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**An Exploration of Consumer Health Information Search
Patterns and Information Sharing with Physicians in
Canada**

By

Mehrdad Roham, Anait R. Gabrielyan, Normand P. Archer

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ABSTRACT

Objectives: To investigate the patterns and predictors of individual online health information seeking, including socio-demographic characteristics, Internet activities and level of use, type of health information sought, and likelihood of sharing health information with physicians.

Data and Methods: Secondary data analysis from a cross-sectional survey of a representative national Canadian consumer sample in 2007 (n=26588). Bivariate and multivariate logistic regression analyses were performed to assess the relationships between Internet search for health information, sharing Internet health information with physicians, and the socio-demographic characteristics, Internet usage levels, and Internet activities of respondents.

Results: 61% of the Canadian population more than 16 years old had home Internet access, and 59% of these, or 36% of the population, sought health information via the Internet. Searching for health information was the second most popular online activity, following general Internet activities. Socio-demographic characteristics, Internet usage experience, privacy and security concerns, and Internet activities were significantly associated with health information search. Disease-specific information was the most frequently sought health information, followed by lifestyle information and disease symptoms. Women, individuals who had used the Internet for 2-5 years, and those who lived in megalopolises, were very concerned about Internet privacy and security. Individuals who used the Internet for other activities (general, government and online shopping) were more likely to discuss health information found on the Internet with their physicians.

Conclusions:

This study reveals that income, rural/urban residency, and the number of persons in households were not significant determinants of Internet use for online health information searches by Canadians. Our study indicates a low level of communication between physicians and patients about health-related information found on the Internet. Strategies to increase Canadian access to the Internet for health information will likely help them to become better informed and active participants with their physicians on health related decisions.

Keywords: internet, health information search, information search behavior, physician–patient communication

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INTRODUCTION

Internet use over the last decade has grown dramatically, with more people using the Internet as a complementary and positive resource¹ to find health related information²⁻¹¹. Internet-derived information is helping to transform medical care³, yielding better informed patients with a higher likelihood of adherence and improved health outcomes¹², improving patient understanding of their medical conditions and self-efficacy¹³ and changing the way people protect their health.

Access to Internet health information is also changing the dialogue between providers and patients about health¹⁴⁻¹⁶, where better informed patients are involved in purposeful and goal-oriented activities, rather than in passive exposure to information^{13,14,16}. Health information seeking has been noted as a critical component of shared decision-making^{17, 18}. Patients who are encouraged to share information with their healthcare practitioners¹⁹⁻²¹ can become more actively involved in health related decisions²²⁻²⁶ that are thus weighted more according to the specific needs, preferences, and values of the patient.

Understanding who is more likely to use the Internet as a health information tool, what they are looking for, and who is sharing the information they find with their physicians is an important aspect of understanding how the Internet is transforming medical care. Numerous studies have investigated the characteristics of people who use the Internet for health information, but most research on this issue has been done with populations in the United States²⁷⁻³⁵ and Europe^{14,36-40}.

In results obtained from previous studies there has been a digital divide between those who use and those who do not use the Internet to search for health information. Health information seekers are more likely females compared to males^{27-29,33,37}, and tend to be better educated^{1,3,33}. However, other socio-demographic characteristics, such as age, income and race/ethnicity have yielded mixed results in several studies^{1,3,33-37}. Important Internet usage characteristics, such as expertise, tenure (number of years of online experience), activities (e.g. general, government information and shopping), and concerns about privacy and security are often missing from peer-reviewed investigations about the nature of health information search^{1, 3, 33}.

Since there is also a dearth of research on the use of the Internet to obtain health information, outside of studies of American and European populations, it is useful to address all the limitations mentioned, for other populations. This study investigates patterns of online health information seeking, including considerations of socio-demographics, Internet use and activities, types of health information sought, and patterns of sharing information found on the Internet with doctors, via a secondary analysis of survey data from a large national sample that is representative of the Canadian population.

METHODS

Data source and respondents

The data for this study were derived from the Canadian Internet Use Survey (CIUS), which was a telephone survey conducted in 2007 by the Science, Innovation and Electronic Information

Division at Statistics Canada, to measure for a sample of Canadians their demand for and use of the Internet, their social backgrounds, and online behaviors in the previous 12 months⁴¹.

The target population for the survey included respondents representative of the civilian, non-institutionalized population 16 years of age or older in Canada's 10 provinces. Specifically excluded from the survey's coverage were respondents of the Yukon, Northwest Territories and Nunavut, persons living on Indian Reserves, full-time members of the Canadian Armed Forces, and inmates of institutions. These groups together represent an exclusion of approximately 2% of the target population. CIUS only collected information from one member of each randomly selected household, and proxy responses were not permitted. CIUS interviews were completed with 26,588 people, at a response rate of 75.9%. Because of the high response rate, we do not view non-response error as an area of significant concern. Population estimates are based on CIUS weights, provided by Statistics Canada. Complete details about the survey methodology are available online⁴¹.

The first subsample of respondents (N=16153 or 60.8%) for this research consisted of those respondents who had Internet access at home and used the Internet for non-business purposes, so only these respondents were asked questions about searching for health information. The second subsample (N=9524) included only respondents from the first subsample who sought health information through the Internet.

Measures

Socio-Demographic

Socio-demographic variables were assessed by individual and by household. Individual variables included gender, age, marital status, and education. Household variables included number of persons in the household, annual household income, and geographical household location.

Internet Usage and Privacy and Security Concerns

Two variables measured Internet usage of the respondents. Respondents were asked how long they had used the Internet and the average weekly hours they spent using the Internet. Respondents also answered questions regarding their concerns about Internet privacy and security.

Internet Activities.

Internet activities were measured by three variables, created through the use of a series of questions that asked respondents whether they had used the Internet for general, government or shopping activities in the past year. In all cases, if respondents reported "yes" to using each activity, they were given a score of 1 for that source; if not they received a zero. The scores were summed and the respondents could receive a score from zero to 22 (22 questions for General Internet activities such as e-mail, browsing, viewing news, etc.), from zero to 11 (11 questions for Government related activities such as downloading government forms, searching government services, filing taxes, etc.) and from zero to 16 (16 questions for Shopping activities such as ordering a product online: travel, books, clothing, etc.). Each of these three constructed variables were grouped into three levels that reflect the intensity of use of each activity.

Internet Health Information Seeking

The first outcome variable for this research was a measure that assessed whether respondents did or did not seek health information via the Internet. Respondents were also asked what type of health or medical information they looked up online. These included questions about whether they had sought health/medical information about (1) lifestyles, (2) alternative therapies, (3) the health care system, (4) drugs, (5) surgeries, (6) diseases, (7) symptoms and (8) other.

Sharing Health Information Found on the Internet with Their Physicians

The second outcome variable for this research was a measure that assessed whether the respondent discussed health information found on the Internet with his/her physician.

Data analysis

Data analysis was undertaken in three steps. First, descriptive statistics of the independent variables, such as socio-demographics, Internet usage, privacy and security concerns, and Internet activities were used to characterize respondents from the sample population who reported having home Internet access. Then, bivariate analyses were used to test whether differences exist between health information users and non-users on the basis of socio-demographics, Internet usage, privacy and security concerns, and Internet activities. Wald χ^2 statistics⁴² were computed to check the statistical significance of each such test, and unadjusted odds ratios were computed using logistic regression models. In the third step, multivariate logistic regressions were used to investigate the relationships between the outcome variables health information seeking and sharing information with physicians, and the independent variables. To perform these analyses, three models for each outcome variables were created. Model 1 and Model 4 included socio-demographics, to which Internet usage and privacy and security concerns were added to create Model 2 and Model 5. Model 3 and Model 6 were created by adding Internet activities to Model 2 and Model 5. Log likelihood ratio tests were used to assess the fit of the three nested models (Models 1-3 and Models 4-6), one of which (the null model, Model 1 and Model 4) is a special case of the expanded models, (2 and 3 or 5 and 6). Model quality was determined by comparing the overall percentage of correct classifications predicted by each model.

RESULTS

Subsample Characteristics

The study sample is representative of Canadians who used the Internet at home in the previous 12 months for non-business purposes. Fig.1 shows the frequency and number of respondents who used the Internet for different activities. About 61% of the Canadian population accessed the Internet at home during this period. From this subsample, 99.7% used the Internet for general activities, and 59% used the Internet for health information search.

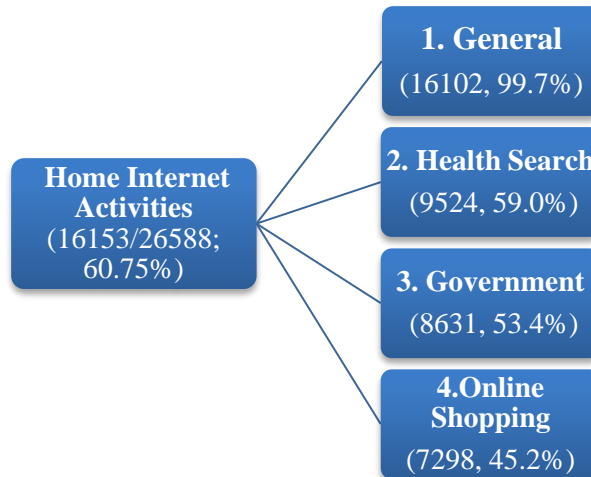


Figure 1. Frequency and Number of Respondents with Home Internet Activities

Table 1 describes the socio-demographics of the subsample of 16153 individuals who accessed the Internet from home. 8075 were males and 8078 were females, 61.8% were married or in common law relationships, and 42% had college or some postsecondary education. 39% had 4 or more persons in their households, 32% had a household income of CAN \$95,000 (US\$ 94,924⁴³) or more, and 36% lived in big cities (megalopolises). 75% percent of the respondents had used the Internet for 5 or more years, 49.8% spent less than five hours per week on the Internet, and 74% were concerned about Internet privacy and security (Table 2). 64% of respondents used the Internet for 7-14 general activities, 53% used it for government activities, and 45% used it for online shopping activities (Table 3).

Use of the Internet to Search for Health Information

Socio-Demographic, Internet Usage, and Privacy and Security Concern Determinants

Table 1 shows that there are significant differences between all the socio-demographic characteristics of Internet users who search for health information and those who do not. On the basis of unadjusted odds, women were significantly more likely to search for health information than men (OR=1.93, 95% CI=1.84-2.02), respondents in older age groups were 1.2-1.7 times more likely to search health information than those in the referent group aged 16-24 years. Married people were less interested in searching for health information than divorced, never-married, and single persons. Additionally, health information searching via the Internet increased with respondent education, household size, and household income. People in urban (non-megalopolises) and rural areas were 1.2-1.6 times more likely to search for health information than those living in big cities.

Internet usage level and concerns about Internet privacy and security were each significantly associated with Internet health information search (Table 2). Respondents with 5 or more years of Internet experience were 1.7 times more likely to search for health information than respondents with less than one year of Internet experience.

Table 1. Socio-Demographic Characteristics of Users of Internet Health Information

Individual and household characteristics	Total n=16153	Health information search, %		Unadjusted odds ratio	95% Confidence interval
		Non-users n=6629	Users n=9524		
Gender $\chi^2(1) = 823.5^*$					
Male	49.99%	58.35%	44.17%	Ref	
Female	50.01%	41.65%	55.83%	1.93*	1.84,2.02
Age group (years) $\chi^2(5) = 655.7^*$					
16 to 24	19.49%	23.28%	16.86%	Ref	
25 to 34	20.58%	18.48%	22.04%	1.71*	1.60,1.84
35 to 44	21.71%	20.44%	22.59%	1.59*	1.48,1.70
45 to 54	19.89%	18.71%	20.72%	1.59*	1.48,1.71
55 to 64	11.96%	11.86%	12.03%	1.46*	1.33,1.6
65 and older	6.37%	7.23%	5.77%	1.15**	1.01,1.29
Marital status $\chi^2(2) = 62.6^*$					
Married/common law	61.80%	57.50%	64.79%	Ref	
Separated/divorced, widow or widower	8.02%	7.97%	8.06%	1.45*	1.30,1.62
Single, never married	30.18%	34.53%	27.15%	1.13*	1.07,1.20
Education $\chi^2(2) = 884.8^*$					
High school or less	32.26%	40.19%	26.74%	Ref	
College or some post-secondary	41.69%	39.27%	43.38%	1.59*	1.51,1.67
University certificate or degree	26.05%	20.55%	29.88%	2.09*	1.96,2.23
Persons in household $\chi^2(3) = 483.2^*$					
1 person	8.23%	8.21%	8.24%	Ref	
2 persons	30.75%	30.04%	31.25%	1.49*	1.41,1.58
3 persons	21.68%	21.38%	21.90%	1.47*	1.38,1.58
4 or more persons	39.33%	40.38%	38.61%	1.37*	1.31,1.44
Income $\chi^2(4) = 577.4^*$					
Quintile 1 - <=\$24,000	8.47%	9.21%	7.95%	Ref	
Quintile 2 - \$24,001 - \$39,999	13.92%	15.74%	12.65%	1.15**	1.06,1.25
Quintile 3 - \$40,000 - \$59,999	19.79%	21.04%	18.93%	1.29*	1.21,1.39
Quintile 4 - \$60,000 - \$94,999	25.94%	25.71%	26.10%	1.46*	1.37,1.55
Quintile 5 - \$95,000 +	31.88%	28.29%	34.37%	1.74*	1.65,1.85
Urban/Rural $\chi^2(2) = 371.6^*$					
Megalopolises	36.46%	36.86%	36.17%	Ref	
Other Urban	43.31%	41.15%	44.82%	1.57*	1.49,1.64
Rural & PEI	20.23%	21.98%	19.00%	1.24*	1.16,1.33

Note: PEI- Prince Edward Island; * p<0.001; **p<0.05;*** p<0.1

Similarly, people that five or more hours using the Internet were 1.4-2.3 times more likely to search for health information than those who spent less than 5 hours per week on the Internet.

Surprisingly, respondents who were significantly concerned about Internet privacy and security were 1.6 times more likely to search for health information than those who were not. This may be due to a belief by many online user reported concerns with Internet privacy and security that they have to give up some privacy to participate as online shoppers, whereas those searching for health information usually do not⁴⁴. Age related differences between Internet health information users and non-users about privacy and security concerns are shown on Figure 2.

Table 2. Internet Use and Privacy and Security Concerns of Health Information Users

Individual Characteristics	Total	Health Information Search, %		Unadjusted Odds Ratio	95% Confidence Interval
		Non-Users	Users		
How long have you used the Internet? $\chi^2(3) = 921.1^*$					
Less than 1 year	3.53%	5.50%	2.10%	Ref	
1 to 2 years (1 year or more but less than 2 years)	4.54%	6.60%	3.10%	0.67*	0.58,0.78
2 to 5 years (2 years or more but less than 5 years)	17.41%	21.60%	14.50%	0.96	0.89,1.04
5 or more years	74.52%	66.20%	80.30%	1.74*	1.68,1.81
Ave/wk - hours spent on Internet - home $\chi^2(5) = 884.1^*$					
Less than 5 hours	49.83%	58.74%	43.67%	Ref	
Between 5 and 9 hours	25.30%	21.00%	28.27%	1.95*	1.82,2.08
Between 10 and 19 hours	15.43%	12.27%	17.62%	2.08*	1.91,2.26
Between 20 and 29 hours	5.70%	4.70%	6.39%	1.97*	1.71,2.26
Between 30 and 39 hours	1.90%	1.94%	1.87%	1.4**	1.11,1.76
40 hours or more per week	1.83%	1.35%	2.16%	2.31*	1.80,2.97
Concerned - privacy and security on Internet? $\chi^2(2) = 619.5^*$					
Not at all concerned	25.83%	30.10%	22.90%	Ref	
Concerned	39.41%	37.60%	40.70%	1.56*	1.48,1.64
Very concerned	34.76%	32.30%	36.40%	1.62*	1.54,1.71

Note: * p<0.001; **p<0.05;*** p<0.1

Older respondents are more concerned about Internet privacy and security on the Internet. The differences between health information users and non-users among concerned groups are significant (Figure 2 b, c).

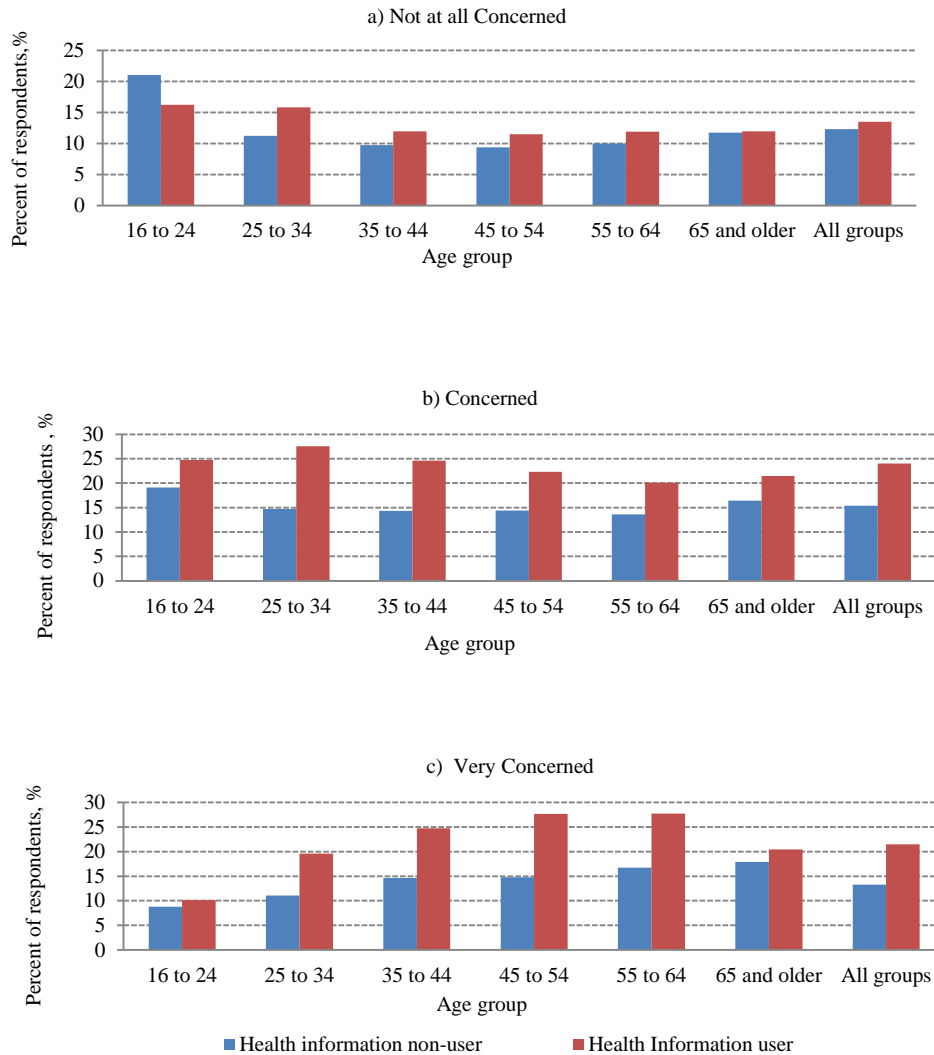


Figure 2. Privacy and Security Concerns of Health Information Users and Non-users, by Respondent Age Groups.

Internet Activity Determinants

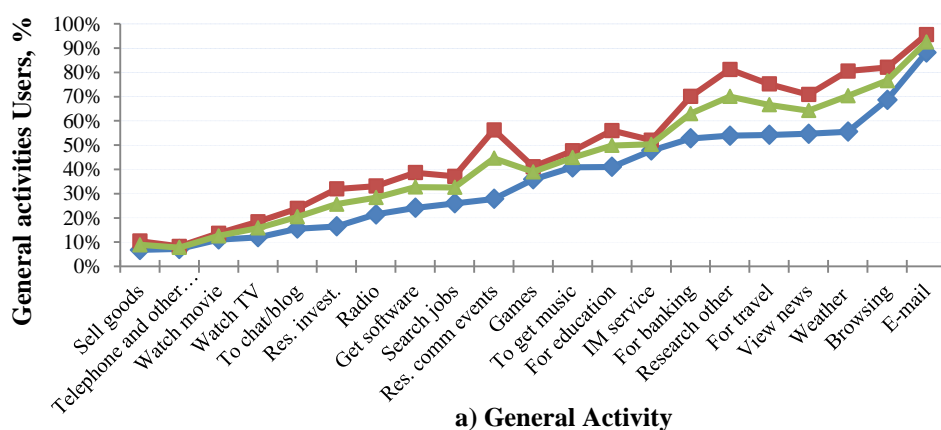
Table 3 shows that respondents who use the Internet for general, government, and shopping activities are significantly more likely to search for health information online. 95% of the respondents who sought health information online also used the Internet for email, but only 88% of the respondents who did not seek health information online used the Internet for e-mail ($p < 0.05$, two-sided test). Most important general Internet activities were e-mail, browsing, weather reports, viewing news, travel, research, and banking (Fig. 3a). Respondents with more than 7 general activities were 1.8-4.8 times more likely to search health information than those who had only used the Internet for 0-6 general activities (Table3).

Table 3. General, Government and Shopping Activities for Health information Users

Internet Activities	Total	Health Information Search, %		Unadjusted Odds Ratio	95% Confidence Interval
		Non-Users	Users		
General Activities $\chi^2(2) = 1630.2^*$					
0-6	26.3%	40.8%	16.2%	Ref	
7-14	64.1%	55.2%	70.3%	1.83*	1.76,1.9
15+	9.6%	4.0%	13.5%	4.84*	4.24,5.52
Government Activities $\chi^2(2) = 1962.4^*$					
0	46.6%	63.8%	34.6%	Ref	
1-5	43.1%	32.5%	50.4%	2.23*	2.11,2.34
6+	10.4%	3.7%	15.0%	5.88*	5.13,6.74
Online Shopping Activities $\chi^2(2) = 1382.1^*$					
0	54.8%	67.5%	46.0%	Ref	
1-5	38.2%	29.7%	44.1%	2.14*	2.03,2.25
6+	7.0%	2.8%	9.9%	5.06*	4.33,5.93

Note: * p<0.001; **p<0.05;*** p<0.1

Information about federal and provincial government services, and downloading government forms were the most frequently used government activities among all respondents (Fig 3b). Respondents with high levels of government activities (more than 6) were 5.9 times more likely to search for health information than those who did not use the Internet for government activities.



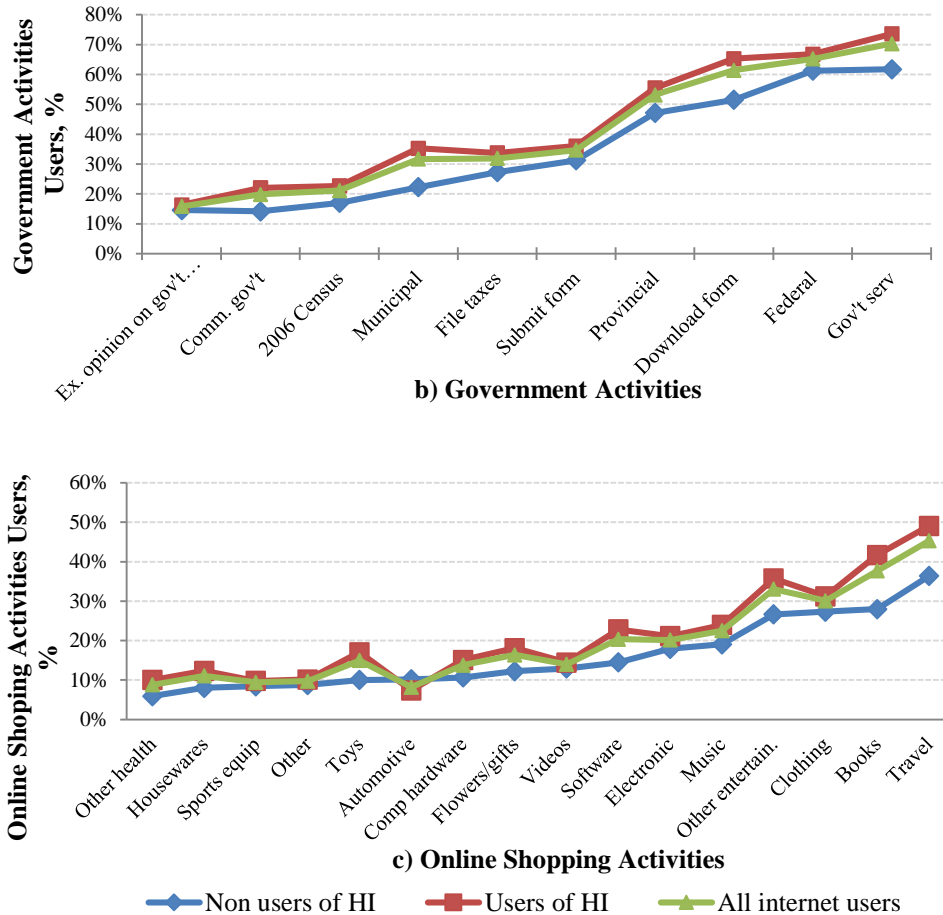


Figure 3. Frequency of Internet use for General Activities by Users and Non-users of Health Information (HI).

49% of respondents who sought health information, used the Internet for travel shopping, and 42% bought books online. Respondents with 1-5 shopping activities were 2.4 times more likely to search for health information than those who did not used the Internet for shopping activities.

Types of Health/Medical Information Sought

Figure 4 shows the nature and type of health information that respondents sought online. Disease-specific information was the most frequently sought information (55.2%), followed by lifestyle (52.7%) and disease symptoms (52.6%). These are followed in order by drugs (43%), alternative therapy (21.5%), the health-care system (21.4%) and surgery (16.4%). The extended version of Figure 3, presented in Appendix 1, shows significant differences in health information searches between males and females (Figure A1), and age groups (Figure A2).

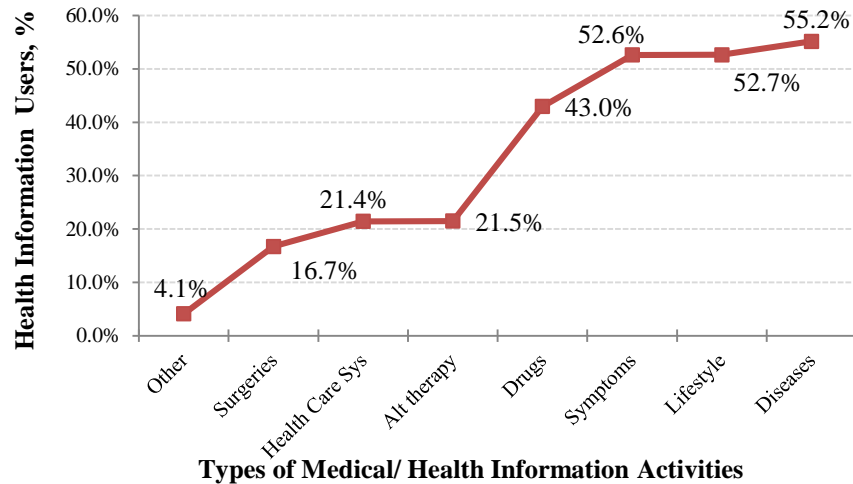


Figure 4. Popularity of Internet Searches by Type of Health or Medical Information

Assessment of Internet Searches for Health Information

Model 1: Multivariate logistic regression of online health information search was conducted on the socio-demographic characteristics that bivariate analyses showed were significantly associated with health information use (Table 4, Model 1). After adjusting for all other socio-demographic variables, respondents older than 55 years were less likely to search for health information than those in the 16-24 year old referent group.

Table 4. Multiple Logistic Regression Models Predicting Internet Health Information Use

Independent Variables	Model 1	Model 2	Model 3
	Socio-Demographic model OR (95% CI)	Socio-Demographic with Internet experience and concern model OR (95% CI)	Socio-Demographic with Internet experience, concern and Internet activities model OR (95% CI)
Gender	*	*	*
Male	Ref	Ref	Ref
Female	1.83*(1.71,1.95)	1.98*(1.85,2.12)	2.49*(2.31,2.68)
Age	*	*	*
16 to 24	Ref	Ref	Ref
25 to 34	1.16**(1.03,1.32)	1.32*(1.16,1.5)	1.32*(1.15,1.51)
35 to 44	1.01 (0.88,1.15)	1.22** (1.06,1.4)	1.35* (1.16,1.56)
45 to 54	1.03 (0.89,1.18)	1.34* (1.16,1.55)	1.73* (1.48,2.03)
55 to 64	0.93 (0.79,1.08)	1.24** (1.05,1.47)	1.94* (1.62,2.32)
65 and older	0.83*** (0.69,1)	1.12(0.93,1.36)	2.24*(1.82,2.76)
Marital status	*	*	*
Married/common law	Ref	Ref	Ref
Separated/divorced, widow or widower	0.88*** (0.77,1.02)	0.87*** (0.75,1.00)	0.85** (0.73,0.99)
Single, never married	0.77* (0.69,0.86)	0.71* (0.63,0.79)	0.75* (0.66,0.84)

Education	*	*	*
High school or less	Ref	Ref	Ref
College or some post-secondary	1.52*(1.41,1.64)	1.43*(1.32,1.55)	1.21*(1.12,1.32)
University certificate or degree	1.81*(1.65,1.99)	1.52*(1.38,1.67)	1.07(0.96,1.19)
Persons in household	**	***	
1 person	Ref	Ref	Ref
2 persons	0.87***(0.75,1.01)	0.90(0.78,1.05)	0.9(0.77,1.06)
3 persons	0.85**(0.73,0.99)	0.94(0.8,1.1)	0.99(0.84,1.17)
4 or more persons	0.77*(0.66,0.9)	0.85**(0.72,0.99)	0.94(0.8,1.11)
Income	*	*	
Quintile 1 - <=\$24,000	Ref	Ref	Ref
Quintile 2 - \$24,001 - \$39,999	0.97 (0.84,1.12)	0.95 (0.82,1.1)	0.94 (0.8,1.1)
Quintile 3 - \$40,000 - \$59,999	1.06 (0.92,1.21)	1.04 (0.9,1.2)	0.99 (0.86,1.15)
Quintile 4 - \$60,000 - \$94,999	1.13***(0.99,1.29)	1.04(0.91,1.2)	0.97(0.83,1.12)
Quintile 5 - \$95,000 +	1.35*(1.18,1.54)	1.21**(1.05,1.39)	1.02(0.88,1.19)
Urban/Rural	*	*	
Megalopolises	Ref	Ref	Ref
Other Urban	1.12**(1.04,1.21)	1.11**(1.03,1.2)	1.04(0.96,1.13)
Rural & PEI	0.92***(0.84,1.01)	0.94(0.86,1.04)	0.97(0.87,1.07)
Used the Internet		*	*
Less than 1 year		Ref	Ref
1 to 2 years		1.22***(0.97,1.55)	1.13 (0.88,1.44)
2 to 5 years		1.59*(1.31,1.94)	1.31**(1.06,1.61)
5 or more years		2.43*(2.01,2.93)	1.43*(1.17,1.75)
Ave/wk - hours spent on Internet		*	*
Less than 5 hours		Ref	Ref
Between 5 and 9 hours		1.88*(1.73,2.04)	1.31*(1.2,1.44)
Between 10 and 19 hours		2.10*(1.9,2.33)	1.26*(1.12,1.41)
Between 20 and 29 hours		2.17*(1.86,2.54)	1.30**(1.1,1.54)
Between 30 and 39 hours		1.52*(1.19,1.94)	0.76**(0.58,0.98)
40 hours or more per week		2.80*(2.14,3.65)	1.40**(1.05,1.87)
Concerned - privacy and security on Internet?		*	*
Not at all concerned		Ref	Ref
Concerned		1.27*(1.16,1.38)	1.17*(1.07,1.28)
Very concerned		1.29*(1.18,1.41)	1.20*(1.09,1.32)
General Activities			*
0-6			Ref
7-14			2.68*(2.44,2.95)
15+			6.50*(5.41,7.81)
Government Activities			*
0			Ref
1-5			1.90*(1.76,2.06)
6+			3.60*(3.07,4.23)
Online Shopping Activities			*
0			Ref
1-5			1.36*(1.25,1.47)

6+			1.99*(1.65,2.39)
Wald χ^2 (df)	791.6(19)	1532.31(29)	3091.76 (35)
2Log likelihood test	20467.22	19726.495	18167.046
Hosmer and Lemeshow test	39.59	15.73	17.84
p-value	<0.001	0.046	0.022
Percentage Correct	62.6	65.3	69.7

Note: * p<0.001; **p<0.05;*** p<0.1

Married people were more likely to be interested in searching for health information than divorced, never married, and single persons. Additionally, health information online searching increased with education and household income of the respondent. People in rural areas and with more than one person in the household were less likely to search online for health information than those living in big cities or other urban areas and living alone.

Model 2: Internet usage and concerns about Internet privacy and security, as well as socio-demographic determinants, were included in multivariate logistic Model 2. When controlling for other variables in the model, results from Model 2 showed that all variables also had a significant relationship with health information search. Testing the significance of the difference between Model 1 and Model 2 allowed us to conclude that adding Internet usage, average time spent on the Internet, and privacy and security concern variables to the model significantly improved the results ($\chi^2 = 740.73$, df = 10, N = 16153, p < 0.001). Overall success rate in prediction increased as a result from 62.6% to 65.3%.

Model 3: General, government and shopping online activities were added in the final multivariate regression Model 3. When controlling for other variables in the model, results from Model 3 showed that the number of persons in the household, family income, and respondent residency had no significant relationship with online health information search. Respondents with more than 7 general activities were 2.7-6.5 times more likely to search for health information than those who used the Internet for only 0-6 general activities (Table 4). Respondents with more government and online shopping activities were more likely to report using the Internet for health information. Testing the significance of the difference between Model 2 and Model 3 allowed us to conclude that adding general, government and online shopping activities variables to the model significantly improved the results ($\chi^2 = 1715$, df = 6, N = 16153, p < 0.001). Overall success rate in prediction increased as a result from 65.3% to 69.7%.

Sharing Internet Health Information with Physicians

People share Internet health information with their physicians for several reasons, such as being proactive in improving their health, appealing to their physicians as experts, becoming more educated to meet a need or to seek reassurance from their physicians, or checking or testing the physician in terms of up-to-date knowledge on current research¹⁴. Only 27.2% (n=2589) of respondents who sought health information online (16% of Internet users or 9.7% of all Canadians) said that they discussed this information with their physicians.

Model 4: Multivariate logistic regression of sharing information found on the Internet with their physicians was conducted on the socio-demographic characteristics of respondents who sought health information (Table 4, Model 4). After adjusting for all other socio-demographic variables, respondents older than 55 years were less likely to share health information with physicians than

those in the 16-24 year old referent group. Married people were more likely to share health information than divorced, never married, and single persons. Additionally, sharing health information with physicians (similar to health information online searching) increased with education and household income of the respondent. People in megalopolises were more likely to share health information found on the Internet with their physicians than those living in other urban and rural areas.

Table 5. Multiple Logistic Regression Models Predicting Sharing Internet Information with Physicians

Independent Variables	Model 4	Model 5	Model 6
	Socio-Demographic model OR (95% CI)	Socio-Demographic with Internet experience and concern model OR (95% CI)	Socio-Demographic with Internet experience, concern and Internet activities model OR (95% CI)
Gender	*	*	*
Male	Ref	Ref	Ref
Female	1.55*(1.41,1.7)	1.61*(1.46,1.77)	1.81*(1.64,2)
Age	*	*	*
16 to 24	Ref	Ref	Ref
25 to 34	1.13(0.94,1.36)	1.17***(0.97,1.4)	1.13(0.94,1.36)
35 to 44	1 (0.83,1.22)	1.03 (0.85,1.26)	1.02 (0.83,1.24)
45 to 54	1.09 (0.89,1.33)	1.13 (0.92,1.39)	1.19 (0.97,1.47)
55 to 64	0.80*** (0.64,1.01)	0.83 (0.66,1.05)	0.91 (0.72,1.15)
65 and older	0.68**(0.51,0.9)	0.73**(0.54,0.97)	0.88(0.65,1.18)
Marital status	**	**	**
Married/common law	Ref	Ref	Ref
Separated/divorced, widow or widower	0.94(0.77,1.14)	0.94(0.78,1.14)	0.94(0.77,1.15)
Single, never married	0.77*(0.66,0.89)	0.76*(0.65,0.88)	0.78**(0.66,0.91)
Education	**	**	
High school or less	Ref	Ref	Ref
College or some post-secondary	1.11***(0.99,1.25)	1.09(0.97,1.23)	1.03(0.91,1.16)
University certificate or degree	1.26*(1.1,1.43)	1.2**(1.05,1.37)	1.06(0.92,1.22)
Persons in household	**	**	***
1 person	Ref	Ref	Ref
2 persons	0.97(0.78,1.19)	0.97(0.79,1.21)	0.96(0.78,1.2)
3 persons	1.06(0.85,1.32)	1.08(0.87,1.35)	1.09(0.88,1.37)
4 or more persons	0.87(0.7,1.08)	0.89(0.72,1.12)	0.93(0.74,1.16)
Income	**	**	**
Quintile 1 - <=\$24,000	Ref	Ref	Ref
Quintile 2 - \$24,001 - \$39,999	1.17 (0.95,1.46)	1.18 (0.95,1.47)	1.21*** (0.97,1.5)
Quintile 3 - \$40,000 - \$59,999	0.99 (0.8,1.21)	1 (0.81,1.23)	0.99 (0.8,1.22)
Quintile 4 - \$60,000 - \$94,999	1.03(0.84,1.26)	1.04(0.85,1.28)	1.01(0.82,1.24)
Quintile 5 - \$95,000 +	1.25**(1.02,1.53)	1.25**(1.02,1.53)	1.14(0.93,1.41)
Urban/Rural	***	***	***
Megalopolises	Ref	Ref	Ref
Other Urban	0.95(0.86,1.05)	0.95(0.85,1.05)	0.93(0.84,1.03)
Rural & PEI	0.85**(0.74,0.97)	0.85**(0.74,0.97)	0.86**(0.75,0.99)

Used the Internet		**	**
Less than 1 year		Ref	Ref
1 to 2 years		0.97(0.6,1.57)	0.93 (0.57,1.5)
2 to 5 years		1.55**(1.05,2.28)	1.46***(0.99,2.15)
5 or more years		1.63**(1.12,2.37)	1.35(0.93,1.97)
Ave/wk - hours spent on Internet		*	
Less than 5 hours		Ref	Ref
Between 5 and 9 hours		1.19**(1.07,1.34)	1.09(0.97,1.23)
Between 10 and 19 hours		1.36*(1.2,1.56)	1.13***(0.98,1.29)
Between 20 and 29 hours		1.15(0.94,1.42)	0.91(0.73,1.12)
Between 30 and 39 hours		1.54**(1.1,2.17)	1.22(0.86,1.72)
40 hours or more per week		1.33****(0.96,1.85)	0.98(0.7,1.38)
Concerned - privacy and security on Internet?		*	*
Not at all concerned		Ref	Ref
Concerned		1.01(0.89,1.14)	1.00(0.88,1.14)
Very concerned		1.22**(1.07,1.38)	1.21**(1.06,1.37)
General Activities			*
0-6			Ref
7-14			1.19**(1.02,1.39)
15+			1.7*(1.37,2.11)
Government Activities			*
0			Ref
1-5			1.13**(1.01,1.26)
6+			1.62*(1.39,1.9)
Online Shopping Activities			*
0			Ref
1-5			1.12**(1,1.25)
6+			1.71*(1.44,2.02)
Model -specific			
Wald χ^2 (df)	192.25(19)	260.23(29)	427.28(35)
2Log likelihood test	10749.28	10681.301	10514.257
Hosmer and Lemeshow Test	24.12	17.00	10.78
p-value	<0.001	0.03	<0.001
Percentage Correct	72.5	72.5	72.9

Note: * p<0.001; **p<0.05;*** p<0.1

Model 5: Internet usage and concerns about Internet privacy and security, as well as socio-demographic determinants, were included in multivariate logistic Model 5. When controlling for other variables in the model, results from Model 5 showed that all variables also had a significant relationship with sharing health information with physicians. Testing the significance of the difference between Model 4 and Model 5 allowed us to conclude that adding Internet usage, average time spent on the Internet, and privacy and security concern variables to the model significantly improved the results ($\chi^2 = 67.98, df = 10, N = 9524, p < 0.001$), though overall success of prediction did not increase.

Model 6 in Table 5 reports results from multivariate logistic regression analysis that examined the relationship between respondent socio-demographic, internet use, concerns about privacy and security, Internet activities, and sharing information found on the Internet with their physicians. All variables, except education and average hours spent per week accessing the Internet, were significant. Women were 1.8 times more likely to share information with their physicians than men, although older people, divorced or single respondents, were less likely to share information with their physicians. Respondents in small cities and rural areas were also less likely to share health information with their physicians than respondents from big cities. Furthermore, respondents who were very concerned about Internet security and privacy were 1.2 times more likely to discuss information found online with their physicians than those who were not concerned about security and privacy. Model 5 and Model 6 allowed us to conclude that adding general, government and online shopping activities variables to the model significantly improved the results ($\chi^2 = 177, df = 6, N = 9524, p < 0.001$). Overall success rate of prediction increased as a result from 72.5% to 72.9%.

Age related differences among respondents who shared and didn't share information found on the Internet with their physicians, by respondent level of Internet privacy and security concern, are shown in Appendix 2. Respondents with more online general activities and online government and shopping categories were more likely to share information with their physicians.

DISCUSSION AND CONCLUSIONS

We believe that this study is the first of its kind to provide insights into Internet searches by Canadians for health information and sharing it with their physicians. Moreover, it is also the first study to assess the relationships among different kinds of Internet activities and health information usage and sharing. The percentage of Canadian home Internet users of the Internet for health information (59%) is similar to that reported in the US⁴⁵ for 2008 (near 62%), but more than in Europe³⁷ (52.2%). The cultural differences between Canadians and Americans are not significant⁴⁶, although citizens of European countries differ significantly in their use of the Internet and in searching for health information³⁷. However, the present study emphasizes that online searching for health information is the second most popular online activity for Canadians, after general Internet activities.

Studies in other countries have shown that men and women are equally likely to access the Internet at home, but health information seekers are more likely to be women than men^{27-29,33,37}, and also more educated^{1,3,33}. This analysis showed similar results for Canadians: 55.8% of women were looking for health information compared with 44.2% of men, and respondents with more education were more likely to search for health information. When controlling for other variables in this study, age and marital status were strong predictors of health information searching. Older adults are increasingly using the Internet for health information, and our study reveals that age is not a "discriminating factor in health information searching"³¹. Despite many studies that link the income, number of persons in the household, and where people live as significant predictors of online health information search^{31,39, 45,49} our study shows, when controlling for other variables, that these socio-demographic characteristics are not significant.

Internet experience, average hours spent online per week, and other online activities (general, government and online shopping) are also significant predictors of online health information searching.

This study suggests that Canadians searching online for health information are motivated to better understand information about diseases, lifestyle, disease symptoms, and alternative therapies, although it is not clear from the data whether they looked for the information before or after physician consultations. Future research that develops a better understanding of the main drivers for online health information search is still needed.

Our study found that there seems to be insufficient communication between Canadian physicians and their patients. In comparison with other countries, 27% of Canadians share information found online with their physicians, less than in the U.S.⁴⁷ (85%), Europe¹¹ (50%), and Australia and New Zealand⁴⁸ (50%). This comparison should be viewed with caution, as our sample includes only respondents who searched for health information from home, while the other studies did not indicate where their searches originated^{11,47,48}.

Physicians still remained the preferred source of health related information⁵⁰⁻⁵³ and people trust face-to-face contact with their physicians. Thus the behavioral differences between searching for health information on the Internet and not sharing this information with physicians might be due to patient confidence in their physicians' knowledge, or possibly having conflicting views with physicians on information obtained from the Internet^{50,54,55}.

Women who are young, married, living in big cities, with more than two years Internet experience, who are very concerned about privacy and security on the Internet, and involved with more Internet activities (general, government and shopping online) were more likely to share information with their physicians. Strategies aimed at increasing Canadian access to Internet health information will likely help them to become better informed and to participate more actively in health-related decisions with their physicians. Healthcare providers could improve this form of patient health education by directing patients to recognized Internet sources of high quality information, and discussing this information with their patients.

Limitations

Although the findings of this study provide further insight into the major factors that predict online health information searching and sharing this information with physicians, there are some restrictions associated with the cross-sectional, self-reported data that we used. The major limitations of this study are that nothing was reported in the database about the health status of respondents, or their physical activity, diet or other behaviors. Future research on health information needs should include specifically identify chronically ill patients, patients with comorbidities, and trends from the latest data on Internet searches for health information. Further research is also needed to determine the existence and impact of any moderating effects of health information found online on patient health outcomes and healthcare utilization patterns.

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APPENDIX 1

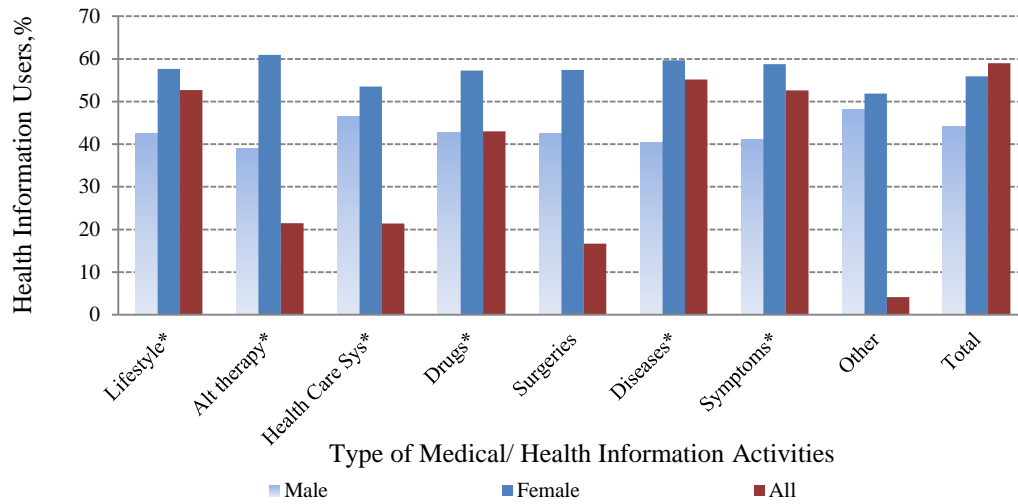


Figure A1. Popularity of Internet Searches by Type of Health or Medical Information and Gender of Respondent.
Note: * significant at $p < 0.05$ (difference between males and females)

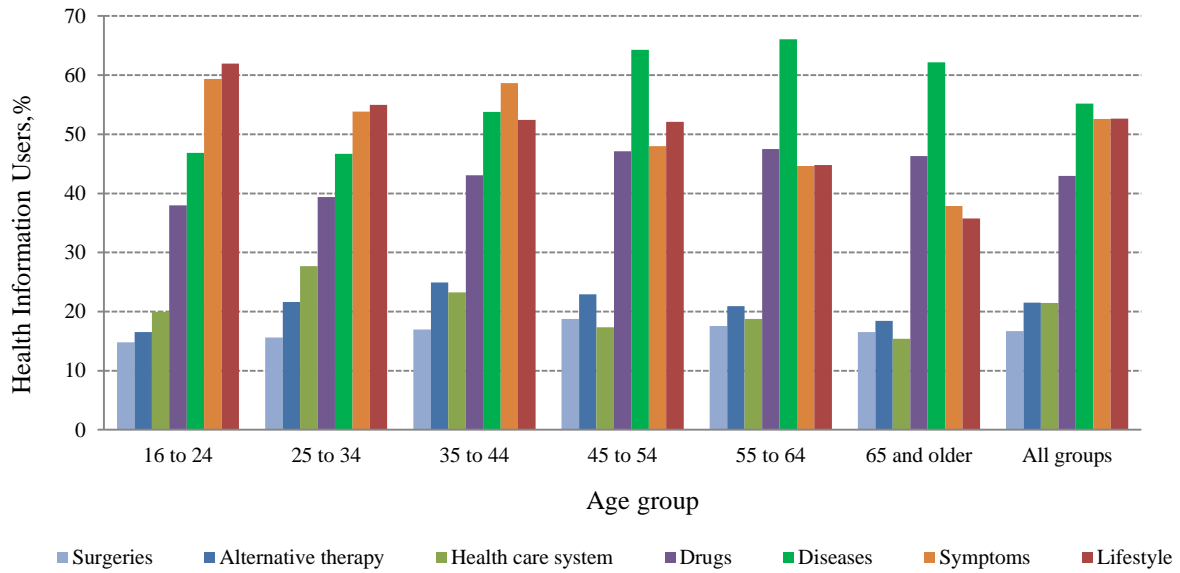


Figure A2. Popularity of Internet Searches by Type of Health or Medical Information and Age Groups.

APPENDIX 2

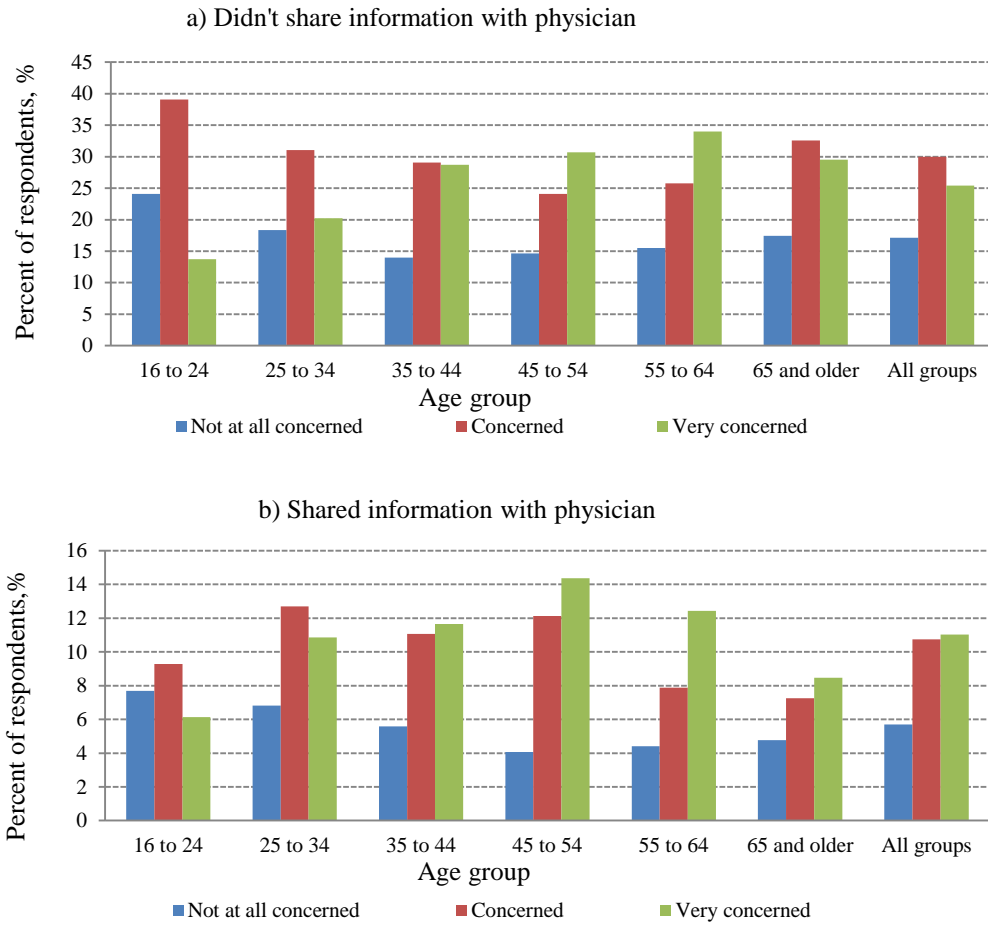


Figure A3. Privacy and Security Concerns of Health Information Users Who Shared and Didn't Share Internet Information, by Respondent Age Groups

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