



Rural and Small Town Canada ANALYSIS BULLETIN



Rural and Small Town Canada Analysis Bulletin
Vol. 7, No. 3 (September 2007)

Catalogue no. 21-006-XIE

Factors Associated with Internet Use: Does Rurality Matter?

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Highlights

- In 2005, only 58% of residents living in rural and small town areas accessed the Internet, well below the national average. Rates in Canada's largest urban areas ranged from 68% in Montreal to 77% in both Ottawa–Gatineau and Calgary.
- This gap between rural and urban areas may reflect the interaction of other socio-economic factors or may represent another effect, such as broadband availability.
- Individuals that are older, those with lower levels of education and those living in households with lower incomes were less likely to have used the Internet.
- The importance of other factors associated with Internet use, such as gender and the presence of children, appears to have changed. The presence of children in a household has no statistically significant effect on an individual's use of the Internet, while women have greater odds of using the Internet than men.

Introduction

The infrastructure of the Internet, like the electrical grid, induces major changes economically, socially, and politically. The longer communities and individuals in Canada stall in their accessibility, adoption and effective use of the Internet, the less competitive they may become relative to those with more aggressive adoption and use rates. Although Bollman (2007) identifies technology as a fundamental driver for rural Canada, he also views Internet service as a component of infrastructure. With the relative

price of communication declining, rural residents can both receive and send information faster than even a few years ago. It remains to be seen however, if and how rural residents are responding to this improvement and what opportunities may arise. This study investigates factors that influence Internet use with an emphasis on rural areas and small towns.

The Canadian Internet Use Survey (CIUS) estimates that 68% of adult Canadians used the



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**Rural and Small Town Canada
Analysis Bulletin**

ISSN 1481-0964
ISBN 978-0-662-46588-1

Editor: Ray D. Bollman
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Published in collaboration with The Rural Secretariat, Agriculture and Agri-Food Canada. The *Rural and Small Town Canada Analysis Bulletin* is an occasional publication of the Agriculture Division of Statistics Canada. To obtain a single issue, visit our website at www.statcan.ca and select Our Products and Services.

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Special thanks to: Josée Bourdeau and Véronique Julien.

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Symbols

The following standard symbols are used in this Statistics Canada publication:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0** true zero or a value rounded to zero
- 0^s** value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- P** preliminary
- r** revised
- x** suppressed to meet the confidentiality requirements of the *Statistics Act*
- E** use with caution
- F** too unreliable to be published

Internet in 2005 for personal non-business reasons. However, only 58% of rural and small town residents accessed the Internet, well below the national average. An analysis of the 2005 CIUS by Noce and McKeown (2007) identifies factors that influence Internet use in Canada. They confirm that an urban-rural digital divide persists with the odds of using the Internet being almost one and a half times greater for an urban resident than for a rural and small town resident.

In addition, other socio-economic factors are shown to have a significant influence on Internet use, chiefly one's level of education. The odds of people with at least some post-secondary education using the Internet are almost three times greater than the odds of people who have, at most, graduated from high school. While past studies

have reported similar findings on education and 'rurality',¹ this study found differing results for two other factors - women rather than men have greater odds of using the Internet, and the presence of children in a household no longer appears to be a significant factor in increasing the odds of an adult using the Internet.

These findings should be taken into consideration by efforts aimed at supporting Internet access and use.

An information society

The ability of a community to compete in today's knowledge economy depends, in part, on the level of uptake of information and communication technologies (ICTs). For many years, there has been a public policy interest in Canada to promote access to advanced telecommunication services and the use of innovative technologies, especially in rural and remote areas where Internet infrastructure is less likely to be provided by market forces. Historically, the evolution of the telecommunications industry was shaped by government policies to regulate the "natural monopoly" structure of providing telephone services (Winseck, 1997).

Regionally-based 'incumbent' firms, enjoying exclusive market share, were required to subsidize rural services from the revenues of more profitable urban and long-distance services in pursuit of the policy goal of universal access to an acceptable level of telephone and 'wireline' data services². For example, a Canadian Radio-television and Telecommunications Commission (CRTC) ruling required incumbent service

1. The term 'rurality' reflects the extent of being rural which is greater for individuals living in places with lower population densities and / or places further from an urban centre. (See Box 1 for the definition of rural and small town areas used in this Bulletin).
2. 'Wireless' services based on the use of radio communications are excluded from these regulations, e.g. cellular telephone and wireless Internet services.

providers to include touch-tone services capable of supporting dial-up Internet access (CRTC, 1999). More recently, the CRTC has mandated the use of a “Deferral Account” reserve fund held by the incumbents for the purposes of extending high-speed services, or ‘broadband’, to rural and remote regions (CRTC, 2006a).

Over the years, a series of federally-appointed panels were created, often leading to programs that promoted ICTs in rural and remote regions. Among others, the 1995 Information Highway Advisory Council laid the foundation for the Connecting Canadians Agenda (Industry Canada, 1995) and the 2000 National Broadband Task Force (Industry Canada, 2001) set a round of broadband initiatives in motion. In addition, many provinces and territories have launched similar regional programs. Despite these initiatives, the CRTC noted that nearly half (47%) of Canadian communities, mainly rural or smaller towns, still did not have access to broadband services in 2005 (CRTC, 2006b).

While it is argued by some people that market forces should be the principal driver for extending and maintaining the availability of telecommunications services, others maintain that certain rural and remote communities will require assistance in order to gain the access required to be full participants in the information society (Ferguson, 2004; Ramírez, 2001). The Telecommunications Policy Review Panel (Industry Canada, 2006) recommended greater reliance on market forces in the industry, but has also called for government interventions to ensure that all communities have access to broadband services by 2010.³

Factors associated with Internet use

Previous research has shown geography to be a significant factor associated with Internet use. Singh (2004) found that households residing outside of Canada’s 15 largest urban areas were significantly less likely to use the Internet from 1998 to 2000, controlling for other factors including age, education and income. In the United States (U.S.) however, a study by Bell, Reddy and Rainie (2004) concluded that living in a non-metro county in itself has little influence as to whether one goes online as digital divides are explained by socio-economic differences. More recently, Whitacre and Mills (2006) reported that rural areas in the U.S. trailed urban areas by 13 percentage points in residential Internet access. They described an evolving ‘digital divide’ determined not only by income but also the availability of broadband services.

Sciadas (2002) concentrated on income as a key factor in the Internet ‘digital divide’, noting that differences in usage rates due to income narrowed somewhat between 1997 and 2000, but that usage gaps persisted between the highest and lowest income earners. Other studies have identified education, age and family structure, in addition to income, as significant factors influencing Internet use (OECD, 2004; Singh, 2004; Veenhof, Clermont and Sciadas, 2005). Given the Canadian policy context and these previous research findings, this study uses data from the Canadian Internet Use Survey (CIUS) to examine factors influencing Internet use (See Box 2).

3. One option is off-setting the higher cost of individuals and communities to connect via satellite services that are now available to all Canadian communities.

Box 1 Data and definitions: Geography

In this study, rural and small town areas are defined as those areas outside of Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs). A Census Metropolitan Area (CMA) has an urban core population of 100,000 and over. A Census Agglomeration (CA) has an urban core population of 10,000 to 99,999. Both CMAs and CAs include all neighbouring municipalities where 50 percent or more of the workforce commutes to the urban core. Rural and small town areas are towns or municipalities outside the commuting zone of CMAs and CAs.

Box 2 Data and definitions: Data source

The 2005 Canadian Internet Use Survey (CIUS), conducted as a supplement to the Statistics Canada Labour Force Survey (LFS), asked more than 30,000 Canadians aged 18 years and over about their Internet use, including electronic shopping, for the previous 12 months. The CIUS replaced the Household Internet Use Survey (HIUS), and more closely conforms to international standards by, for example, focusing on the use of the Internet by individuals, as compared to whether the household had an Internet connection.

A logistic regression model is used to determine the importance of various social, economic and demographic factors in the propensity to use the Internet. The dependent variable is binary, reflecting an individual's use versus no use of the Internet from any location.⁴ Table 1 presents the percentage of adult Canadians 18 years of age and older who used the Internet for personal and non-business reasons from any location during 2005 by the seven independent factors examined in the study. Previous research findings along with our results are discussed further below.

4. An Internet user reported using the Internet during 2005 for personal and non-business reasons from any location including home, school, work, public library or other locations. A detailed technical description of the model can be found in Noce and McKeown (2007).

Table 1 Individuals (18 years of age and over) using the Internet for personal and non-business reasons from any location by selected characteristics, 2005

Characteristics	Percent
All Internet users	68
Age	
- 18 to 34 years	89
- 35 to 54 years	75
- 55 to 64 years	54
- 65 years and older	24
Household income quartile	
- Less than \$25,000	42
- \$25,001 to \$46,999	59
- \$47,000 to \$79,999	74
- \$80,000 or more	86
Geographical location	
1 Urban (CMA/CA)	71
0 Rural and small town	58
Sex	
1 Male	68
0 Female	68
Level of education	
1 At least some post-secondary	81
0 No post-secondary	49
Language of interview	
1 English	70
0 French	61
Household type	
1 With unmarried children under 18	81
0 No children under 18	61

Note: For CMA and CA definition, see *Box 1*

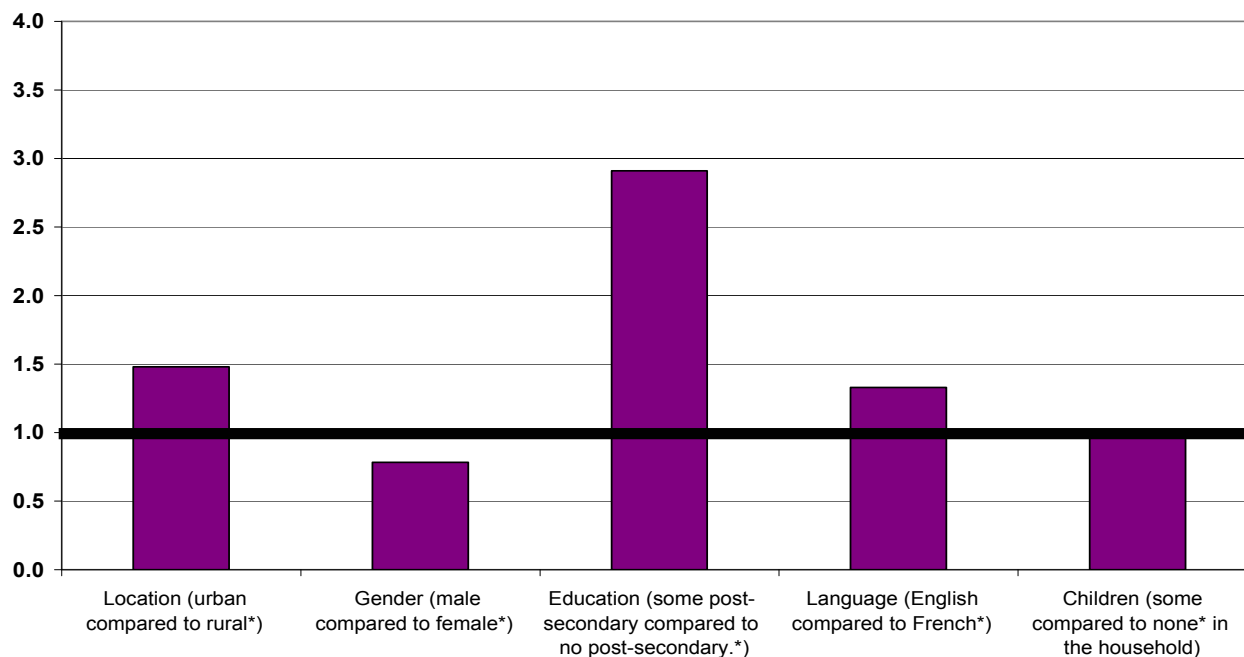
Source: Statistics Canada, Canadian Internet Use Survey, 2005.

Figure 1 graphically illustrates the model results, listing the odds ratio values for five of the independent variables.⁵ These values represent the relative odds of using the Internet after controlling for all other variables. For example, the odds of someone who resides in an urban area using the Internet were 1.48 times that of someone from a rural and small town area. Likewise, the odds of using the Internet for a male were about 0.78 times

(or 22% less) than that of a female. In addition, the odds of using the Internet for someone living in a household with children were the same as those for someone from a household without children, controlling for other factors such as age, income and education.

5. Of the seven factors influencing Internet use, two were continuous control variables – age and household income – and the remaining five were treated as binary predictor variables – residential location, sex, education, language and the presence of children.

Figure 1 Odds ratio of using the Internet for personal or non-business reasons, comparing each indicator to the reference group, for individuals 18 years and over, Canada, 2005



* reference group

Source: Noce and McKeown (2007)

Age

Previous research has found that younger individuals are more likely to adopt ICTs than older members of society (OECD, 2004; Singh, 2004). Therefore, respondent age was entered into our model as a continuous control variable. The results are consistent with previous findings in that each additional year of age results in a 6 % reduction in the odds of using the Internet. This indicated that age is an important factor to control for when comparing urban with rural areas. While a generational gap currently exists for Internet use, it is a cohort rather than an age effect. That is, people will not stop using the Internet as they age. Rather, the Internet use rate among tomorrow’s older Canadians will reflect the higher rate of today’s younger adults.

Income

Sciadas (2002), Singh (2004), and Whitacre and Mills (2006) all noted that lower incomes are associated with lower rates of Internet use. As such, respondent household income was entered into our model as a continuous control variable. As expected, we found income had a strong and positive influence on Internet use.⁶ With the relative cost of access, bandwidth and computer equipment declining, income should become less of an impediment to Internet use. Nevertheless, it continues to be an important

6. The household income distribution, skewed positively, was transformed logarithmically to base 10 for entry into the model to satisfy the assumption of a normal distribution for a continuous independent variable. This makes interpretation of the resulting coefficient less straightforward.

factor to take into account when comparing urban with rural Internet use.

Gender

The OECD (2004) observed that proportionately more men than women are Internet users in most countries. However, some evidence points out that this difference has diminished over time, particularly – but not always – in countries with higher Internet use rates such as Canada and the U.S. (Huyer, Hafkin, Ertl and Dryburgh, 2005). According to our analysis, Canadian adult males were 22 % less likely than females to use the Internet for personal non-business reasons after controlling for other factors such as age, education and household income. Therefore, despite an overall equal proportion of men and women using the Internet, a gender gap exists in Canada, after one takes into account the other factors in our model.

Education

Most studies have associated a higher level of educational attainment (a factor linked with income) with a higher rate of Internet use (Dryburgh, 2001; Singh, 2004; Whitacre and Mills, 2006). In our model, respondents were divided into two groups - those with at least some post-secondary education and those with no post-secondary education. Consistent with previous findings, education has a positive and significant influence on Internet use. That is, after controlling for other factors, the odds of using the Internet are nearly three times (2.91) greater for someone who has some post-secondary education than someone who has, at most, a high school education.

Language

In 2000, it was estimated that about 44% of Francophones in Canada used the Internet, compared with 58% of Anglophones

(Dryburgh, 2001). In our study, language of the interview for the CIUS, either English or French, was used as a proxy indicator and entered into the model.⁷ Our model finds that, after controlling for other factors, the odds of using the Internet are 1.3 times greater for someone who was interviewed in English than in French. The ability or desire to communicate in French appears to be a potential barrier to Internet use. A reason might be the perceived smaller amount of French language material found on Canadian websites.⁸

Children

Singh (2004) found that the presence of children under the age of 18 in the household increased the odds of a household accessing the Internet. In our model, respondents were classified either as living in a household with children under the age of 18 or living in a household without children. After controlling for other factors, the presence of children in the household did not change the odds of an individual using the Internet. This finding suggests that, although households with children are more likely to have an Internet connection, it does not directly extend to the fact that all adult household members use the Internet for personal or non-business reasons.

Geographic location

Singh (2004) reported that, after holding all other independent variables constant for all three years between 1998 and 2000,

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7. Language of interview is not in all respects a perfect proxy for mother tongue or home language.
 8. In the 2005 CIUS, for Internet users who indicated English as their language of preference for the interview, 97% reported obtaining information in the language of their choice compared to just 83% among those indicating French. Similarly, Dryburgh (2001) reported that 99% of Anglophones believed there is enough Internet content in their language of choice, compared to only 62% of Francophones.

households located outside the largest 15 CMAs in Canada had lower odds of using the Internet. However, Bell and colleagues (2004) found that living in a non-metro county in itself had little influence on Internet use. To test this effect, residents were classified as either urban (CMA or CA) or rural and small town (non-CMA/CA). The model found location as the second most important factor influencing Internet use. After taking into account all the variables listed above, we found that the odds of urban dwellers using the Internet were almost one and a half (1.48) times greater than those from small towns and rural areas. This shows that ‘rurality’ is still a significant determinant in and of itself, in line with Singh’s (2004) previous findings.

Discussion

The results of this study indicate that some factors that influence the decision to connect a household to the Internet do not equally influence Internet use by adult members of the household. However, it also shows that three important barriers to Internet use in Canada continue to be lower levels of income, lower levels of educational attainment and a rural location – a finding consistent with past studies. Efforts to understand the connectedness of Canadians must therefore consider both supply and demand factors. On the supply side, the availability of ICT infrastructure, particularly

broadband and its cost is important while, on the demand side, the greatest digital divide reflects differences in an individual’s post-secondary education.

There are two areas that require further study. First, our results do not take ‘interaction effects’ into account – there may be important relationships among the factors we examined. For instance, Singh (2004) found that, contrary to the expectation that rural entrepreneurs would be more likely to be using the Internet to overcome distance, rural households with a self-employed respondent were less likely to be connected to the Internet, compared to an urban household with a self-employed respondent. In this study, an interaction effect between gender and education may shed further light on the apparent reversal of the gender divide.

Second, our results warrant further investigation of the ‘digital divide’ along an urban-to-rural gradient, based on both distance and population density. This may reveal important nuances among rural residents living closer to cities versus those living in more remote regions of Canada. To measure distance, areas that lie outside of cities may be classified according to the degree of urban influence exerted using metropolitan influence zones (MIZ) (see McNiven, Puderer, and Janes, 2000). The Internet use rate across one such gradient is depicted in Table 2.

Table 2 Individuals (18 years of age and over) using the Internet for personal and non-business reasons from any location by community size, 2005

Community size	Percent
CMA > 1 million persons	73
CMA 250,000 to 1 million persons	71
CMA 100,000 to 249,999 persons	68
CA (10,000 to 99,999 persons)	65
Rural and small town, strong to moderate MIZ	56
Rural and small town, weak to no MIZ	57

Note: For CMA/CA definitions, see *Box 1*

Source: Statistics Canada, Canadian Internet Use Survey, 2005.

The declining rate of Internet use along this gradient implies that location might be acting as a surrogate for other factors such as broadband availability or the higher price of connecting to the Internet in rural areas. As Whitacre and Mills (2006) conclude, over the past decade, the availability of broadband has now become a factor in the rate in which rural American households use the Internet. High-speed access enables an increasing host of Internet uses ranging from commercial, educational and health-related, to accessing government services, social networking and using new modes of communication (e.g., Voice Over Internet Protocol - VOIP).

If broadband availability is an influential supply factor, especially in smaller towns and rural areas, further studies of Internet use should consider gaps in access speeds as well as gaps in connectedness. As communities across Canada gain access to high-speed Internet services, the focus may shift to the price of these services and the demand for connecting to these services at current prices. Moreover, it also appears the 'digital divide' is evolving beyond connectedness to a second level or usage divide observed through the diversity and versatility of Internet use (Montagnier, 2007).

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