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1

Plugging In:
The Increase of Household Internet Use Continues into 1999

P. Dickinson and J. Ellison

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P. Dickinson and J. Ellison

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Abstract

Canadians are logging onto the Internet in growing numbers. In 1999, the proportion of   households that regularly used it, from any location of use, increased to 41.8%. The increase was largely driven by the remarkable jump in the proportion of households that used the Internet from home (28.7%).

Not only are more households using the Internet, but they are using it more often and for longer periods of time. Households have also become more diversified in their use of this new medium and they use it for a wider variety of services, including the purchase of goods and services. Once households become connected, they stay connected, with connections to the Internet via cable accounting for 12% in 1999. Churning has been very low.

Higher-income households are still more likely to use the Internet, as are households with higher levels of education. Although Internet use among seniors is still much lower than among younger households, Internet penetration increased for all age groups and family types.

The richer provinces of Alberta, British Columbia and Ontario are the most connected, but connectedness increased in every province, with Québec experiencing the highest rate of growth. There is considerable variability in the rates of Internet penetration among larger urban centres but, in general, households living there are more likely to be connected than those living in other geographical areas.

Plugging In:
The Increase of Household Internet Use Continues into 1999

By P. Dickinson and J. Ellison

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1. CONTEXT

Canadians are logging onto the Internet in growing numbers. In 1999, the proportion of households that regularly use it*, from any location of use, jumped to 41.8% from 35.9% in 1998. Internet use, measured at the level of the household, was higher from both homes and schools, according to data from the 1999 Household Internet Use Survey. The new medium is now permeating the everyday activities of many Canadians at home.

The Internet has certainly attracted enormous attention and generated a lot of discussion. Its diffusion and use is widely regarded as an indispensable means of future growth and development. "For Canada to generate jobs, growth and wealth, it must have a leading, knowledge-based economy that creates new ideas and puts them to work for Canadians. To do this, it is essential to connect Canadians to each other, to schools and libraries, to governments, and to the marketplace – so they can build on each other's ideas and share information" (Government of Canada 1999, p. 12).

To that end, numerous private and public sector initiatives are underway, aiming both at infrastructure and service delivery. Increasingly attractive and affordable access packages are being offered, and making the Internet accessible to all Canadians is high among the government's priorities. Programs to provide access through public sites in rural, remote and urban communities, to connect schools and libraries and to deliver government services on-line have been underway for some time (Government of Canada 2000).

The demand for monitoring household Internet connectivity and use is becoming stronger as new applications, such as electronic commerce, emerge. This paper reports on 1999 data, updating previous estimates and analyses (Dickinson and Sciadas 1996, 1997, 1999 and Dickinson and Ellison 1999). It provides information on Internet use by households, including location, frequency, intensity and types of use, and analyzes the relationships between usage and income, education, age and family type. In addition, it offers an account of the growth of household Internet use over time.

2. GENERAL TRENDS

Overall connectedness continues to rise, driven by a strong increase in home use

The increase in Internet use among Canadian households continues at a rapid pace. Overall, in 1999, 41.8% of Canadian households were regular-use households. This penetration rate covers use from any location - home, work, school, a public library or other location - and has increased significantly from 1998 (35.9%) and 1997 (29.4%) (Chart 1). An additional 3.3% of households that did not use the Internet indicated that they planned to start using it within the next twelve months.

* Regular-use households are those that responded yes to the question: "In a typical month, does anyone in the household use the Internet – from any location?" In addition to regular use, the survey collects information on households that have *ever* used the Internet. The analysis in this paper is based on regular-use households, unless otherwise specified.

NOTE TO READERS

The Household Internet Use Survey (HIUS) is administered to a sub-sample of households included in the Labour Force Survey (LFS), and therefore its sample design is closely tied to that of the LFS. The LFS is a monthly household survey based on a representative sample of households with civilian, non-institutionalized population in Canada's ten provinces. Excluded from the survey's coverage are residents of the Yukon, Northwest Territories or Nunavut, persons living on Indian Reserves, full-time members of the Canadian Armed Forces and inmates of institutions. Altogether these groups constitute an exclusion of approximately 2% of Canada's population 15 years of age and over.

Unlike the LFS, where information is collected on each eligible household member individually, the HIUS collected information on the household as a whole. In 1999, 43,034 households were eligible for the HIUS survey. Interviews were completed for 36,241 of these households for a response rate of 84.2%. Results were weighted to the entire count of households.

The annual estimate for the number of households in Canada is projected from the Census of Population. The 1997 and 1998 HUIS sample data were weighted based on projections from the 1991 census, while the 1999 weighting is based on projections from the 1996 census. The increase in the number of households projected from the 1991 census was a little larger than the increase that actually took place, according to the 1996 census. Thus, the total number of households in all ten provinces is slightly lower for the 1999 analysis (11,631,995) than for the 1998 analysis (11,913,370). Because of this, valid comparisons of proportions can be made over the years, but not of absolute values. That is, the penetration rates for 1997, 1998 and 1999 can be compared, but the change in the actual number of connected households cannot be calculated given the weighted populations available at this time. For example, the slight drop in the work penetration rate need not necessarily mean that the actual number of work-use households fell.

In addition, the 1999 survey asked households about their use of the Internet, while the 1997 and 1998 surveys asked more generally about the use of 'computer communications'. This change may have contributed to the reported reduction in the work penetration rate between 1998 and 1999. It is possible that some respondents who use office Intranet systems, but do not connect to the Internet from work, would respond positively to the more general term and negatively to the more specific one.

Additional information associated with definitions, concepts and methodological details for the HIUS 1999 survey can be found in Statistics Canada (1999, 2000a). Supplementary information related to LFS methodology is contained in Statistics Canada (2000b).

The most notable driving force behind this increase was the remarkable jump in the proportion of households using the Internet from home. The home use rate has increased substantially in two years, from 16% in 1997 to 28.7% in 1999. More than two-thirds (68.7%) of all regular-use households have at least one member using from home. More than one in five households (21.9%) used the Internet from the workplace. (A methodological change in the survey, explained in the Note to Readers, may be a factor contributing to the slight drop from 1998). Internet use from school continued to increase, reaching 14.9%. It was followed by use from a public library (4.5%) and other locations[1] (3.9%).

Chart 1.
Internet penetration rates, by location of use

Mode of connection

As Internet penetration and use become more widespread, information needs extend from the number to the type of connections. Broadband access, which refers to the capacity required for the delivery of more advanced and faster services, is regarded as a key determinant of future developments. For the first time, in 1999, the survey collected information on the type of Internet connection among households, in order to shed some light on this issue. The overwhelming majority of households accessing the Internet from home indicated that their home connection to the Internet was by means of a telephone line connected to a computer. Households with cable lines connected to computers comprised 12% of households accessing the Internet from home[2].

Once households become connected, they remain connected

In 1999, almost half (48.8%) of all households said that one or more members had ever used the Internet, up from 45.7% in 1998 and 38.1% in 1997. The difference between households that have ever used the Internet and regular-use households is mainly attributable to one-time and sporadic users, rather than to the discontinued use by former regular-use households. Only 1.9% of households were Internet "drop-outs" and an even smaller proportion (0.7%) were drop-outs from regular home use.
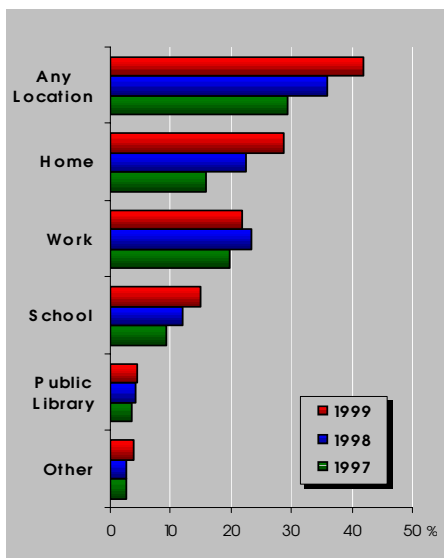
Internet Households use the Internet more often, for a longer time and for a wider variety of services than in the past

Almost two-thirds (65.4%) of home-use households access the Internet every day, and only a very small proportion (2.8%) do so less than once per week. Home use of the Internet is a daily part of the lives of almost one in five Canadian households, doubling from 9.8% in 1997 to 18.8% in 1999.

Along with the increased frequency of home use, the time spent on the Internet is also increasing for more households. In 1999, more than two-thirds (67.1%) of home-use households spent at least ten hours per month using the Internet from home, and almost half (47.1%) spent at least twenty hours. As a share of all households, those using from home for at least twenty hours per month (13.5%) have more than doubled since 1997.

Home access to the Internet is used primarily, but by no means solely, for purposes unrelated to employment. Although almost all home-use households accessed the Internet for personal non-business use one in five households (19.2%) used from home for self-employment purposes, and one in four (23.9%) did so for employer-related reasons.

The home-use household has also become more diversified in its use of the types of services available on the

1 -- When asked to specify, the largest proportion of respondents using from other locations indicated that they used the Internet from the homes of friends, neighbours or relatives.

2 -- For related information concerning cable Internet connections see April (2000).

Internet, as reflected in the rising proportions for almost all the services investigated (Table 1). For example, the connected household that does not use e-mail from home is somewhat of a rarity; in 1999 more than nine in every ten home-use households used e-mail. More than half (54.2%) now use the Internet from home to seek medical and health information, and the vast majority (85%) use it to get specific information on other topics. The proportion of home-use households purchasing goods and services increased significantly to 19%, almost doubling since 1998. These households represent 5.5% of all households.

Recreational uses are popular, including playing games, listening to radio and downloading music. The proportion of home-use households using the Internet for formal education and training remained quite stable over the last year. The higher home penetration rates, however, increased the proportion of all households that used the Internet from home for education and training, and getting government information. The increased diversity of Internet use is also reflected in the high proportion of home use for other unspecified services.

3. HOUSEHOLD CHARACTERISTICS

This section examines the relationship between the incidence of Internet use and household income, education and age of the household head, and family type.

Higher income households more likely to use the Internet

The very strong relationship between household income and Internet use persisted in 1999. In the top income quartile (the 25% of households with the highest incomes), 71.2% of households used the Internet compared to 18.8% of households in the bottom income quartile (Table 2). More than half (53.5%) of households in the top quartile used the Internet from home, compared to only 10.9% of the bottom income quartile.

The difference between penetration rates in the top and bottom quartiles has increased a little since 1998, perhaps suggesting that the inequality in Internet use - the so-called 'digital divide' - has increased. But inequality in this context is a relative concept and can be analyzed in different ways.

For example, penetration rates increased in every income quartile, indicating that more households in each group were connected from year

Table 1.
Proportions of households using the Internet from home, by purpose of use

	All Households				Regular Home-use Households		
Purpose of Use	1997	1998	1999		1997	1998	1999
E-mail	13.3	19.3	26.3	%	83.1	85.6	91.7
Electronic banking	3.1	5.5	8.0		19.6	24.4	27.7
Purchasing goods/services	1.5	2.5	5.5		9.2	10.9	19.0
Medical/health information	--	9.6	15.6		--	42.5	54.2
Formal education/training	--	6.8	9.2		--	30.0	32.0
Government information	--	8.2	12.7		--	36.4	44.1
Other specific information	--	15.3	24.4		--	67.9	85.1
General browsing	13.5	17.6	24.3		84.7	78.1	84.7
Playing games	--	7.8	12.3		--	34.4	42.7
Chat groups	--	5.7	7.5		--	25.4	26.2
Obtaining/saving music	--	--	7.8		--	--	27.1
Listening to radio	--	--	5.0		--	--	17.5
Other Internet services	2.2	2.6	10.0		13.7	11.6	34.7

Note: "--" indicates a category of use not asked in that year's survey.

Table 2.
Internet penetration rates, by location of use and household income

	Home			Work			School			Public Library			Other			Any Location		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
									%									
All Households	**16.0**	**22.6**	**28.7**	**19.9**	**23.3**	**21.9**	**9.4**	**12.1**	**14.9**	**3.7**	**4.3**	**4.5**	**2.8**	**2.6**	**3.9**	**29.4**	**35.9**	**41.8**
Bottom Quartile	5.5	7.1	10.9	4.9	4.1	4.3	5.8	6.1	8.6	1.8	2.7	3.2	2.0	2.0	3.3	12.4	13.2	18.8
Second Quartile	8.8	13.6	18.0	10.3	12.1	10.9	5.9	7.9	9.7	2.5	3.2	3.1	2.2	2.3	3.5	18.4	23.6	29.2
Third Quartile	17.1	24.4	32.4	22.2	26.3	24.5	9.7	13.1	15.8	4.1	4.9	5.0	3.1	2.5	3.9	32.8	41.5	48.1
Top Quartile	32.5	45.1	53.5	42.3	50.4	47.8	16.1	21.0	25.5	6.2	6.6	6.7	3.9	3.7	5.1	53.7	65.1	71.2

to year. At the same time, the penetration growth rate has been greater in the bottom quartile than in the top quartile. As a result, households in the top quartile were nearly five times more likely than households in the bottom quartile to be Internet users in 1998, but less than four times more likely in 1999. Furthermore, the share of all regular-use households that were in the bottom half of the income distribution increased from 25.6% in 1998 to 28.7% in 1999, while the share in the top half fell from 74.4% to 71.3%.

As well, households in the top income quartile were six times more likely to be home users in 1998 than households in the bottom quartile, but only five times more likely in 1999. The proportion of home-use households that were in the bottom half of the income distribution increased from 23% in 1998 to 25.1% in 1999.

The link between affordability and income may explain some, but not all, of the relationship between income and penetration rates. There are various reasons why some households do and others do not use the Internet. Many higher-income households do not use the Internet even though affordability is not an issue, just as many lower-income households may choose not to use for reasons that have nothing to do with cost or

affordability.[3] The remainder of this section, therefore, analyzes the distribution of penetration rates in terms of household characteristics other than income.

Internet use remains higher among higher-educated households
The higher the education level of the household head, the greater the likelihood that someone in the household uses the Internet. In 1999, the overall penetration rate for households where the head had a university degree (70.1%) was almost double that of households in which the head had a high school or college qualification (44.4%) and more than four times the rate of households in which the head did not complete high school (16.1%). Each specific location of use has a similar basic relationship between education and Internet use, although the actual magnitudes differ (Table 3).

Between 1998 and 1999, despite a small decrease in the work use rate, all education categories showed significant increases in the overall penetration rate, as well as in the penetration rates from home and from school. As with income, though, the rate of increase was greatest in the lowest education category.

3 -- When the 16.6% of Canadian households with a home computer were asked why they did not use it to access the Internet, only one in four (26%) mentioned cost as one of the reasons. This is less than the proportion that simply said they had no need to use from home or did not find it useful to do so (29.2%).

The relationship between Internet use and education reflects the relationship between education and income. Households in which the head did not complete high school represent a little more than one-quarter (27.4%) of all households, but nearly half (47.3%) of households in the bottom income quartile. Conversely, households where the head has a university degree accounted for one-fifth of all households (20.2%) but only 8.1% of the bottom income quartile. (The Appendix Tables contain additional detailed information).

All age groups are more connected

Connectedness increased for all age groups between 1998 and 1999, although the penetration rates remained much lower for households with older heads than for households with younger heads (Table 4). More than half the households with heads aged less than 54 used the Internet, but this drops to less than one-third where the head is aged 55 to 64, and only one-tenth for households headed by a senior (65 and over).

Some of the difference in Internet use between younger and older households may be because older households are more likely to be retired, contributing to a lower work use rate. Also, older households are less likely to have children living at home and still in school, contributing to a lower school use rate. But neither of these reasons would explain why the home use rate is also much lower among older households. One-third or more of households with heads under 55 used from the Internet from home, dropping to one-quarter in the 55 to 64 age group, and less than 10% in the 65-and-over group. The rate of growth of the 65-and-over group, though, is the fastest of all age groups.

Table 3.
Internet penetration rates, by location of use and education of household head

	Home			Work			School			Public Library			Other			Any Location		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
									%									
All Households	**16.0**	**22.6**	**28.7**	**19.9**	**23.3**	**21.9**	**9.4**	**12.1**	**14.9**	**3.7**	**4.3**	**4.5**	**2.8**	**2.6**	**3.9**	**29.4**	**35.9**	**41.8**
Less than high school	3.9	6.6	9.6	4.7	5.6	4.8	3.2	5.3	6.3	1.2	1.8	1.7	1.0	1.2	1.7	9.0	12.6	16.1
High school/college	16.0	23.1	29.6	19.9	23.0	21.3	10.4	13.0	16.5	3.9	4.3	4.8	3.3	2.9	4.6	31.0	37.4	44.4
University degree	37.5	46.7	52.4	47.0	52.5	46.7	16.9	19.9	22.7	7.2	8.5	7.5	4.2	3.8	5.2	59.6	68.1	70.1

Table 4.
Internet penetration rates, by location of use and age of household head

	Home			Work			School			Public Library			Other			Any Location		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
									%									
All Households	**16.0**	**22.6**	**28.7**	**19.9**	**23.3**	**21.9**	**9.4**	**12.1**	**14.9**	**3.7**	**4.3**	**4.5**	**2.8**	**2.6**	**3.9**	**29.4**	**35.9**	**41.8**
Less than age 35	19.1	26.1	32.8	25.6	30.2	28.6	9.5	11.3	14.3	4.2	4.8	5.3	4.5	4.3	7.1	37.9	45.3	53.0
Age 35 to 54	21.6	30.1	38.0	27.4	31.4	30.1	14.6	19.2	24.0	5.3	6.1	6.3	3.5	3.1	4.8	38.8	46.9	54.9
Age 55 to 64	12.0	18.2	24.6	13.2	16.3	16.1	5.1	6.8	7.1	2.1	3.1	3.6	(1.2)	1.6	1.9	21.1	27.5	32.7
Age 65 and over	3.4	5.3	8.2	2.4	2.6	2.4	(0.8)	(0.8)	1.5	(0.7)	(0.7)	(0.7)	(0.6)	(0.5)	(0.6)	5.5	7.2	10.1

( ) = Lower reliability estimates due to sample size.

Because the 35 to 54 age group had the highest penetration rates and accounted for the largest share of all households (45%), it made up well over half of all connected households, and of households that specifically used from work, home, and public libraries (approximately 60% in all cases). This age group also made up nearly three-quarters (72.5%) of all school-use households. Conversely, despite the fact that households with heads 65 and over represented about one in five (21.4%) households, they accounted for only 6.1% of home-use households.

With few exceptions, penetration rates were higher at higher levels of income within each age group, and lower at higher age groups within each income category (Appendix Table 2). For example, among households in the top income quartile, three-quarters of those with heads under age 54 were regular-use households, as were nearly two-thirds (64.7%) of the 55 to 65 age group and one-third (33.1%) of the 65 and over group.[4] But the penetration rates in the next-highest income quartile were much lower for each and every age group, despite the fact that affordability is highly unlikely to be a problem for them.

Connectedness has increased for all family types
A larger share of all family types used the Internet in 1999 than in 1998, although there remains a big difference in penetration rates across family types (Table 5). In 1999,

single-family households with unmarried children under age 18 continued to have the highest overall penetration rate (59%), which was some 50% higher than the rate for single-family households without such children (38.7%). Part of this difference can be accounted for by the obvious fact that families with children have a much higher rate of school use (30.3%) than do equivalent families without children (9%). This alone, however, can not account for the difference in penetration rates, since the proportion of single-family households that use from home is also much higher for those with children (40.6%) than for those without (28.3%).

The fact that there is a relationship between penetration rates and the presence of children does not necessarily imply that children are the cause of the difference in home penetration rates.[5] Rather, the presence of children may be related to other household characteristics that are more important causes of the difference. For example, Internet use is lower in older age groups, and the older age groups contain a larger share of the families without children than the younger age groups.

Multi-family households have the second-highest connectedness rate (55.1%), but they are only 4% of all households. One-person households, who are one-quarter of all households, have the lowest overall penetration rate (22.1%) and the lowest from each specific location of use.

4 -- Since households headed by a senior are 21.4% of all households but only 6.1% of households in the top income quartile, their higher penetration rate in this quartile does little to compensate for their much lower rates in other quartiles.

5 -- Analysis of the 1998 data for single-family households, standardized for age and education of the household head, revealed no evidence of a consistent relationship between home-use rates and the presence of unmarried children under age 18.

Table 5.
Internet penetration rates, by location of use and family type

	Home			Work			School			Public Library			Other			Any Location		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
									%									
All Households	**16.0**	**22.6**	**28.7**	**19.9**	**23.3**	**21.9**	**9.4**	**12.1**	**14.9**	**3.7**	**4.3**	**4.5**	**2.8**	**2.6**	**3.9**	**29.4**	**35.9**	**41.8**
SF, children	21.7	31.0	40.6	26.0	30.0	30.0	16.5	22.8	30.3	5.6	6.7	7.5	4.1	3.5	5.7	38.24	47.6	59.0
SF, no children	15.5	22.5	28.3	18.8	22.4	20.6	6.5	8.4	9.0	2.9	3.6	3.3	2.0	1.9	2.6	27.7	34.2	38.7
One-person	7.1	10.5	12.6	11.5	14.3	12.5	2.3	2.2	2.7	1.5	1.8	2.1	2.0	1.9	2.9	16.5	20.4	22.1
Multi-family	24.6	26.2	36.7	27.7	28.3	27.0	15.8	14.5	21.9	6.4	6.2	7.0	(4.6)	5.6	8.2	43.7	45.5	55.1

SF = Single-family household. "Children" refers to unmarried children under age 18 living at home.
( ) = Lower reliability estimates due to sample size.

4. THE GEOGRAPHICAL DIMENSION

The richer provinces are the most connected

The three provinces with the highest average incomes – Ontario, Alberta, and British Columbia – have the highest overall Internet penetration rates (Chart 2), and the highest rates of use from the home and the workplace (Table 6). They are the only provinces whose overall penetration rates exceed the national average.

Overall penetration rates increased in each and every province between 1998 and 1999, but there was considerable improvement in Québec's position relative to the other provinces. Although Québec's

Chart 2.
Internet penetration rates, from any location, by province, 1999
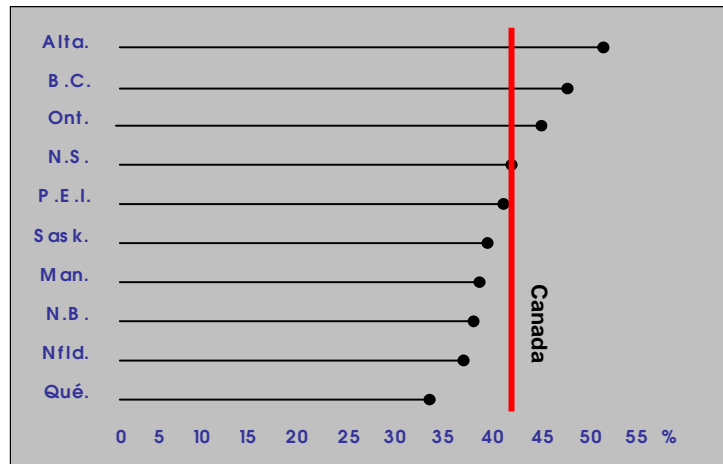
Table 6.
Internet penetration rates, by province and location of use

	Home			Work			School			Public Library			Other			Any Location		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
									%									
All Provinces	**16.0**	**22.6**	**28.7**	**19.9**	**23.3**	**21.9**	**9.4**	**12.1**	**14.9**	**3.7**	**4.3**	**4.5**	**2.8**	**2.6**	**3.9**	**29.4**	**35.9**	**41.8**
Newfoundland	12.4	15.4	18.1	15.7	17.2	14.2	12.9	14.5	18.0	4.3	4.7	5.5	(1.3)	3.7	4.0	26.6	28.9	35.2
P.E.I.	10.5	17.1	20.1	16.6	21.0	19.8	11.4	14.5	19.0	(2.0)	(4.5)	(3.6)	(2.2)	(2.6)	(3.3)	26.0	35.4	40.5
Nova Scotia	14.3	23.7	26.7	20.7	22.9	19.7	14.3	17.4	14.5	5.0	5.6	3.8	3.1	3.4	4.8	32.2	37.9	41.1
New Brunswick	12.1	18.2	23.6	18.0	19.8	19.2	10.7	12.3	13.1	2.6	2.3	2.5	4.9	(2.1)	4.1	29.1	31.0	38.0
Québec	10.2	15.6	21.2	13.1	16.4	17.2	5.6	7.6	11.2	2.1	2.8	3.4	1.8	1.7	3.2	20.1	26.2	33.1
Ontario	19.3	25.5	32.0	23.3	25.5	24.2	10.6	12.6	16.0	4.4	4.7	4.9	3.1	2.4	3.3	33.2	39.0	44.5
Manitoba	13.7	19.9	24.7	20.4	22.3	20.2	9.4	12.5	14.4	3.3	2.4	2.8	3.1	2.8	4.1	29.3	33.5	38.3
Saskatchewan	12.3	18.3	23.6	18.2	21.5	19.3	8.9	13.9	16.6	2.8	3.7	4.1	3.3	2.6	4.9	27.2	33.8	39.9
Alberta	18.7	27.7	34.1	25.8	31.7	27.6	11.8	17.6	21.2	4.3	4.8	5.0	3.4	3.7	4.8	34.5	45.1	50.8
British Columbia	19.9	27.9	35.8	21.2	26.7	23.6	9.6	13.1	14.6	4.5	6.5	6.4	3.1	4.2	6.1	33.6	42.0	48.1

( ) = Lower reliability estimates due to sample size.

penetration rate was still the smallest, it had the biggest percentage increase (26%). One-third (33.1%) of all Québec households used the Internet in 1999, compared with little more than one-quarter (26.2%) in 1998. Furthermore, Québec's penetration rate increased from two-thirds (67.2%) to three-quarters (74%) of Ontario's rate.

Since 1997, Québec has also shown remarkable increases in Internet usage from specific locations, with the work use rate being one-third higher and the home use rate doubling. Newfoundland's home and work penetration rates remain the lowest.

CMA households more likely to be connected

Almost two-thirds (63.1%) of all households in the ten provinces live in Census Metropolitan Areas (CMAs), and more than half (56.3%) live in the largest fifteen CMAs. Taken as a group, households in these fifteen

CMAs had a penetration rate of 46.2%, compared with a 36.1% rate for households residing elsewhere, and made up 62.3% of all households that used the Internet (Table 7).

There was considerable variability within the top 15 CMAs, with penetration rates ranging from highs of 60.7% in Ottawa and 60.1% in Calgary, to lows of 33.6% in Windsor and 33.9% in Quebec City.

Between 1998 and 1999 the overall penetration rate increased for every one of the largest 15 CMAs, although the rates of increase differed. Taken as a group, penetration increased by a smaller proportion for households in these CMAs than it did for other households.

In all the geographic areas investigated, home penetration rates increased between 1998 and 1999 and, with a few exceptions, work penetration rates fell, while school penetration rates increased. In all geographic regions, the major driving force behind the overall increase in penetration was the increase in home use.

Since Québec had the biggest growth in the penetration rate, Montréal

deserves special mention. Although it still had one of the lowest home penetration rates, with one in four home-use households, it had the highest rate of increase of all CMAs between 1998 and 1999. Since 1997, Montréal's work use rate grew by more than one-third, its home use rate practically doubled, and its school use rate more than doubled. All these contributed to giving Montréal a bigger rate of increase in overall penetration than any other CMA between 1997 and 1999.

5. SUMMARY REMARKS

The rapid increase in Internet connectedness among Canadian households seen in 1998 continued in 1999. It was driven largely by an increase in the proportion of households that regularly connect to the Internet from their own homes. By November 1999, 41.8% of households used the Internet in a typical month from any location, and 28.7% did so from home. Furthermore, the average home-use household accessed the Internet more often, more intensely and for a wider variety of uses. The Internet is becoming a daily part of the lives of more and more Canadians.

Table 7.
Internet penetration rates, by location of use and Census Metropolitan Area

	Home			Work			School			Any Location		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
							%					
CANADA	**16.0**	**22.6**	**28.7**	**19.9**	**23.3**	**21.9**	**9.4**	**12.1**	**14.9**	**29.4**	**35.9**	**41.8**
Halifax	19.2	33.8	36.4	30.9	33.7	29.1	15.5	21.5	15.0	39.2	50.2	52.4
Quebec	12.4	21.1	23.3	16.0	18.6	17.2	(7.8)	8.3	(6.0)	23.9	28.6	33.9
Montréal	12.8	18.2	25.5	16.5	20.6	22.4	5.9	8.0	13.0	24.3	31.6	39.1
Ottawa*	34.0	36.1	43.6	44.7	42.3	40.3	15.8	15.8	19.4	55.6	55.4	60.7
Toronto	22.9	27.7	34.8	28.4	29.0	28.8	10.7	12.5	18.3	38.0	42.0	48.5
Kitchener	20.5	25.9	30.9	23.5	26.3	24.4	(12.6)	17.1	(11.9)	34.9	42.4	43.7
Hamilton	16.6	26.8	31.9	20.1	28.1	25.2	(10.8)	14.1	16.2	30.4	41.2	43.1
St. Cath.-Niagara	(14.2)	19.2	25.4	(14.7)	(14.5)	(13.0)	(10.9)	(9.4)	(10.8)	26.1	29.3	34.4
London	18.4	29.0	32.9	22.3	24.7	23.5	(12.1)	(15.3)	(14.1)	31.8	40.4	45.9
Windsor	(14.0)	(15.7)	(21.4)	(13.4)	(14.3)	(14.4)	(10.1)	(11.0)	(14.2)	25.7	26.8	33.6
Winnipeg	16.0	23.6	27.8	24.0	26.2	22.6	10.4	13.5	15.2	33.1	37.8	42.1
Calgary	22.9	34.8	40.7	31.3	38.6	35.4	11.7	20.2	23.3	41.1	52.8	60.1
Edmonton	20.2	27.0	34.3	27.7	30.7	27.1	13.1	13.9	20.7	35.9	43.9	48.8
Vancouver	22.1	31.6	38.4	23.1	30.5	26.5	9.3	13.7	14.7	35.9	45.7	49.7
Victoria	20.9	34.5	42.9	26.2	27.9	30.5	(10.5)	(14.9)	(14.1)	40.1	48.5	56.4
"Top 15" CMAs	19.3	26.2	32.6	24.2	27.3	26.3	10.0	12.5	15.8	33.9	40.4	46.2
Other households	11.8	17.9	23.7	14.6	18.1	16.2	8.6	11.5	13.8	23.6	30.1	36.1
Other CMAs			26.3			21.2			14.9			40.9
All CMAs			32.0			25.8			15.7			45.7

* Ottawa excludes the Hull component of the Ottawa-Hull CMA, which is classed as part of "Other CMAs". Penetration rates for the entire Ottawa-Hull CMA are 56.7% for any location, 39.2% for home, 37.4% for work and 18.2% for school.
( ) = Lower reliability estimates due to sample size.

Internet penetration continues to be higher for households at higher levels of income and education, and for families in younger age groups. But usage has increased for every group, and there are indications that the disparities between groups may have fallen a little. Although interdependent, each of these characteristics has some independent influence on Internet use. There are likely other factors at play explaining the choice to use or not to use the Internet.

Geographically, relative Internet usage continues to be highest in Alberta, British Columbia and Ontario, and lowest in Québec and Newfoundland. However, Québec has had the biggest rate of increase in household penetration. Also, in terms of broad geographical aggregates, the rate of Internet use is larger for households living in the larger urban communities than in other areas.

6. RELATED WORK

In November 1999, for the first time, the Household Internet Use Survey also collected information related to household involvement in electronic commerce. The information from that portion of the survey, available for regular home user households, is analyzed separately in a forthcoming paper, entitled "Internet Shopping in Canada 1999" (Ellison, Earl and Ogg 2001). The paper reports on the number and proportion of households that used the Internet for shopping, whether 'window-shopping' or actually engaging in e-commerce transactions by placing orders over the Internet, the types of goods and services involved, and the characteristics of those households. As well, it reports on the value of household-to-business electronic transactions and the destination of orders and payments.

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Appendix Table 1.
Internet penetration rates, by income and household characteristics

	Bottom Quartile			Second Quartile			Third Quartile			Top Quartile			All Incomes		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
Regular Use From Home							%								
ALL HOUSEHOLDS	**5.5**	**7.1**	**10.9**	**8.8**	**13.6**	**18.0**	**17.1**	**24.4**	**32.4**	**32.5**	**45.1**	**53.5**	**16.0**	**22.6**	**28.7**
Education of household head															
Less than high school	(1.2)	2.3	3.4	2.5	4.3	7.1	6.5	12.1	17.9	13.6	22.9	28.4	3.9	6.6	9.6
High school/college	7.6	9.9	14.6	9.8	15.4	20.5	16.0	24.4	32.6	29.0	40.7	49.1	16.0	23.1	29.6
University degree	23.8	27.2	34.5	25.5	32.7	33.8	33.7	37.5	45.3	46.0	58.6	66.6	37.5	46.7	52.4
Age of household head															
Less than age 35	10.3	14.0	21.2	15.8	20.1	26.8	19.7	28.8	35.6	33.8	44.1	51.8	19.1	26.1	32.8
Age 35 to 54	7.9	11.2	15.4	11.1	17.5	24.5	19.8	26.7	35.8	34.5	48.4	56.9	21.6	30.1	38.0
Age 55 to 64	(3.4)	(4.2)	8.2	6.0	10.7	12.6	12.0	19.3	27.9	27.3	38.4	51.1	12.0	18.2	24.6
Age 65 and over	(1.1)	(1.3)	3.0	(2.4)	4.3	6.8	(6.9)	11.4	17.4	16.3	26.3	27.9	3.4	5.3	8.2
Family type															
Single-family, with children	7.3	11.4	18.3	12.0	19.1	27.5	19.9	29.4	38.8	35.8	48.8	59.6	21.7	31.0	40.6
Single-family, no children	7.4	8.2	12.2	7.1	11.5	15.5	15.0	21.2	28.4	28.9	42.6	49.6	15.5	22.5	28.3
One-person household	3.1	4.0	5.9	6.5	10.6	11.8	12.6	20.4	25.4	26.4	34.1	36.6	7.1	10.5	12.6
Multi-family household	(12.6)	(14.8)	26.2	18.2	17.8	27.3	31.4	24.1	39.6	39.0	44.3	52.1	24.6	26.2	36.7
Regular Use From Any Location							%								
ALL HOUSEHOLDS	**12.4**	**13.2**	**18.8**	**18.4**	**23.6**	**29.2**	**32.8**	**41.5**	**48.1**	**53.7**	**65.1**	**71.2**	**29.4**	**35.9**	**41.8**
Education of household head															
Less than high school	3.4	4.9	7.0	6.2	9.1	12.9	15.6	23.4	28.0	27.1	38.7	42.3	9.0	12.6	16.1
High school/college	17.9	18.0	25.8	21.0	27.0	33.2	32.0	40.9	49.0	50.9	60.8	67.6	31.0	37.4	44.4
University degree	41.9	45.6	49.3	46.1	49.5	51.5	55.8	62.5	64.0	69.4	79.9	84.3	59.6	68.1	70.1
Age of household head															
Less than age 35	24.6	27.8	39.0	32.3	38.4	45.7	40.2	50.8	57.2	59.3	67.0	75.0	37.9	45.3	53.0
Age 35 to 54	17.0	19.1	27.8	24.7	30.5	41.2	37.7	46.3	53.6	56.6	69.0	75.2	38.8	46.9	54.9
Age 55 to 64	7.5	7.4	12.3	11.8	16.6	18.4	22.1	29.3	37.2	44.0	56.3	64.7	21.1	27.5	32.7
Age 65 and over	(2.1)	2.2	3.8	4.2	5.3	8.6	10.2	15.6	21.5	24.0	34.7	33.1	5.5	7.2	10.1
Family type															
Single-family, with children	17.1	22.6	34.3	24.2	33.5	47.4	36.9	47.7	57.8	57.7	68.0	77.8	38.2	47.6	59.0
Single-family, no children	15.1	13.1	18.3	13.8	17.4	21.5	27.0	34.3	39.5	49.5	62.8	65.9	27.7	34.2	38.7
One-person household	6.9	7.4	10.6	17.1	21.1	21.1	32.4	42.9	44.9	47.3	57.1	59.0	16.5	20.4	22.1
Multi-family household	31.5	30.3	43.6	33.9	34.7	47.9	52.9	44.2	54.8	60.0	68.0	72.3	43.7	45.5	55.1

"Children" refers to unmarried children under age 18 living at home.
( ) = Lower reliability estimates due to sample size.

Appendix Table 2.
Distribution of household characteristics, by income

	Bottom Quartile			Second Quartile			Third Quartile			Top Quartile			All Incomes		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999

Regular Use From Home

%

Education of household head

Less than high school	(12.7)	15.5	15.2	18.7	18.7	21.2	29.5	32.2	33.7	39.1	33.6	29.8	7.0	8.0	9.2
High school/college	9.7	8.8	10.5	15.9	17.7	18.4	28.5	29.9	30.8	45.8	43.6	40.3	54.6	56.5	54.0
University degree	6.4	4.7	6.6	9.9	10.1	10.3	23.8	21.2	23.0	60.0	63.9	60.1	38.4	35.5	36.8

Age of household head

Less than age 35	14.7	13.6	17.1	20.9	20.2	22.3	28.3	28.9	27.4	36.2	37.3	33.2	26.4	25.4	22.3
Age 35 to 54	5.9	5.6	6.2	9.9	11.8	12.2	26.0	26.2	28.6	58.2	56.4	53.0	59.2	59.0	59.6
Age 55 to 64	(6.8)	(5.4)	8.2	13.3	16.3	14.2	25.9	25.5	26.2	53.9	52.9	51.5	10.0	10.9	12.1
Age 65 and over	(13.4)	(11.0)	16.1	(25.4)	26.0	28.1	(29.6)	31.4	31.6	31.6	31.7	24.3	4.4	4.8	6.1

Family type

Single-family, with children	5.6	6.0	7.1	11.0	12.5	13.4	26.3	27.5	28.4	57.0	53.9	51.1	46.6	46.7	46.4
Single-family, no children	7.4	6.3	7.4	13.3	14.0	14.7	26.2	25.0	27.0	53.1	54.7	50.9	35.7	36.7	37.5
One-person household	22.1	18.4	22.9	23.8	28.1	27.1	30.7	33.8	33.0	23.4	19.6	17.1	10.7	11.4	11.1
Multi-family household	(14.2)	(12.9)	17.5	19.6	17.1	18.4	26.6	21.4	25.1	39.6	48.6	39.0	7.0	5.1	5.1

Regular Use From Any Location

%

Education of household head

Less than high school	15.8	17.3	18.8	20.2	20.8	23.1	30.6	32.4	31.6	33.4	29.6	26.6	8.9	9.7	10.6
High school/college	11.8	9.9	12.4	17.6	19.1	19.8	29.3	30.9	30.9	41.4	40.1	37.0	57.9	57.7	55.6
University degree	7.0	5.4	7.0	11.2	10.5	11.8	24.8	24.3	24.3	56.9	59.8	56.9	33.3	32.6	33.8

Age of household head

Less than age 35	17.6	15.7	19.4	21.4	22.3	23.6	29.0	29.4	27.2	32.0	32.6	29.8	28.6	27.7	24.7
Age 35 to 54	7.0	6.2	7.8	12.2	13.2	14.2	27.5	29.1	29.6	53.2	51.6	48.4	58.0	57.9	59.1
Age 55 to 64	8.5	6.3	9.2	14.9	16.7	15.6	27.1	25.6	26.2	49.5	51.4	49.0	9.5	10.4	11.0
Age 65 and over	(16.2)	14.2	16.3	27.6	23.6	28.6	27.3	31.5	31.7	28.9	30.8	23.4	3.9	4.1	5.2

Family type

Single-family, with children	7.5	7.8	9.2	12.6	14.3	15.9	27.6	29.1	29.0	52.2	48.9	45.9	44.8	45.2	46.3
Single-family, no children	8.5	6.5	8.1	14.4	13.9	15.0	26.4	26.7	27.5	50.8	52.9	49.5	34.9	35.2	35.2
One-person household	21.1	17.7	23.4	26.9	28.8	27.7	33.9	36.6	33.2	18.0	16.9	15.7	13.6	14.0	13.3
Multi-family household	19.9	15.3	19.5	20.6	19.2	21.5	25.2	22.7	23.1	34.2	42.9	36.0	6.8	5.6	5.2

All Households

%

Education of household head

Less than high school	42.1	44.2	43.0	29.2	28.6	28.8	17.6	17.5	18.1	11.1	9.6	10.1	28.8	27.5	27.4
High school/college	20.4	20.6	21.3	26.0	26.4	26.5	28.4	28.3	28.0	25.2	24.7	24.3	54.8	55.3	52.4
University degree	10.0	8.1	10.0	14.6	14.5	16.1	26.5	26.4	26.6	49.0	51.0	47.4	16.4	17.2	20.2

Age of household head

Less than age 35	27.1	25.5	26.4	25.1	26.3	27.3	27.3	26.2	25.3	20.5	22.1	21.1	22.2	21.9	19.5
Age 35 to 54	16.0	15.2	15.4	19.2	20.2	19.0	28.4	29.5	30.3	36.4	35.1	35.4	43.9	44.3	45.0
Age 55 to 64	23.8	23.3	24.5	26.6	27.7	27.7	25.8	24.0	23.0	23.7	25.1	24.8	13.3	13.5	14.1
Age 65 and over	42.3	46.7	44.2	36.3	32.2	33.8	14.7	14.6	14.9	6.6	6.4	7.2	20.7	20.3	21.4

Family type

Single-family, with children	16.8	16.4	15.7	20.0	20.3	19.8	28.7	29.0	29.7	34.6	34.2	34.8	34.4	34.1	32.8
Single-family, no children	15.5	17.1	17.2	28.9	27.4	26.9	27.1	26.6	26.9	28.5	28.9	29.1	36.9	36.9	38.0
One-person household	50.4	48.8	48.8	26.0	27.9	29.0	17.3	17.4	16.4	6.3	6.0	5.9	24.2	24.7	25.2
Multi-family household	27.7	22.9	24.6	26.6	25.2	24.8	20.8	23.3	23.2	24.9	28.7	27.5	4.6	4.4	4.0

Example (1997, 3rd line): 38.4% of all regular home-use households are headed by someone with a university degree. Of these, 60% are in the top income quartile and 6.4% are in the bottom quartile.

"Children" refers to unmarried children under age 18 living at home.

( ) = Lower reliability estimates due to sample size.

Appendix Table 3.
Distribution of income, by household characteristics

	Bottom Quartile			Second Quartile			Third Quartile			Top Quartile			All Incomes		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
Regular Use From Home							%								
Education of household head															
Less than high school	(10.2)	15.7	14.7	9.5	9.9	12.5	7.7	9.5	11.0	5.4	5.5	5.9	7.0	8.0	9.2
High school/college	61.5	63.1	59.7	63.1	66.3	63.2	58.1	62.6	59.0	49.3	49.2	46.7	54.6	56.5	54.0
University degree	28.2	21.2	25.6	27.5	23.8	24.3	34.2	27.9	32.0	45.3	45.4	47.5	38.4	35.5	36.8
Age of household head															
Less than age 35	44.9	43.7	40.0	39.9	34.0	31.6	27.9	27.1	21.6	18.8	18.9	15.8	26.4	25.4	22.2
Age 35 to 54	40.4	42.2	39.1	42.4	46.0	46.5	57.5	57.1	60.3	67.9	66.5	67.7	59.2	59.0	59.6
Age 55 to 64	(7.9)	(7.4)	10.5	9.6	11.7	10.9	9.6	10.3	11.2	10.6	11.5	13.3	10.0	10.9	12.1
Age 65 and over	(6.8)	(6.7)	10.4	(8.1)	8.3	11.0	(4.9)	5.6	6.9	2.7	3.0	3.2	4.4	4.8	6.1
Family type															
Single-family, with children	30.4	35.7	34.7	37.1	38.8	39.7	45.8	47.6	46.7	52.3	50.4	50.8	46.6	46.7	46.4
Single-family, no children	30.7	29.2	29.2	34.4	34.1	35.2	35.0	34.1	35.9	37.4	40.2	40.9	35.7	36.7	37.5
One-person household	27.4	26.7	26.8	18.5	21.3	19.1	12.3	14.3	13.0	4.9	4.5	4.1	10.7	11.4	11.1
Multi-family household	(11.5)	(8.4)	9.4	10.0	5.8	6.0	7.0	4.1	4.5	5.5	5.0	4.2	7.0	5.1	5.1
Regular Use From Any Location							%								
Education of household head															
Less than high school	13.3	18.3	17.7	11.4	12.2	14.0	9.7	10.9	11.6	6.5	6.3	6.6	8.9	9.7	10.6
High school/college	64.5	62.5	61.2	64.8	67.0	63.1	60.7	61.8	59.8	52.3	50.9	48.2	57.9	57.7	55.6
University degree	22.2	19.2	21.2	23.8	20.8	22.9	29.6	27.3	28.6	41.3	42.8	45.2	33.3	32.6	33.8
Age of household head															
Less than age 35	47.8	47.3	42.5	39.0	37.4	33.3	29.7	28.1	23.4	20.0	19.9	17.3	28.6	27.7	24.7
Age 35 to 54	38.7	39.2	40.8	45.1	46.2	48.3	57.2	58.2	60.9	67.3	65.7	67.2	58.0	57.9	59.1
Age 55 to 64	7.7	7.1	9.1	9.1	10.5	9.9	9.3	9.2	10.0	10.3	11.7	12.7	9.5	10.4	11.0
Age 65 and over	(5.9)	6.3	7.6	6.8	5.9	8.5	3.8	4.5	5.7	2.4	2.8	2.9	3.9	4.1	5.2
Family type															
Single-family, with children	32.0	38.5	37.7	36.0	39.3	42.2	44.4	45.4	46.8	51.0	48.6	49.9	44.8	45.2	46.3
Single-family, no children	27.9	25.1	25.5	31.8	29.7	30.2	33.0	32.4	33.6	38.6	40.9	40.8	34.9	35.2	35.2
One-person household	27.2	27.1	27.7	23.3	24.5	21.2	16.5	17.7	15.4	5.3	5.2	4.9	13.6	14.0	13.3
Multi-family household	12.8	9.3	9.1	8.9	6.5	6.5	6.1	4.4	4.2	5.1	5.3	4.4	6.8	5.6	5.2
All Households							%								
Education of household head															
Less than high school	48.6	48.8	47.3	33.6	31.5	31.6	20.4	19.3	19.9	12.8	10.6	11.1	28.8	27.5	27.4
High school/college	44.8	45.7	44.6	56.9	58.5	55.5	62.3	62.6	58.6	55.2	54.5	50.8	54.8	55.3	52.4
University degree	6.6	5.6	8.1	9.5	10.0	13.0	17.4	18.1	21.5	32.0	34.9	38.2	16.4	17.2	20.2
Age of household head															
Less than age 35	24.1	22.4	20.6	22.3	23.0	21.3	24.2	23.0	20.0	18.1	19.3	16.4	22.2	21.9	19.5
Age 35 to 54	28.2	27.0	27.7	33.6	35.8	34.2	49.8	52.2	54.6	63.9	62.0	63.6	43.9	44.3	45.0
Age 55 to 64	12.7	12.6	13.8	14.2	15.0	15.6	13.8	13.0	13.0	12.6	13.5	13.9	13.3	13.5	14.1
Age 65 and over	35.1	38.1	37.9	30.0	26.2	28.9	12.2	11.9	12.8	5.5	5.2	6.1	20.7	20.3	21.4
Family type															
Single-family, with children	23.2	22.4	20.7	27.4	27.7	26.0	39.5	39.5	38.9	47.5	46.5	45.6	34.4	34.1	32.8
Single-family, no children	23.0	25.3	26.2	42.6	40.4	40.9	40.0	39.2	40.9	41.9	42.5	44.1	36.9	36.9	38.0
One-person household	48.8	48.2	49.2	25.1	27.5	29.2	16.7	17.1	16.5	6.1	5.9	5.9	24.2	24.7	25.2
Multi-family household	5.1	4.1	3.9	4.8	4.5	3.9	3.8	4.1	3.7	4.5	5.1	4.4	4.6	4.4	4.0

Example (1999 columns): Households where the head has a university degree are 20.2% of all households but 36.8% of regular home-use households. They make up 38.2% of all households in the top quartile, but are 47.5% of regular home-use households in that quartile.

"Children" refers to unmarried children under age 18 living at home.

( ) = Lower reliability estimates due to sample size.

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Innovation Analysis Bulletin

A tri-annual report from Statistics Canada with up...
- Government science and technology ac...
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- Advanced technology and innovation

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Vol. 2, No. 2 (May 2000)

Connectedness

In this issue

Innovation in the engineering services industry (page 3)

Fuelled by rapid technological change and the emerging global marketplace, the need for a stream of new and improved products —in other words innovation—is growing. Some 31% of the engineering firms surveyed replaced an existing product, added a new product to their existing line or diversified into new product lines.

Barriers to innovation in service industries (page 5)

Innovation is the basis for progress and the key to success for many organizations. This article examines the effect of perceived barriers to innovation by sector. For instance, the financial services sector is cautious about new technological developments due to f... risks and market outlets.

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Measuring the attractiveness of R&D tax incentives (page 9)

The federal government is an essential player S&T activities in Canada in which it invests over five billion dollars each year. In addition to this direct investment, an additional $1.3 billion of assistance is provided through the federal R&D tax incentive program. This article examines regional differences in science and technology tax regimes in Canada.

The working age population, by degrees (page 10)

To understand the relationship between S&T skills and the labour market Statistics Canada has produced a study that provides insight into where S&T skills are deployed. A study that the number of persons with S&T degrees, pegged at 5 million in 1996, has been growing five times faster than the number of non S&T degree holders. As a group, services (38.1%), and construction (34.4%). have S&T degrees, business graduates are in health (52.0% have concentrations of S&T

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