access to employment in Toronto. Industries of employment were aggregated into manufacturing, construction and three service industries, and then were compared among selected locations within the Toronto CMA. The analysis indicated that immigrant women are a growing component of the Toronto workforce employed in large numbers in manufacturing and consumer services. Also, the small loss of jobs in the centre of the urban region and the inner suburbs was accompanied by a substantial increase in immigrant women's employment in the outer suburbs.

Source: Preston, V., York University, "Examining Immigrant Women's Access to Employment - Canadian and American Studies." Paper presented to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Relationship of Transportation Accessibility and Employment Opportunities (United States)

The University of Illinois at Chicago has used US Census data to analyze the relationship between accessibility and entry-level jobs and other employment opportunities, as a means of assessing the adequacy of transit services to serve low-income or entry-level workers.

Source: Personal communication, Dr. Paul Metaxatos, University of Illinois at Chicago, March 2001.

Application: Delivery of Promotional Resources (Regional Municipality of Peel, Ontario)

The Regional Municipality of Peel (Public Health Department) used Place of Work data to identify where the Region's Workplace Health Promotion resources would be most effective. The data were used to target groups and their characteristics for planning health promotion programs that address the Public Health mandate.

The most important characteristics of the workforce were identified and target groups were defined by specific combinations of demographic, economic and employment attributes. The distribution of the combined attributes for each target group was conducted by Place of Work (at the traffic zone level). Two series of factor analysis runs were conducted on the Place of Work data that enabled the data to be presented using maps that illustrated the relationship between the most important attributes.

By way of example, young workers would be targeted for smoking cessation, reproductive health, healthy eating and active lifestyle programs. Also, specific age categories of working women could benefit from information on smoking cessation programs, reproductive health information/services, and presentations on the value of tests for early detection of cancer. The analysis also revealed that a number of specific target groups showed a strong affinity for transit usage and as such, campaigns addressing the relevant issues to these particular groups (i.e., young workers; specific language groups other

than English) could be introduced within key bus shelters or bus routes.

Source: Cichocki-Beaudry, M.K., and the Health Department, Regional Municipality of Peel. Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

LAND USE PLANNING

Census data may be used to assess current and likely future demand for different land uses in a particular area. This allows municipalities to provide the appropriate zoning and regulatory environment for development, and to ensure that an adequate supply of developable land and the supporting infrastructure are available.

Application: Regional and Local Employment Projections (Regional Municipality of Peel, Ontario)

Census Place of Work data from the Region of Peel were used to help understand how and where employment growth may occur within the Region. The assessment considered three primary land use employment categories (as opposed to industrial sectors), namely major office, population related, and employment land.

The categorization revealed that within the Region of Peel, 12% of employment was related to major office (that is, to nodes and concentrations of jobs), 32% related to the population (i.e., jobs that serve the population, such as retail, etc.; at a rate of one employee for every five persons with about 80% occurring locally and 20% occurring regionally), and 56% related to industrial-type areas (primarily 'greenfield' development). This categorization of the data according to land use yields an improved understanding of the relationship among land use, behaviour and economic sectors.

Source: Mathew, R., Hemson Consulting Ltd., Toronto. . Presentation to the seminar on Applied Uses of Census Place of Work Data, Mississauga, Ontario, 20 October 2000.

Application: Location of Industrial / Commercial Complexes (Australia)

The Western Australia Ministry for Planning, in consultation with other State Departments use Journey to Work data when considering suitable locations of new industrial and commercial complexes. These data are also used in determining the influence of possible traffic congestion from proposals to increase the current size of existing shopping centre complexes and the creation of new complexes.

Source: Personal communication with G. Chaperon, Western Australia Ministry of Planning, November 2000.

MARKET ANALYSIS

Census data may be used to more effectively provide services to people who are either at work or on their way to work.

Application: Delivery of Banking Services

In New York City, a major national bank used Census data to reassess its current branch locations and to study the potential for relocation or expansion to other locations in the City. The assessment resulted in more convenient locations of banking services to serve people at their place of work, thus minimizing the disutility for travel (i.e., minimizing the need for workers to go out of their way) and providing a more efficient delivery of services.

Financial institutions may also use data on commuting patterns and occupation to define market areas for describing lending practices and the effects of bank mergers.

Source: Hammel, L., Non-Transportation Uses of the Urban Transportation Planning Package, TRB Special Report 206 – Proceedings of the National Conference on Decennial Census Data for Transportation Planning: p. 74.

Application: Real Estate Development

The journey to work data can be used by residential real estate developers to help identify the commutershed for residents of a particular neighbourhood. By knowing the current commutershed for an area, a developer can market a product to workers employed within that commutershed.

Journey to work data can also be used by commercial real estate market analysts to determine optimal sites for locating a firm on the basis of characteristics of the labour force and minimizing commute time.

Source: Dunphy, R., Census Data for Real Estate Decisions, TRB Conference Proceedings 4 - Decennial Census Data for Transportation Planning: p. 95.

Application: Radio Listening Audience

Radio stations can use journey to work data to ascertain how many commuters are in private vehicles during any hour of the day and program station content accordingly.

Source: Purvis, C., The Decennial Census and Transportation Planning: Planning for Large Metropolitan Areas, TRB Conference Proceedings 4 - Decennial Census Data for Transportation Planning: p. 55.

EMERGENCY RESPONSE PLANNING

Police and fire departments use data that describe where people live and work to plan emergency services in high concentrations of employment.

Application: Disaster-Preparedness in California

By providing detailed information on commuter flows and daytime population, Census Journey to Work data were used for disaster-response planning in California. The plans were implemented after the October 1989 Loma Prieta Earthquake in Northern California and the January 1994 Northridge Earthquake in Southern California.

Source: Purvis, C., The Decennial Census and Transportation Planning: Planning for Large Metropolitan Areas, TRB Conference Proceedings 4 - Decennial Census Data for Transportation Planning: p. 55.

Application: Evacuation Plan for a Nuclear Power Plant

Travel time to work and vehicular availability data obtained from the CTPP were used to develop an emergency evacuation plan for a nuclear power plant.

Source: Hammel, L., Non-Transportation Uses of the Urban Transportation Planning Package, TRB Special Report 206 – Proceedings of the National Conference on Decennial Census Data for Transportation Planning: p. 74.

CHAPTER 5 - Synthesis of Potential Uses

5.1 EMERGING INFLUENCES

There are many well-established uses of the Place of Work / Modal Choice data. However, several issues and influences have emerged in recent years. These are noteworthy, because they influence the demand for and use of these (and other) data:

- *An increasingly fluid analytical basis for planning.* This has several implications: First, 'artificial' spatial units, such as traffic zones, are becoming less and less relevant and meaningful as new analytical methods move towards micro-scale analysis.[8] Second, there are corresponding desires for geo-coded data at the block-face (or smaller) level of geography, as well as for the ability to aggregate such data to user-specified spatial definitions. Third, transportation planners require data that measure changes over small units of time (i.e., dynamic, second-by-second information) and individual trips (i.e., by individual person-trip or vehicle-trip). Finally, in the United States, continuous data collection using small samples is being tested as a means to provide needed information in some fields, as opposed to discrete point-in-time Census-level coverage.

- *Availability of increasingly powerful computational tools.* In particular, the common use of geographic information systems (GIS) to store and display spatial data, and the almost universal availability of cheap and powerful personal computers, has furthered the move towards micro-scale data.

- *Availability of electronic communications.* The ability to transfer information almost instantaneously, through various media (notably, the Internet) has both 'democratized' the use of data for decision-making and is making the immediate availability of up-to-date information an essential condition to ensure their relevancy and value.

- *Changed jurisdictional responsibilities for the provision of public services.* In 1988, governments remained the primary providers of public services and infrastructure. Today, the downloading of responsibilities among the three levels of governments has in turn provided a greater role for the private sector in (formerly) public domains. This means that the private sector may actively provide public infrastructure (notably, Highway 407 in the Greater Toronto Area).

  Importantly, this also means that individuals and business must take responsibility for decisions that once were the purview of government – for example, in how to get to work. As a result, government has less influence in these decisions than it had formerly; in particular, in its ability to influence public (or business) behaviour in ways that benefit society (for example, in reducing automobile use in order to reduce fuel use and pollution).

- *Globalization of the economy.* Related to the preceding points is the increased interdependence of local economies on non-local (national, global) influences. The economic development departments of individual cities are now cognizant that they must 'compete' in an increasingly larger, more volatile market place for new business. This means that business decisions taken somewhere else may have a significant impact on local development – for example, a hi-tech company can shrink, expand or relocate its physical presence in a particular city much more rapidly than in 1988. As well, some companies and individual workers band

[8] This is driven by an emerging movement towards activity-based demand modelling, in place of traditional travel demand modelling. Among other features, trips are derived from a household's activities, which provides a more holistic synthesis of a household's behaviour. In other words, the individual household is the building block, not the traffic zone. This allows the differences among *households*, rather than among *zones*, to be captured. It is also computationally more efficient.

together to meet the needs of a particular project, then disband.

As a result, the traditional definition of the 'workplace' may no longer be entirely appropriate (i.e., a person can live in one city and 'work' in another, via telecommunications). Finally, these forces reinforce the need for instantaneous, comprehensive data, since business decisions increasingly outpace the ability of government to support (or control) them.

- *Globalization of issues*. Also related to the above is a better understanding of many of the influences that impact local issues – that is, that planning issues do not respect political or jurisdictional boundaries. Notable among these are environmental issues such as climate change (greenhouse gases), air quality and resource consumption.

5.2 POTENTIAL APPLICATIONS

In practical terms, the aforementioned issues define both challenges and opportunities for the use of the Place of Work and Modal Choice variables. From these, we identified a number of potential new users and uses. These would complement the existing 'best practices' described in the previous chapter.
The lists below categorizes issues in two ways:

- *New users*: potential applications for organizations that have not used the data previously.

- *New uses*: potential applications for organizations that have used the data previously, but only in certain tabulations and/or at certain geographies.

NEW USERS

The following potential new users (i.e., new applications) were identified:

- Healthy communities / smog: The issue is the role of urban form on individual welfare and lifestyles. For example, does our auto-oriented society preclude walking and other healthy commuting?[9] This issue also is related to smog (air quality), which is of importance to Provincial and municipal governments.

- *Climate change*: Transportation is a significant source of greenhouse gases. Fuel consumption and greenhouse gas emissions are functions of travel activity. The issue is the need to quantify travel activity for all modes, in order to improve current 'top-down' estimates. These 'top-down' methods assume an average annual vehicle use (i.e., kilometres travelled per year). The Place of Work and Modal Choice data alone cannot capture the full picture, but they do provide a uniform, nation-wide data source that could improve existing methods.

- *Economic development*: The issue is to provide a profile of a community to show where the jobs are and where the people live in order to help a city [a] sell a new industry to locate in the area and [b] then help them define where they can locate within the area. Of particular relevance is a profile of commuting distance, which can be used as an indicator of urban quality of life (i.e., compared with other, larger cities, less time may be spent in commuting).

- *Planning for daytime populations*: Urban plans largely are derived from the 'night-time' population – i.e., on where people live first, and on where they work second.[10] However,

[9] In Atlanta, the Centers for Disease Control and Prevention (CDC) collaborated with municipal authorities to augment a travel demand (origin-destination) survey. The CDC's interest was to understand better the role of auto-oriented urban design in people's activities – i.e., whether people were avoiding walking and other healthy travel choices because urban design made it too convenient to drive (or less convenient to walk or cycle).

[10] This is not meant to suggest that municipal plans are inadequate or inappropriate. Rather, the process of planning tends to address the 'home-end', because this is what we know best. Although the 'work-end' is addressed, an improved understanding and profile of the daytime population in turn would ensure that the appropriate planning policies are in place. For example, an improved understanding of the role of telecommuting (i.e., the occupations and industries in which this can and does happen) could be used to tailor development and zoning requirements.

there is an increased recognition that people's activities are both diffused and not easily separated between night-time and daytime activities. Therefore, a more holistic approach is required

- *Auto insurance*: Some public insurers advocate distance-based premiums (i.e., premiums that reflect more closely the actual travel activity). The Place of Work and Modal Choice variables could be used to improve an understanding of this activity.

- *Electronic dissemination of information*: Data of various types are becoming increasingly accessible, and the tools to access, analyze and present them are becoming ever more powerful and inexpensive. The demand for user-specified definitions – e.g., the types of data, the spatial boundaries they describe, etc. – is expanding accordingly. Data also can be used to aid in real-time decision-making – whether for a technical analysis or for public policy, for both private uses and public consultation / political voting.

EXISTING USERS / NEW USES

Potential new uses were identified for existing users.

- *Basis of travel demand model*: Smaller cities have used the Place of Work data as the basis for their travel demand model, in lieu of an expensive travel survey – for example, Saint John and Fredericton. The auto tends to dominate, much more so than in larger cities which have more diversified travel choices. The availability of Modal Choice data provides an opportunity for an improved understanding of the potential role of alternate modes (i.e., public transit) in addressing the city's travel activities without building new roads.

- *Advertising 'reach'*: The issue is to measure the exposure of outdoor advertising to a potential 'daytime' population.

- *Locations of new branches of franchises*: The locations of many auto-oriented retail and service facilities are designed to reflect commuting routes to work (e.g., donut shops) or homebound from work (e.g., service stations). Many of these decisions are based solely upon the volume of traffic that passes a particular site. The Place of Work data could be used to assess the demographic and socio-economic profiles of the people who commute past the site (i.e., through a simple assignment [allocation] of 'trips' to the road in question). The Modal Choice variable allows a similar assessment to be conducted for modes other than the private auto.

- *Equity:* The issue of 'who pays versus who uses' a transportation facility is not often addressed explicitly in transportation planning; one reason being that full-cost pricing for the use of such facilities generally does not exist. However, the issue is emerging: For example, the recent proposal of TransLink, the regional transportation authority in Greater Vancouver, to impose lot levies[11] to raise funds for urban transit improvements, generated concern from some suburban politicians who felt that the expenditures would benefit the 'central' city (i.e., Vancouver) but not their residents.[12] The Place of Work linkages and the Modal Choice data could be used to prove (or disprove) such claims.

  The importance here is the definition of the commuter catchment area. In the United States, allocations of Federal funds for transportation infrastructure among an urban area's individual municipalities take into account population, among other criteria, as a means to allocate funds according to system 'use.' Some American central cities tax

[11] Lot levies are taxes assessed against each property ("lot") owner in a city or town, for particular purposes. For example, in the City of Ottawa, new homes are assessed a 'development charge' to pay for the new sewers, waterworks, roads, etc., that must be built to serve the new community. The use of a transit levy is more common in the USA, but is starting to be implemented in Canada as a way to fund public transit improvements.

[12] TransLink has the ability to generate revenues for transportation improvements from a variety of sources. In addition to lot levies, these include bridge tolls and special fees that are added to the renewal of vehicle and driver licenses. Montréal's Agence métropolitaine de transport also can generate revenues, although on a more limited basis. No other urban authority in Canada has these abilities – nonetheless, the issue of equity remains as an emerging issue, regardless of the source of revenues.

workers at the place of employment, regardless of where they live – i.e., they account for the daytime use of the city's services as well as for the night-time use. Neither American application exists in Canada; however, equity and the equitable distribution of funds could emerge as future issues as municipal infrastructure resources become scarcer.

- *Social policy planning:* Urban policy planners must improve their understanding of urban development. Just how much impact does the suburban commute have? What modes do they use? Relating these data to land-based data such as population or employment densities helps define practicality of new services to serve the daytime populations of the suburbs.

  Urban policy planners also must consider the impact of changing demographics - such as aging - on modal choice and home / work location.

- *Employment policy planning*: Policy makers could use the data to gain a better understanding of the relationship among high unemployment areas and accessibility – for example, is a particular area readily accessible by public transit?
- *Potential transit markets*: The provision of public transit service traditionally has focused on the work trip to the central city or key employment centres. Transit operators now must examine potential new markets; notably the reverse commute (to serve workers in the suburbs) and the potential commutershed outside the urban transit service area (i.e., for rural residents who work in the city).

- *Location of new public infrastructure*: The issue is the location of new infrastructure such as emergency services, daycare, schools, etc. These are commonly determined according to where people live, but – in suburban areas that have a high proportion of jobs, or in which telecommuting or home-based employment is growing, there may be a need to examine the demand for such services according to where people work.

An example illustrates: Survey respondents did not see the immediate need for this type of planning; for example, for assigning students to schools near their parents' workplace as opposed to their place of residence as a matter of convenience for the parents. However, a downtown Ottawa elementary school recently advertised for suburban students. The solicitation is "aimed at parents working downtown to enroll their children" at the downtown school. The purpose is to balance underutilized downtown capacity and overcrowded suburban space, in order to avoid a threatened closure of the downtown school. Parents would be close to their children during the day, and could participate in school programmes. The recent relaxation of boundary restrictions and municipal amalgamation facilitate the ability of students to transfer among school territories within the overall school district.[13]

The point of this example is to note the dynamics of urban spatial activity, and the resulting importance of understanding the work end (daytime population) as well as the home end (night-time population). However, the role of the daytime population is not yet obvious.

This example also points to an inferred obstacle to the broader use of the data; namely, the degree to which potential users were aware of the Place of Work / Modal Choice data and their capabilities. Although this was not raised as a specific issue by respondents, a lack of awareness of the data's potential clearly precluded broader uses. Related to this is the source of the issue at hand; that is, the need to work with non-traditional partners in addressing a particular issue. It is hoped that this Synthesis of Practice will go far in broadening the awareness of the Place of Work / Modal Choice variables as practical and reliable data for informed decision-making.

[13] Lofaro, Tony, Downtown school looks to suburbs for survival; Commute with your kids, ad suggests; Ottawa Citizen, Wednesday 24 January 2001, pages A1 – A2.

5.3 CONCLUSION

This *Synthesis of Practice* has reviewed existing applications of the Census Place of Work and Modal Choice variables. Applications were presented, in the form of case studies, from Canada, the United States and Australia. The non-Canadian applications provide both comparisons and possible future directions, given the different institutional and fiscal environments.

As the two preceding sections have demonstrated, perhaps the greatest potential for the use of the Place of Work / Modal Choice data lies more in meeting the needs of emerging influences and possible applications. In this sense, the availability of such a rich data source can allow policy makers and planners, in both the public and private sectors, to be pro-active in meeting tomorrow's demands.

Appendix A

The 1996 Place of Work / Modal Choice Standard Tabulations

(source: Statistics Canada)

Place of Work Data: A valuable resource for statistics on Commuters and Work Populations/Daytime Markets *available only from Statistics Canada*

What are the Place of Work data?

Place of work data from the 1996 Census include two distinct topics:

1. **Place of work variable**s, which include Place of Work Status (e.g. worked at home, worked in some census subdivision), Mode of Transportation to work (e.g. bicycle, public transportation) and Commuting Distance.
2. **Place of work geographie**s, i.e., workplace locations with workforce populations for which all 1996 Census variables, including Place of Work variables, can be reported.

This appendix describes the standard 1996 Census tables which provide Place of Work data, including tables about the resident population which include Place of Work variables **(Place of Residence Table**s), tables about the workforce population at the workplace **(Place of Work Table**s), and tables about the workforce population showing both residence and workplace geographies **(Place of Residence/Place of Work Table**s). Place of Work data is found in four different categories of 1996 Census standard tables, i.e., Nation Series, Dimension Series, Basic Summary Tabulations, and Census Area Profiles. Place of Work data can also be incorporated in custom tables, and can be provided for custom geographies.

The majority of Canada's working population commute to places of work located away from their Place of Residence. Information from Place of Work data enables us to understand more about the commuting phenomenon and its impact on urban society. Data can be provided for workers in terms of where they live (Place of Residence), where they work (Place of Work) or both where they live and work.

1. Place of Residence Tables

Like all other Census variables, Place of Work variables are reported for resident populations in Area Profiles, Basic Summary Tabulations (BST) and Nation Series tables, and can be included in custom tables. Use Place of Residence tables to study Place of Work status, mode of transportation and/or commuting distance by sex for the resident population in standard or custom geographic areas of interest.

2. Place of Work Tables

Unique among Census variables, the Place of Work responses permit the reporting of data for workplace populations, sometimes referred to as the Daytime Population. Both business organizations and regional and municipal government planners can use Census data about workplace populations, such as industry, occupation, education, income, etc., to analyze local economic and labour market conditions and make site location and economic development decisions. Marketers can use Census data for the Daytime Population, such as income, age, sex, ethnic origin, etc. for measuring the size of the daytime market, studying the characteristics of workers in a given area, or locating outlets in key employment areas. One BST and five Dimension Series tables provide a basic workplace population dataset, and the custom table service will provide these data custom-tailored to the user's analytical requirements. All population characteristics can be included in a workplace custom table, and the data can be provided for standard or custom geographies.

3. Place of Residence/Place of Work Tables

So-called "flow" tables provide the count of people who live in one location and work in another. These data support both point-of-reference analysis (people living in location A work where?, or people working in location B live where?) and integrated systems analysis, e.g., examining all commuter flows between components of an urban centre. These data are available alone in the Nation Series tables, or cross-tabulated with other variables in BSTs. Custom "flow" tables can also be provided, incorporating custom cross-tabulation and/or custom geographies.

4. Custom Tables

Custom tables can be provided for any population group, including Employed Labour Force, Population Who Worked Full-time Full-year in 1995, Self-Employed, etc. They can include any and all variables, including age, sex, income, education, ethnic origin and so on. They can incorporate Place of Residence, Place of Work, or both. Custom tables can be provided for standard geographies including enumeration areas, and for custom geographies, both for Place of Residence and Place of Work.

Place of Residence Tables

Employed Labour Force 15 Years and Over by Sex (3), **Showing Commuting Distance (km) (9)** for Persons with a Usual Place of Work, for census metropolitan areas - Nation Series 93F0027XDB96018

Employed Labour Force 15 Years and Over by Sex (3), **Showing Mode of Transportation (9)**, for Canada, Provinces, Territories, and census metropolitan areas - Nation Series 93F0027XDB96019

Employed Labour Force 15 Years and Over by Sex (3), **Showing Place of Work Status (5)**, for Canada, Provinces, Territories, and census metropolitan areas - Nation Series 93F0027XDB96017

Employed Labour Force 15 Years and Over by Place of Work Status (5), **Showing Age Groups (7)** and Sex (3) for "census subdivisions" - BST 95F0240XDB96001 Part 1 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (5), **Showing Industry Divisions (14)** (Based on the 1980 Standard Industrial Classification) and Sex (3), for "census subdivisions" - BST 95F0242XDB96001 Part 1 of 2

Employed Labour Force 15 Years and Over with a Usual Place of Work **Showing Mode of Transportation (9)** and Sex (3), for "census subdivisions" - BST 95F0243XDB96001 Part 1 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (5), **Showing Occupational Broad Categories (11)** (based on the 1991 Standard Occupational Classification) and Sex (3), for "census subdivisions" - BST 95F0241XDB96001 Part 1 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (5), **Showing Total Income (12)** and Sex (3), for "census subdivisions" - BST 5F0244XDB96001 Part 1 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (5), **Showing Work Activity (4)** and Sex (3) for "census subdivisions" - BST 95F0245XDB96001 Part 1 of 2

Employed Labour Force 15 Years and Over, **Showing Place of Work Status (17), and Mode of Transportation (19)**, for "census subdivisions" - Census Area Profile

Employed Labour Force 15 Years and Over, **Showing Place of Work Status (11), and Mode of Transportation (19)**, for all other geographies - Census Area Profile

Place of Work Tables

Employed Labour Force 15 Years and Over by **Place of Work Status (3)**, **Showing Industry Divisions (14)** (Based on the 1980 Standard Industrial Classification), **Occupational Broad Categories (11)** (Based on the 1991 Standard Occupational Classification) and Sex (3), for Workplace Canada, Provinces, Territories, census divisions and census subdivisions - BST 95F0246XDB96001

Employed Labour Force 15 Years and Over by **Place of Work Status (3) and Home Language (17), Showing Age Groups (7)** and Sex (3), for Workplace Canada, Provinces, Territories, census divisions and census subdivisions - Dimensions Series 94F0009XDB96132

Employed Labour Force 15 Years and Over by **Place of Work Status (3), Work Activity (4A) and Total Income Groups (12), Showing Age Groups (7)** and Sex (3), for Workplace Canada, Provinces, Territories, census divisions and census subdivisions - Dimensions Series 94F0009XDB96131

Employed Labour Force 15 Years and Over With a Usual Place of Work by **Mode of Transportation (9) and Industry Divisions (19)** (Based on the 1980 Standard Industrial Classification), **Showing Age Groups (7)** and Sex (3), for Workplace census metropolitan areas, census agglomerations and Corresponding census subdivisions - Dimensions Series 94F0009XDB96137

Employed Labour Force 15 Years and Over With a Usual Place of Work by **Mode of Transportation (9) and Occupational Broad Categories (11)** (Based on the 1991 Standard Occupational Classification), **Showing Age Groups (7)** and Sex (3), for Workplace census metropolitan areas, census agglomerations and Corresponding census subdivisions - Dimensions Series 94F0009XDB96136

Employed Labour Force 15 Years and Over With a Usual Place of Work by **Mode of Transportation (9) and Total Income Groups (12), Showing Age Groups (7)** and Sex (3), for Workplace census metropolitan areas, census agglomerations and Corresponding census subdivisions – Dimensions Series 94F0009XDB96138

Flow Tables

Employed Labour Force 15 Years and Over Residing or Working in a given **census metropolitan area** CMA by Sex (3), **Showing Place of Work Status (5)** and Workplace census subdivisions Within the CMA - Nation Series 93F0027XDB96041 *

Employed Labour Force 15 Years and Over Residing or Working in a given **census metropolitan area** CMA by Sex (3), **Showing Place of Work Status (5)** and Workplace census subdivisions Within the CMA - Nation Series 93F0027XDB96042 *

Employed Labour Force 15 Years and Over by Place of Work Status (1) and Workplace census subdivisions, **Showing Age Groups (7)** and Sex (3) for "census subdivisions" - BST 95F0240XDB96001Part 2 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (1) and Workplace census subdivisions, **Showing Industry Divisions (14)** (Based on the 1980 Standard Industrial Classification) and Sex (3), for "census subdivisions" - BST 95F0242XDB96001 Part 2 of 2

Employed Labour Force 15 Years and Over With a Usual Place of Work by Workplace census subdivisions, **Showing Mode of Transportation (9)** and Sex (3) , for "census subdivisions" - BST 95F0243XDB96001 Part 2 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (1) and Workplace census subdivisions, **Showing Occupational Broad Categories (11)** (Based on the 1991 Standard Occupational Classification) and Sex (3) , for "census subdivisions" - BST 95F0241XDB96001 Part 2 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (1) and Workplace census subdivisions, **Showing Total Income (12)** and Sex (3), for "census subdivisions" - BST 95F0244XDB96001 Part 2 of 2

Employed Labour Force 15 Years and Over by Place of Work Status (1) and Workplace census subdivisions, **Showing Work Activity (4)** and Sex (3), for "census subdivisions" - BST 95F0245XDB96001 Part 2 of 2

** a separate table is available for each census metropolitan area in Canada*

"Census subdivisions" indicates the table includes Canada, Provinces, Territories, census divisions and census subdivisions

Place of Work Data Table Legends

Age Groups (7)
1..Total - 15 years and over
2....15-24 years
3....25-34 years
4....35-44 years
5....45-54 years
6....55-64 years
7....65 years and over

Commuting Distance (kms) (9)
1..Total - All commuters
2....Less than 5 km
3....5 - 9.9 km
4....10 - 14.9 km
5....15 - 19.9 km
6....20 - 24.9 km
7....25 - 29.9 km
8....30 km or more
9..Median commuting distance

Home Language (17)
1..Total - Home language
2....Single responses
3.....English
4.....French
5.....Italian
6.....Portuguese
7.....German
8.....Chinese
9.....Indo-Iranian Languages
10.....Polish
11.....Spanish
12.....Other languages
13....Multiple responses
14.....English and French
15.....English and non-official language
16.....French and non-official language
17.....English, French and non-official language

Industry Divisions (14)
1..Total - Industry divisions
2....Primary industries
3....Manufacturing industries
4....Construction industries
5....Transportation and storage industries
6....Communication and other utility industries
7....Wholesale and retail trade industries
8....Finance, insurance, real estate industries
9....Business service industries
10....Government service industries
11....Educational service industries
12....Health and social service industries
13....Accommodation, food and beverage service industries
14....Other service industries

Industry Divisions (19)
1..Total - Industry divisions
2....Division A - Agricultural and related services industries
3....Division B - Fishing and trapping industries
4....Division C - Logging and forestry industries
5....Division D - Mining (including milling), quarrying and oil well industries
6....Division E - Manufacturing industries
7....Division F - Construction Industries
8....Division G - Transportation and storage industries
9....Division H - Communication and other utility industries
10....Division I - Wholesale trade industries
11....Division J - Retail trade industries
12....Division K - Finance and insurance industries
13....Division L - Real estate operator and insurance agent industries
14....Division M - Business service industries
15....Division N - Government service industries
16....Division O - Educational service industries
17....Division P - Health and social service industries
18....Division Q - Accommodation, food and beverage service industries
19....Division R - Other service industries

Mode of Transportation (9)
1..Total - Mode of transportation
2....Car, truck, van as driver
3....Car, truck, van as passenger
4....Public transit
5....Walked to work
6....Bicycle
7....Motorcycle
8....Taxicab
9....Other method

Mode of Transportation (19)
1..Total employed labour force 15 years and over with usual place of work or no fixed workplace status
2..Males, employed labour force with usual place of work or no fixed workplace
3....Car, truck, van as driver
4....Car, truck, van as passenger
5....Public transit
6....Walked to work
7....Bicycle
8....Motorcycle
9....Taxicab
10....Other method
11..Females, employed labour force with usual place of work or no fixed workplace
12....Car, truck, van as driver
13....Car, truck, van as passenger
14....Public transit
15....Walked to work
16....Bicycle
17....Motorcycle
18....Taxicab
19....Other method

Occupational Broad Categories (11)
1..Total - Occupational broad categories
2....A Management occupations
3....B Business, finance and administrative occupations
4....C Natural and applied sciences and related occupations
5....D Health occupations
6....E Occupations in social science, education, government service and religion
7....F Occupations in art, culture, recreation and sport
8....G Sales and service occupations
9....H Trades, transport and equipment operators and related occupations
10....I Occupations unique to primary industry
11....J Occupations unique to processing, manufacturing and utilities

Place of Work Status (1)
1..Usual place of work

Place of Work Status (3)
1..Total - Place of work status
2....Worked at home
3....Usual place of work

Place of Work Status (5)
1..Total - Place of work status
2....Worked at home
3....Worked outside Canada
4....No fixed workplace address
5....Usual place of work

Place of Work (11)
1..Total employed labour force 15 years and over
2..Males in employed labour force
3....Usual place of work
4....At home
5....Outside Canada
6....No fixed workplace
7..Females in employed labour force
8....Usual place of work
9....At home
10....Outside Canada
11....No fixed workplace

Place of Work Status (17)
1..Total employed labour force 15 years and over
2..Males in employed labour force
3....Usual place of work
4.....In CSD of residence
5.....In different CSD
6.....In same CD
7....At home
8....Outside Canada
9....No fixed workplace
10..Females in employed labour force
11....Usual place of work
12.....In CSD of residence
13.....In different CSD
14.....In same CD
15....At home
16....Outside Canada
17....No fixed workplace

Sex (3)
1..Total - Sex
2....Male
3....Female

Total Income (12)
1..Total - Income Groups
2....Without income
3....With income (1)
4.....Less than $10,000
5.....$10,000 - $19,999
6.....$20,000 - $29,999
7.....$30,000 - $39,999
8.....$40,000 - $49,999
9.....$50,000 - $59,999
10.....$60,000 - $74,999
11.....$75,000 and over
12.....Median income

Work Activity (4)
1..Total - Work Activity
2....Did not work in 1995
3....Full time
4....Part time

Work Activity (4A)
1..Total - Work activity
2....Worked full year, full time
3....Worked part year or part time
4....Did not work

A range of data products to meet your needs:

Nation Series Table: a data table with pre-determined content with the following attributes:

- provides information on a single subject matter
- includes a limited number of variables
- provides selected and sometimes full detail categories in each variable
- provides cross-tabulation of the variables
- provides data for Canada, Provinces and Territories, and census metropolitan areas

Basic Summary Tabulation: a data table with pre-determined content with the following attributes:

- provides information on a single subject matter
- includes a limited number of variables, from 2 to 5
- provides summary-level (not detailed) categories in each variable
- provides cross-tabulation of the variables
- available for standard Census areas only, the user chooses which areas

Profile: a data table with pre-determined content with the following attributes:

- provides information on a comprehensive set of subject matters
- includes almost the complete set of variables
- provides selected detail (not full detail) categories in each variable
- presents the variables in tandem, i.e. not cross-tabulated

There are two types of Profile table:

1. Area Profile:

- includes variables on persons, families, households and dwellings
- available as **Census Area Profiles** (standard geographies) and
- **Semi-custom Area Profiles** (custom geographies)

2. Target Group Profile:

- the user specifies the persons sub-group to be reported on, e.g. female lone-parents
- includes variables on persons only
- available for standard and custom geographies

Custom Tabulation: a data table with user-specified content, as follows:

- the user specifies the group or sub-group to be reported on, all groups are available, only one group/subgroup per table
- the user specifies which variables to include, all variables are available
- the user specifies which variable categories to include, and how to aggregate, full variable detail is available
- the user specifies which variables to cross-tabulate, and which variables to append in profile fashion
- available for standard and custom geographies

Custom Geography: a user-specified area, for which data is tabulated directly from Census databases, as follows:

- a user-specified area can be described as an aggregation of standard Census areas
- a user-specified area can be described as an aggregation of postal codes
- a user-specified area can be described as an aggregation of block faces, and linked directly to the Census database via Statistics Canada's Geocoding Service
- can be used with Profile and Custom Tabulation products

For more information, please contact: Statistics Canada:

Telephone Toll-free 1-800-263-1136
E-mail infostats@statcan.ca

Appendix B

The 1996 Place of Work / Modal Choice Custom Tabulations prepared for the TAC Consortium (sample)

(source: Statistics Canada)

Tables at the Census Subdivision Level of Geography

Place of Residence Static Tables

1 Employed Labour Force 15 years of age and over by Industry (based on 1980 SIC) (12) and Employment Status (full time / part time) (3)

2. Employed Labour Force 15 years of age and over by Occupation (based on 1991 SOC) (11)

3. Employed Labour Force 15 years of age and over by Income Groups (12)

4. Employed Labour Force 15 years of age and over by Age Groups (7) showing Sex (3)

5. Employed Labour Force 15 years of age and over by Home Language (17)

Place of Work Static Tables

6. Employed Labour Force 15 years of age and over by Place of Work Status (5) by Industry (based on 1980 SIC) (12) and Employment Status (full time / part time) (3)

7. Employed Labour Force 15 years of age and over by Occupation (based on 1991 SOC) (11)

8. Employed Labour Force 15 years of age and over by Income Groups(12)

9. Employed Labour Force 15 years of age and over by Age Groups (7) showing Sex (3)

10. Employed Labour Force 15 years of age and over by Home Language (17)

Place of Work Flow Tables

11. Employed Labour Force 15 years of age and over, Place of Residence by Place of Work by Mode of Transportation (9)

12. Employed Labour Force 15 years of age and over, Place of Residence by Place of Work by Employment Status (full time / part time) (3)

Notes:

- Census subdivisions [CSD] are legal municipal entities defined by the Provinces / Territories.
- Census subdivisions are identified by their Standard Geographical Classification Code (Province, census division, census subdivision (PRCDCSD).
- Tables developed from the 2001 Census would use the 1997 NAICS (North American Industrial Classification System) and the 2001 SOC (Standard Occupational Classification), rather than the 1980 SIC and 1991 SOC which were used in 1996.

Tables at the Census Tract Level of Geography

UNIVERSE: Employed Labour Force 15 years of age and over.

Place of Residence Static Tables

1. Employed Labour Force 15 years of age and over by Industry (based on 1980 SIC) (12) and Employment Status (full time / part time) (3)
2. Employed Labour Force 15 years of age and over by Occupation (based on 1991 SOC)(11)
3. Employed Labour Force 15 years of age and over by Income Groups (12)
4. Employed Labour Force 15 years of age and over by Age Groups (7) showing Sex (3)
5. Employed Labour Force 15 years of age and over by Home Language (17)

Place of Work Static Tables

6. Employed Labour Force 15 years of age and over by Place of Work Status (5) by Industry (based on 1980 SIC) (12) and Employment Status (full time / part time) (3)
7. Employed Labour Force 15 years of age and over by Occupation (based on 1991 SOC) (11)
8. Employed Labour Force 15 years of age and over by Income Groups(12)
9. Employed Labour Force 15 years of age and over by Age Groups (7) showing Sex (3)
10. Employed Labour Force 15 years of age and over by Home Language (17)

Place of Work Flow Tables

11. Employed Labour Force 15 years of age and over, Place of Residence by Place of Work by Mode of Transportation (9)
12. Employed Labour Force 15 years of age and over, Place of Residence by Place of Work by Employment Status (full time / part time) (3)

Note:

- Census tracts (CTs) represent neighbourhood-like areas. The boundaries or delineation of CTs may change between Censuses, according to population growth and development.
- Tables developed from the 2001 Census would use the 1997 NAICS (North American Industrial Classification System) and the 2001 SOC (Standard Occupational Classification), rather than the 1980 SIC and 1991 SOC which were used in 1996.

Appendix C
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