**Original Article** 

# **Canadian Orthodontist Internet User Profile**

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**Abstract:** An anonymous, self-administered, mail-out survey of Canadian Orthodontists was conducted to evaluate the characteristics of orthodontic Internet use. The response rate was 45.6% (304 of 667). A total of 76.6% of orthodontists reported having Internet access at work, and an additional 12.4% reported having Internet access from a different location. Statistically significant associations between Internet usage and office staff size (P < .001) and years of practice (P = .046) were observed. Offices with larger staffs had greater Internet access. Number of staffs and number of case starts were positively correlated (P < .001, r = 0.498). The odds ratio for having Internet access on the basis of increased case starts from the less than 100 to 300–399 categories was 5.67. Although not statistically significant, there was a trend for greater Internet access by younger practitioners. (*Angle Orthod* 2006;76:92–97.)

Key Words: Internet; e-health; Orthodontist; Demographics

#### INTRODUCTION

The Internet has, in some instances, made access to information, products, and services instantaneous. The Internet has also provided an immediate and efficient way of transferring information, the boundaries of which are only limited by accessibility to an Internet connection. Wide accessibility should allow for implementation of e-health in orthodontic practice. In general terms, e-health refers to health care delivery using electronic media over the Internet and can encompass a variety of services including informational, educa-

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Accepted: January 2005. Submitted: November 2004. © 2006 by The EH Angle Education and Research Foundation, Inc. tional, administrative, clinical, and commercial.<sup>1</sup> Because the characteristics and current habits of Internet use are determined, strategies can be developed for implementation of current and future technology.

There is currently no information available specific to Internet use by orthodontists. This study assesses Internet usage by Canadian orthodontists in 2004. The findings of this study can be compared with baseline data for Internet usage by the general population and by dentists more specifically. Statistics Canada and US Census Bureau indicate that in 2000, almost half of the households in North America had access to the Internet at home.<sup>2,3</sup> Surveys of American dentists show that in 2000, 92.4% had access at home and 85.6% had access at work.<sup>4</sup>

The Internet has become the source of a wealth of information. Understanding who the users are can help increase the service it can provide. Descriptive research has shown that Internet users have certain characteristics. That is, factors such as education, household income, age, and location are used to establish profiles of Internet users and nonusers.

Age has become a common identifier of Internet use. The general trend is that Internet use is lower among older age groups. As is commonly seen, younger generations are more willing to accept, implement, and apply new technology. Surveys of the North American population have revealed that Internet use is highest among persons in their late twenties to early forties.<sup>2,3</sup> Because of the length of time it takes to obtain an education as a certified specialist in orthodontics, one would expect that those who have recently graduated would fall in the age range of 30 to 40 years. Therefore, orthodontists in this age range would be more likely to have Internet access than those at the end of their careers. This is seen among dentists who reported that 85.7% of dentists under the age of 39 had Internet access at work, whereas 67.1% of dentists over the age of 60 had Internet access at work.<sup>4</sup>

As previously mentioned, an orthodontic education takes numerous years of postsecondary university education. With the typical 2-4 years of general studies, four years of dental school, and 2-3 years of orthodontic specialty training, the minimum amount of postsecondary education for a certified specialist in orthodontics would be 8-10 years. Educational attainment is a factor that has been linked to Internet use. It would be expected that orthodontists would be more likely to have access to the Internet.<sup>2,3</sup> US and Canada census information reports that 66.0% and 83.1% of individuals with a bachelor's degree or a university degree had access to the Internet at home.<sup>2,3</sup> Dentists in the US reflect the correlation between greater amount of postsecondary education and Internet access because 92.4% reported having Internet access at home and 85.6% reported having Internet access at work.4

About 8 in 10 family households in the US with annual incomes of \$75,000 US or more had at least one individual who accessed the Internet from home. In contrast, only about 2 in 10 US families with household incomes below \$25,000 had Internet access.<sup>3</sup> In Canada, 80.5% of family households with a household income of \$80,000 CAN or more had at least one Internet user. Only 32.8% of family households with a household income of less than \$30,000 had at least one Internet user.<sup>2</sup> An American Dental Association (ADA) survey of American orthodontists and dentofacial orthopedists revealed that the average net income from primary private practice in 1998 was \$223,730.<sup>5</sup>

The objectives of this study were as follows.

- 1. To obtain information regarding office characteristics relative to Internet use among orthodontists.
- To compare the socioeconomic characteristics of orthodontists to the North American public regarding Internet use.
- 3. To develop profiles of Internet users and nonusers in the orthodontic profession.

## MATERIALS AND METHODS

### Survey instrument

Canadian orthodontists were surveyed using a mailout questionnaire. The purpose of the survey was to obtain information related to computer usage and usage of digital and electronic technology in orthodontic offices in Canada. This survey of orthodontists assessed the following: (1) demographic and practice characteristics, (2) office computer usage, and (3) perceptions and attitudes regarding the use of Information Technology.

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The demographic and practice characteristics surveyed included practice type, birth year, years of orthodontic practice, practice location, number and type of staffs, computers in practice, hours of practice, and yearly case starts. The number of offices that reported having Internet access in their primary practice office determined office Internet usage.

The initial survey was developed by a master's student assisted by his thesis committee (two practicing orthodontists, a dental information technology expert, and a sociologist) who helped identify relevant issues pertaining to the use of the Internet in orthodontic offices and helped develop questions to gather information about the use of the Internet in orthodontic offices. A pilot group consisting of three practicing orthodontists of varying age and practice demographics then reviewed a draft survey. Feedback was obtained from the pilot group, and minor revisions were made to produce the final draft. The research protocol was approved by the Health Research Ethics Board at the University of Alberta.

## Survey distribution

The provincial registries for 2003 were obtained to develop a mailing list of Canadian orthodontists. Two orthodontists were excluded from the mailing list because of their involvement in the development of the research tool. The remaining 687 orthodontists became the population for the study.

The survey questionnaire, a return self-addressed stamped envelope and an introduction letter to explain the research topic and to obtain informed consent from the participating orthodontists were compiled into a packet and distributed. A reminder card was mailed out one and two weeks after the initial mail out. The reminder cards were sent to the population to thank them for their participation or to remind them to complete the questionnaire and to return the survey.

Incorrect addresses resulted in 34 mail-out packets being returned to sender. The American Association of Orthodontists (AAO) and Canadian Association of Orthodontists (CAO) website directories were checked to attempt to obtain up-to-date addresses. Of the 34 returned to sender, updated addresses were located for 14 orthodontists, and the survey packets were redistributed. If a current address could not be obtained for the individual, they were considered not to be practicing and were removed from the population. The total number of surveys mailed to orthodontists was 667.

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## Data analysis

The surveys were collected and responses were entered into precoded spreadsheets. The data were cleaned by checking for any entries outside of the legitimate range or inconsistent codes, and the necessary corrections were made by manually rechecking the surveys. The results were manually entered into SPSS for Windows (SPSS Inc, Chicago, III) and were prepared for data analysis. A random number generator was used to select 20% of the surveys. These were hand-checked by a third party for errors. From this, a rate of data entry errors was determined. The data entry error rate was 0.103% (12 of 11,651 points). This was considered to be low enough to forego further manual confirmation. The data were considered to be accurate enough for data analysis. The data were then analyzed using descriptive statistics. Stepwise logistic regression analysis was completed to evaluate association of the variables of interest with Internet use. Practitioner age, number of staffs, and years of practice were entered into the regression as continuous variables. Number of case starts and hours per week worked were entered as categorical variables. Kendall's correlations were calculated to evaluate association between variables included in the regression model.

## RESULTS

From the population of 667, a total of 304 surveys were received for data collection, which produced a response rate of 45.58%. Nine respondents were in "full-time academic" positions, 17 reported as "not practicing", and 278 orthodontists were currently practicing. The 17 persons who were not practicing were excluded from the analysis. Key demographic data are shown in Table 1.

A total of 76.6% of orthodontists reported having Internet access at work. In addition to this, another 12.4% reported accessing the Internet from a different location. Therefore, 89.0% of orthodontists in Canada have access to the Internet.

Key descriptive data and cross tabulations by Modem/Internet access are shown in Table 2.

The overall regression identified only number of staffs as significant (P < .001), with  $R^2 = 0.12$ . In the final model, years of practice was significant (P = .046, odds ratio = 0.97), and the number of staffs was significant (P < .001, odds ratio = 1.25) (Table 3).

## Age vs Internet

The age of practicing orthodontists ranged from 29 to 73 years of age. A total of 86.6% of orthodontists under the age of 40 reported having Internet access

TABLE 1. Key Demographic Data of Survey Respondents<sup>a</sup>

Characteristics	n	
Age	268	Mean, 47.4 y SD, 9.3 y
Years practicing orthodontics	274	Mean, 15.9 y SD, 9.4 y Range, 1–46
Province of primary practice	275	
British Columbia	58	21.1%
Alberta	46	16.7%
Saskatchewan	6	2.2%
Manitoba	9	3.3%
Ontario	100	36.4%
Quebec Now Brupswick	41	14.9%
Prince Edward Island	1	2.2 /0 4%
Nova Scotia	8	2.9%
Newfoundland	0	0%
Population of community of		
primary practice	275	
Less than 100.000	99	36.0%
100,000-499,999	65	23.6%
500,000-999,999	69	25.1%
1,000,000 or more	42	15.3%
Total number of staff	270	Mean, 7.9 SD. 6.7
Hours worked in the average		,
week	266	
Less than 16	8	3.0%
17–24	22	8.2%
25–32	120	44.9%
33–40	105	39.7%
40 or more	11	4.1%
Case starts per year	260	
Less than 100	30	11.5%
100–199	81	31.2%
200–299	81	31.2%
300–399	38	14.6%
400 or more	30	11.5%
Modem/Internet connection in		
office	269	
Yes	206	76.6%
No	63	23.4%

<sup>a</sup> Total n varies due to nonresponses. Maximum total n = 284.

at work. This amount decreased to 72.6% in the 50 and older category, but the association between age and Internet use was not statistically significant.

Similarly, the range of years of practice of the respondents was between 1 and 46 years of practice. In this instance, 81.9% of the orthodontists with less than 10 years of experience reported having the Internet in their offices, whereas only 72.7% of the orthodontists 30 or more years of practice reported having the Internet. The association between the two variables was of statistical significance (P = .046). With an odds ratio

TABLE 2.	Key Descriptive Data and Cross Tabulations by Modem/
Internet Co	nnection

Yes No   Age $n = 262$ Less than 40 y of age 58, 86.6% 9, 13.4%   40-49 y of age 62, 75.6% 20, 24.4%   50 y of age and older 82, 72.6% 31, 27.4%	Ye	00		
Age $n = 262$ Less than 40 y of age58, 86.6%9, 13.4%40-49 y of age62, 75.6%20, 24.4%50 y of age and older82, 72.6%31, 27.4%Years of orthodontic practice $n = 267$		Yes No		
Less than 40 y of age 58, 86.6% 9, 13.4%   40-49 y of age 62, 75.6% 20, 24.4%   50 y of age and older 82, 72.6% 31, 27.4%		n = 262		
40-49 y of age 62, 75.6% 20, 24.4%   50 y of age and older 82, 72.6% 31, 27.4%	s than 40 y of age 58, 86	6.6% 9,	13.4%	
50 y of age and older 82, 72.6% 31, 27.4% Vears of orthodontic practice $p = -267$	49 y of age 62, 75	<b>'5.6% 20</b> ,	24.4%	
Years of orthodontic practice $n - 267$	of age and older 82, 72	2.6% 31,	27.4%	
	of orthodontic practice	n = 267		
Less than 10 years 68, 81.9% 15, 18.1%	s than 10 years 68, 87	1.9% 15,	18.1%	
10–19 years 66, 78.6% 18, 21.4%	19 years 66, 78	8.6% 18,	21.4%	
20–29 years 56, 71.8% 22, 28.2%	29 years 56, 7'	1.8% 22,	28.2%	
30 or more years16, 72.7%6, 27.3%	or more years 16, 72	2.7% 6,	27.3%	
Population of primary practice	Population of primary practice			
location n = 269	n n = 269			
0 to 99,999 73, 75.3% 24, 24.7%	99,999 73, 75	<b>5.3%</b> 24,	24.7%	
100,000 to 499,999 52, 80.0% 13, 20.0%	,000 to 499,999 52, 80	13, 10.0%	20.0%	
500,000 to 999,999 52, 78.8% 14, 21.2%	,000 to 999,999 52, 78	'8.8% 14,	21.2%	
1,000,000 or more 29, 70.7% 12, 29.3%	10,000 or more 29, 70	0.7% 12,	29.3%	
Provincial location of practice $n = 269$	cial location of practice	n = 269		
Alberta 36, 81.8% 8, 18.2%	erta 36, 87	81.8% 8,	18.2%	
British Columbia 45, 77.6% 13, 22.4%	sh Columbia 45, 77	7.6% 13,	22.4%	
Manitoba 7, 77.8% 2, 22.2%	iitoba 7, 77	7.8% 2,	22.2%	
New Brunswick 5, 83.3% 1, 16.7%	/ Brunswick 5, 83	3.3% 1,	16.7%	
Nova Scotia 8, 100.0% 0, 0%	a Scotia 8, 10	00.0% 0,	0%	
Ontario 69, 71.1% 28, 28.9%	ario 69, 7	1.1% 28,	28.9%	
Prince Edward Island 1, 100.0% 0, 0%	ce Edward Island 1, 10	00.0% 0,	0%	
Quebec 29, 72.5% 11, 27.5%	bec 29, 72	2.5% 11,	27.5%	
Saskatchewan 6, 100.0% 0, 0%	katchewan 6, 10	00.0% 0,	0%	
Total number of staff $n = 264$	number of staff	n = 264		
Less than 5 39, 54.9% 32, 45.1%	s than 5 39, 54	4.9% 32,	45.1%	
5 to 8 79, 76.0% 25, 24.0%	8 79, 76	6.0% 25,	24.0%	
9 or more 84, 94.4% 5, 5.6%	more 84, 94	4.4% 5	, 5.6%	
Hours worked in the average n = 266 week	worked in the average k	n = 266		
0 to 24 h 20, 66.7% 10, 33.3%	24 h 20, 66	6.7% 10,	33.3%	
25 to 32 h 90, 75.0% 30, 25.0%	o 32 h 90, 75	5.0% 30,	25.0%	
33 or more h 94, 81.0% 22, 19.0%	or more h 94, 8 <sup>-</sup>	1.0% 22,	19.0%	
Case starts per year $n = 259$	starts per year	n = 259		
Less than 100 18, 60.0% 12, 40.0%	s than 100 18, 60	0.0% 12,	40.0%	
100–199 54, 67.5% 26. 32.5%	-199 54. 67	7.5% 26.	32.5%	
200–299 65, 80.2% 16, 19.8%	-299 65. 80	0.2% 16.	19.8%	
300 or more 60, 88.2% 8, 11.8%	or more 60, 88	8.2% 8,	11.8%	

TABLE 3.	Result of Stepwise Logistic Regression for Practice Var-
iables Asso	ciated With Internet Access

		Odds	95% Confidence Interval for Odds Ratio	
	P value	Ratio	Lower	Upper
Years of practice Number of staff	.046 <.001	0.969 1.251	0.939 1.136	0.999 1.377

of 0.969, the relationship between years of practice and Internet access was not clinically significant.

#### Location vs Internet

Survey responses were received from all the provinces in Canada except Newfoundland, where only four orthodontists are reported to be practicing, and the territories. Not considering Newfoundland and the territories (North West Territories, Nunavut, and Yukon), provincial location appears to be of little importance regarding Internet use because all the provinces reported Internet access above 70%. Unfortunately, because of the small sample population and response rate in some provinces, it was not possible to include region of practice in the regression model.

The population of the city or town in which the orthodontists' primary practice was located was not associated with any statistically significant differences in Internet use. In fact, offices situated in locations of more than one million people reported the lowest frequency of Internet use (70.7%). Offices in locations between 100,000 and 499,999 people reported the highest incidence of Internet access at 80.0%.

## Office size vs Internet

Offices with more staffs use the Internet more than those with fewer staffs. Offices with nine or more staffs had Internet access at work 94.4% of the time, whereas only 54.9% of offices with less than five staff members had Internet access at work. The association between number of staffs and Internet access was statistically significant to P < .001. The odds ratio for having Internet access was 1.25, which indicates that there is a 1.25 times greater chance of having Internet access, with addition of another staff member.

In offices where the orthodontist starts 300 cases or more, 88.2% had Internet access. This steadily decreased to 60.0% in offices that started less than 100 cases per year. Practice production, based on the number of case starts per year, was significantly correlated with number of staffs (P < .001, r = 0.498). Because of this correlation, a separate regression for number of case starts by category was completed (Table 4). The odds ratio for having Internet access on the basis of number of case starts, suggests that the likelihood of having Internet access increased by 5.6 times between the categories less than one hundred and the category of 300–399 case starts.

Although not statistically significant, descriptively, the more hours an orthodontist works, the more likely he or she is to have an Internet connection. Only 66.7% of orthodontists working three days or less per week had the Internet compared with 81.0% with orthodontists who worked more than four days per week.

400 +

95% Confidence Interval for Case Starts Odds Ratio Per Year Odds Category P value Ratio Lower Upper Overall .016 100-199 .660 0.512 2.880 1.214 200-299 .076 2.259 0.919 5.557 300-399 .007 5.667 1.595 20.130

**TABLE 4.** Result of Stepwise Logistic Regression For Number ofCase Starts by Category Associated With Internet Access

## DISCUSSION

3.333

.050

0.998

11.193

On the basis of the findings of this research, a profile of an Internet user in the orthodontic profession can be developed. Although some of the characteristics did not reach statistical significance, descriptively, they mirror many of the socioeconomic factors of Internet users seen in the general public. Because these characteristics are identified, efforts can be made to target and assist those who desire and are in need of assistance in incorporating telecommunication technology into their offices.

Descriptively, age and years of orthodontic practice seem to be factors related to Internet usage. The trend observed in the slow but steady decrease in Internet access, as it relates to age, is consistent with other findings. For example, the ADA research shows a gradual but steady decline in Internet access at work in the age categories from under 40 to 60 and older.<sup>4</sup> The North American public has also reported that increase in age has a negative relationship to Internet use.<sup>2,3</sup> As with any new technology, the younger generations seem to be quicker to accept and apply them. It might be expected that as time goes on, age will become a less important indicator of Internet usage because the technology would have filtered through all the generations.

Over three-fourths of orthodontists had Internet access at work, and an additional 12.4% had access at a different location. In other words, the total for Internet access among Canadian orthodontists is 89.0%. This is reflective of a highly educated population, which would be expected to have a relatively high level of Internet usage. In 2000, the comparative dental group reported that 56.4% had the Internet at work, 90.6% had access at home, and another 1.7% had specified access from another location or from a wireless connection.<sup>4</sup> Similarly in 2000, North Americans with a minimum of a university or bachelors degree reported having Internet access in 79.3% of Canadian homes and 66.0% of US homes.<sup>2,3</sup>

Individuals in the general population located in urban or metropolitan areas have tended to be higher

Internet users than those in rural or nonmetropolitan areas.<sup>2,3</sup> Because orthodontic offices are for the most part located in urban or metropolitan centers, data comparison was not expected to show differences between offices located in differently populated centers. This was in fact the case. There was no descriptive or statistical significance in the relationship between the population of the center in which the office is located and computer use. Obviously, part of the issue relates to Internet availability in remote or rural locations. In some more remote locations, Internet access may not yet be available. Because orthodontic offices are typically located in more densely populated areas, Internet availability should not be a factor. In fact, none of the orthodontists who reported that they did not have access to the Internet stated that it was because they were located in a remote location and the service was unavailable.

Similarly, even though Statistics Canada information has shown differences in Internet usage from one province to another, this did not seem to be a significant factor when applied to orthodontist's Internet use. Because of the small number of orthodontists in some of the provinces, it was difficult to obtain statistically significant information, but descriptively, there was no apparent relationship between provincial location and Internet use. In fact, some of the data were opposite of what is seen in the general population, in that orthodontists from Alberta, British Columbia, and Ontario reported less Internet access than their colleagues from other provinces.<sup>2</sup>

Economic factors are also correlated with Internet usage. Statistics Canada and the US Census Bureau use \$80,000 CAN and \$75,000 US, respectively, as their upper limit for their household income groupings. On the basis of ADA Survey Center research, the average net income for orthodontists from their primary private practice in 1998 was \$223,730 US. This would indicate that in all probability the majority of practicing orthodontists would fall into the highest end of the household income categories. Orthodontists' Internet use was comparable with or slightly higher than that of the high income general public.<sup>2,3,5</sup>

Because net income may not relate directly to practice size, total number of staffs, hours of work per week, and orthodontic case starts were the practice factors used to assess practice size. On the basis of number of staffs and number of case starts, it appears that there is a major increase in Internet usage from the very small (less than 100 case starts) and the moderately large sized (300–399 case starts) practice. Larger orthodontic practices use the Internet more than smaller orthodontic practices.

# CONCLUSIONS

- A total of 76.6% of orthodontists in Canada have Internet access at work, and 89.0% report Internet access either at work or elsewhere.
- There is no statistical significance between an orthodontist's age of practice and Internet use; however, younger cohorts appear to be more likely to use the Internet.
- Orthodontists' Internet access is similar to or slightly higher than the university educated general population.
- Most orthodontic offices are located in urban locations, and no relationship was found between population size and office Internet access.
- There is no apparent interprovincial difference in Internet access.
- · Larger orthodontic offices, which have more staffs

and treat more cases, have a greater frequency of Internet access.

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