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ORIGINAL RESEARCH

Reasons for not having received influenza vaccination and its predictors in Canadians

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Background: Influenza vaccination is the most effective way to prevent influenza. However, only about one-third of Canadians receive an annual seasonal influenza vaccination.

Methods: The reasons for not having received influenza vaccination were examined among 131,061 Canadians ≥ 12 years of age who participated in a national survey in 2007–2008. Among them, 127,297 subjects responded to the questions concerning their flu shot history and were grouped into three categories: never (n = 51,767), 1+ year ago (n = 29,310), last year (n = 46,220). Subjects who reported not having had a flu shot during the past year were asked the reasons for not having it. The log binomial regression model was used to estimate prevalence ratios (PRs) and 95% confidence intervals (95% CIs) for the associations of various reasons for not having received influenza vaccination and their predictors.

Results: When weighted to the Canadian population, 44.0% had never previously received influenza vaccine and 24.5% had received the vaccine > 12 months ago. The most common reasons for not having received influenza vaccination in the past 12 months were "Respondent did not think it necessary" (71.3%) and "Have not gotten around to it" (17.6%). Log binomial regression analysis shows that females were less likely to report these two reasons compared to males with PRs of 0.98 (0.97, 0.99) and 0.84 (0.81, 0.87), respectively. Younger participants were more likely to report, "Have not gotten around to it." For those who had an influenza vaccination previously, the primary reason for not having an influenza vaccination in the last year was "Have not gotten around to it."

Conclusions: More than two-thirds of Canadians 12+ years of age did not receive an influenza vaccination in the past year, and "Respondent did not think it necessary" and "Have not gotten around to it" were the main reasons.

Keywords: Canada, flu shot, human, influenza, survey, vaccination

Introduction

Seasonal influenza is an important public health concern and vaccination against seasonal influenza is an effective method for prevention.[1] Influenza vaccination reduces the public health burden for influenza and complications[2] and has been found to be associated with reductions in all-cause mortality,[3] hospitalizations,[4] emergency room visits,[5] as well as physician visits.[6] Being vaccinated each year with the seasonal influenza vaccine is the most effective way to prevent influenza.[7]

In spite of the benefits, only about one-third or less of Canadians 12 years of age or older receive an annual seasonal influenza vaccination.[8,9] Even in Ontario, which has a Universal Influenza Immunization Program, approximately 60% of residents do not receive the seasonal influenza vaccine.[9]

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In the Canadian Community Health Survey, which targets the Canadian population aged 12 years or older, the reasons for not having received an influenza vaccination in the past year were examined. The current analysis is based on data collected in 2007–2008, which were collected before the H1N1 pandemic, with an intention to avoid its potential impact on seasonal influenza vaccination coverage. The purpose of the study is to better understand the reasons for not having received a seasonal influenza vaccination and factors related to influenza vaccination status in order to design better influenza vaccination strategies to improve vaccination rates for seasonal influenza in the general population.

Materials and methods

Study population

In the present study, we used data from the Canadian Community Health Survey (CCHS) conducted by Statistics Canada in 2007 and 2008. The CCHS is "a cross-sectional survey that collects information related to health status, health care utilization and health determinants for the Canadian population" (Canadian Community Health Survey – Annual Components. User Guide. 2007–2008 microdata file. Statistics Canada, Health Statistics Division). Household residents aged 12 years or more in all the ten provinces and three territories in Canada were targeted in the survey, excluding individuals living on Indian Reserves or Crown lands, residents of institutions, full-time members of the Canadian Armed Forces, and residents in certain remote regions. This survey used a multistage stratified sampling design and three sampling frames to select the sample of households: an area frame of the Canadian Labour Force Survey, a list frame of telephone numbers, and a Random Digit Dialing (RDD) sampling frame. The publicly released data file includes a total of 131,061 persons 12 years of age or more, and the survey response rate was 76.4%, which has been described in detail in the CCHS User Guide.

Questionnaire administration and main outcomes

The questionnaire was administered using computer-assisted interviewing. Sampling units selected from a telephone list frame were interviewed from centralized centers, and those selected from an area frame were interviewed mainly by decentralized field interviewers. The analysis was based on data from 127,297 subjects who responded to the question, "Have you ever had a flu shot?," and who further responded to the question, "When did you have your last flu shot: less than 1 year ago, 1 year to less than 2 years ago, or 2 years ago or more?" Subjects were grouped into three categories based on their flu shot history: never (n = 51,767), 1+ year ago (n = 29,310), and last year (n = 46,220). Subjects who reported not having had a flu shot during the past year were asked, "What are the reasons that you have not had a flu shot in the past year?" One or more choices could be selected by the respondent, including: (1) Have not gotten around to it; (2) Respondent did not think it was necessary; (3) Doctor did not think it was necessary; (4) Personal or family responsibilities; (5) Not available at time required; (6) Not available at all in the area; (7) Waiting time was too long; (8) Transportation problems; (9) Language problem; (10) Cost; (11) Did not know where to go/uninformed; (12) Fear (eg, painful, embarrassing, find something wrong); (13) Bad reaction to previous shot; (14) Unable to leave the house because of a health problem; and 15) Other.

Predictors

Subjects were asked if the person had "long-term conditions," which were expected to last or had already lasted six months or more and that had been diagnosed by a health professional. Long-term conditions were grouped into two categories. "Major disease" category in the present analysis included asthma, chronic bronchitis/emphysema/chronic obstructive pulmonary disease (COPD), diabetes, heart disease, cancer, and effects of stroke, which are associated with a high risk of influenza complications. The "non-major chronic disease" category included arthritis, back pain, high blood pressure, migraine headaches, stomach and intestinal ulcers, urinary incontinence, bowel disorder, mood disorder, and anxiety disorder. Self-perceived health was categorized by asking the question: "In general, would you say your health is excellent, very good, good, fair, or poor?" Based on total household income, subjects were classified into low- (<$40,000), middle- ($40,000–$79,999), or high-income groups ($80,000+). Subjects were grouped into three education categories: low education (not proceeding beyond secondary school), middle education (secondary school completed with or without some post-secondary education), and high education (post-secondary school certificate or diploma). The "Current smoker" group consisted of respondents who had smoked at least 100 cigarettes during their lifetime and reported smoking cigarettes every day or almost every day at the time of the survey. Former smokers were those who reported smoking cigarettes daily in the past but were not smoking at the time of the survey. Otherwise, subjects were classified as non-smokers. Based on the total daily energy expenditure values (kcal/kg/day),

the subjects were grouped into three categories: active (>3), moderate active (1.5–2.9), and inactive (<1.5). Energy expenditure (EE) was calculated based on the frequency and duration of leisure-time physical activity (LTPA) and its value of metabolic energy cost, expressed as a multiple of the resting metabolic rate (MET). Other variables included in the analysis were age (12–24, 25–44, 45–64, 65+) and immigrant status (yes or no).

Statistical analysis

The distribution of socio-demographic factors and health status (major and non-major chronic disease, self-perceived health) were compared among three groups with different influenza immunization status histories. Reasons for not having a flu shot in the past years were compared between those who never had one and those who had one more than one year ago. Each reason in association with socio-demographic factors and health status was investigated for those who had not had a flu shot in the past year. Adjusted relative risks and 95% confidence intervals for the main reasons for not having a flu shot in the past year in relation to socio-demographic factors and health status were calculated by using log-binomial regression analysis. Model parameters were estimated and tested using the method of maximum likelihood. All of the variance estimates accounted for the multiple stage and stratified survey design. The effect of the complex survey design on variance estimates is summarized as a design effect. The design effect is the ratio of an estimated variance based on the survey to a comparable estimate of variance from a simple random sample of the population. Standard errors were inflated by this average design effect.[10] First, population weights were divided by the average weight for all subjects included in the analysis. The sum of these relative weights is the effective sample size. Next, we divided the relative weights by the square root of the average design effect. All of the statistical analyses were conducted using SAS 9.2.

Results

Influenza coverage and population characteristics

Among the participants, 44.0% reported never having received a dose of influenza vaccine and 24.5% had the last one more than 12 months ago. Table 1 shows that participants who were male, younger, or healthier were less likely to report having received influenza vaccination in the past year as compared to those who were female, older, or less healthy. Immigrants and those with lower income tended to have a higher influenza vaccination coverage in the past.

Reasons for not having received influenza vaccination

The common reasons reported for not having received influenza vaccination included "Respondent did not think it necessary" (71.3%), "Have not gotten around to it" (17.6%), "Bad reaction to previous shot" (5.3%), "Fear" (4.1%), and "Doctor did not think it necessary" (2.3%) (Table 2). Only about 1% or less of the participants reported each of the following reasons: "Personal/family responsibility," "Not available at time when required," "Not available at all in area," "Waiting time was too long," "Transportation problems," "Language problem," "Cost," "Did not know where to go," and "Unable to leave house/health" (Table 2). Middle-aged people (25–64 years) were more likely to think it unnecessary, young adults tended to be more likely to not have gotten around to it, and the elderly were more likely to have had a bad reaction to a previous one (Figure 1).

Predictors of reasons for not having received influenza vaccination

Log-binomial regression analysis was used to examine various factors associated with the five major reasons for not having received influenza vaccination among the participants who reported having had no flu shot in the past year, taking account for covariates. Table 3 shows that compared with males, females were less likely to report "Respondent did not think it necessary" (PR: 0.98, 95% CI: 0.97, 0.99) and "Have not gotten around to it" (PR: 0.84, 95% CI: 0.81, 0.88) and were more likely to report "Bad reaction to previous shot" (PR: 1.33, 95% CI: 1.23, 1.43), "Fear" (PR: 1.66, 95% CI: 1.53, 1.82), and "Doctor did not think it necessary" (PR: 1.51, 95% CI: 1.34, 1.70). Young participants were more likely to report, "Have not gotten around to it" and less likely to report other reasons. Smokers were less likely to report, "Doctor did not think it necessary." Whites and active individuals were more likely to report "Bad reaction to previous shot." Having a major or non-major chronic condition or self-perceived poor health were associated with higher proportions of "Bad reaction to previous shot," "Fear," and "Doctor did not think it necessary" but a lower proportion of "Respondent did not think it necessary." Self-perceived health was strongly correlated with having a chronic disease. When chronic disease was excluded from the model, we observed stronger association of self-perceived health and various reasons. Figure 2 shows the relative risk for self-perceived health

Table 1 Social-demographic characteristics and health status associated with influenza vaccination history, Canadian Community Health Survey 2007–2008[a]

Characteristics	Influenza vaccination history					
	Never (n = 51767)		1+ year ago (n = 29310)		Last year (n = 46220)	
	No	%	No	%	No	%
Sex						
Male	24453	50.3	14443	53.3	18303	43.7
Female	27314	49.7	14867	46.7	27917	56.3
Age (years)						
12–24	9085	20.7	6945	27.1	3999	11.9
25–44	18761	40.0	9873	36.9	7875	22.4
45–64	18341	33.0	8686	28.1	14929	34.7
65+	5580	6.2	3806	7.9	19417	31.0
Married status						
Single	16475	32.3	10671	37.6	8415	20.1
Married/common law	27161	57.9	13945	52.6	24866	63.1
Separated/divorced/widowed	7997	9.8	4642	9.8	12851	16.8
Unknown	134	–	52	–	88	–
Smoking status						
Smoker	13409	24.6	7555	24.8	7550	15.9
Former smoker	18949	34.8	10671	34.0	21984	43.7
Non-smoker	19247	40.6	10970	41.2	16505	40.4
Unknown	162	–	114	–	181	–
Education						
Low	12748	21.2	7246	21.8	12898	24.4
Middle	12330	25.0	6832	25.3	9128	21.1
High	25477	53.9	14512	52.9	22904	54.5
Unknown	212	–	720	–	1290	–
Income						
Low	14505	25.9	7492	23.5	16093	30.4
Middle	15579	35.7	8202	32.9	12396	33.7
High	14005	38.5	8859	43.6	10068	35.9
Unknown	7678	–	4757	–	7663	–
Being immigrants						
Immigrant	6572	21.1	3657	20.1	7140	25.0
Non-immigrant	43937	78.9	24951	79.9	37939	75.0
Unknown	1258	–	702	–	1141	–
Race						
White	43502	80.9	23891	79.2	39183	80.6
Non-White	6545	19.1	4298	20.8	5170	19.4
Unknown	1720	–	1121	–	1867	–
Physical activity						
Active	13143	25.4	8611	29.2	10643	24.1
Moderate	12810	24.5	7269	24.5	11224	24.5
Inactive	25744	50.1	13383	46.3	24291	51.4
Unknown	70	–	47	–	62	–
Major disease						
No	44536	87.9	23436	81.8	29970	69.3
Yes	7231	12.1	5874	18.2	16250	30.7
Non major disease						
No	28371	60.1	14675	54.7	14509	38.2
Yes	23396	39.9	14635	45.3	31711	61.8
Self-perceived health						
Excellent	11792	25.1	5658	21.3	6873	17.6
Very good	20294	39.9	11364	38.9	15226	34.3
Good	14802	27.4	8830	29.7	14965	31.8
Fair	3773	6.0	2589	7.5	6715	12.1

(*Continued*)

Table 1 (*Continued*)

Characteristics	Influenza vaccination history					
	Never (n = 51767)		1+ year ago (n = 29310)		Last year (n = 46220)	
	No	%	No	%	No	%
Poor	1045	1.6	833	2.5	2344	4.2
Unknown	61	–	36	–	97	–
Provinces						
Ontario	38452	68.9	18012	54.1	27842	54.3
Other provinces/territories	13315	31.1	11298	45.9	18378	45.7

Note: [a]The proportions were weighted to the Canadian general population the design effect due to a multistage stratified sampling strategy.

Table 2 Reasons for not having influenza vaccination in the past year by sex and flu shot history, the Canadian Community Health Survey 2007–2008

Reason	Sex				Influenza vaccination history					
	Men (n = 38896)		Women (n = 42181)		Never (n = 51767)		1+ year ago (n = 29310)		Total (n = 81077)	
	No	%[a]	No	%[a]	No	%[a]	No	%[a]	No	%[a]
Have not gotten around to it	6958	19.5	6143	15.6	4864	10.3	8237	31.0	13101	17.6
Respondent did not think necessary	27173	72.2	28272	70.3	42223	83.4	13222	49.0	55445	71.3
Doctor did not think necessary	659	1.8	1271	2.9	1353	2.5	577	1.9	1930	2.3
Personal/family responsibility	236	0.6	265	0.7	149	0.3	352	1.3	501	0.7
Not available at time when required	407	1.1	440	1.0	159	0.3	688	2.3	847	1.0
Not available at all in area	123	0.3	170	0.4	83	0.1	210	0.6	293	0.3
Waiting time was too long	75	0.2	87	0.2	67	0.1	95	0.4	162	0.2
Transportation problems	30	0.1	68	0.2	27	0.1	71	0.2	98	0.1
Language problem	6	0.1	9	0.0	11	0.1	4	0.0	15	0.1
Cost	195	0.5	288	0.8	271	0.6	212	0.7	483	0.6
Did not know where to go	391	1.1	323	0.9	355	0.9	359	1.2	714	1.0
Fear	1212	3.1	2446	5.2	2844	4.8	814	2.8	3658	4.1
Bad reaction to previous shot	1847	4.5	3124	6.2	697	1.1	4274	13.2	4971	5.3
Unable leave house/health	42	0.1	138	0.3	34	0.0	146	0.4	180	0.2
Other	344	0.8	532	1.4	270	0.5	606	2.1	876	1.1

Note: [a]The proportions were weighted to the Canadian general population.

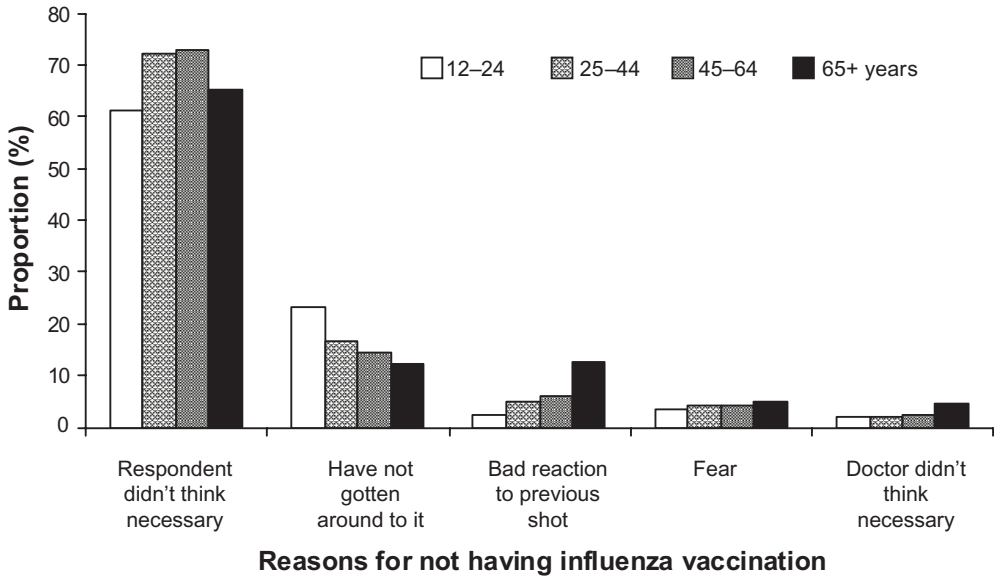

Figure 1 Reasons for not have influenza vaccination during the past year by age, Canadian Community Health Survey 2007–2008.

Table 3 Adjusted relative risks (95% confidence intervals) for reasons for not having influenza vaccination during the past year associated with various factors, Canadian Community Health Survey 2007–2008

	Respondent did not think necessary	Have not gotten around to it	Bad reaction to previous shot	Fear	Doctor did not think necessary
Sex					
Male	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Female	0.98 (0.97, 0.99)	0.84 (0.81, 0.88)	1.33 (1.23, 1.43)	1.66 (1.53, 1.82)	1.51 (1.34, 1.70)
Age (years)					
12–24	0.90 (0.87, 0.92)	1.90 (1.73, 2.09)	0.31 (0.26, 0.37)		0.61 (0.50, 0.76)
25–44	0.98 (0.96, 1.00)	1.43 (1.30, 1.58)	0.57 (0.50, 0.64)		0.53 (0.44, 0.66)
45–64	1.02 (1.00, 1.04)	1.29 (1.17, 1.42)	0.58 (0.52, 0.64)		0.68 (0.57, 0.83)
65+	1.00 (reference)	1.00 (reference)	1.00 (reference)		1.00 (reference)
Married status					
Single	1.00 (reference)		1.00 (reference)		
Married/common law	1.01 (1.00, 1.03)		1.12 (1.00, 1.26)		
Separated/divorced/ widowed	1.01 (0.99, 1.03)		1.22 (1.06, 1.41)		
Smoking status					
Smoker		1.09 (1.03, 1.13)	1.16 (1.05, 1.28)	1.17 (1.05, 1.30)	0.67 (0.57, 0.79)
Former smoker		1.06 (1.01, 1.11)	1.05 (0.96, 1.15)	1.09 (0.99, 1.20)	0.85 (0.74, 0.97)
Non-smoker		1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Education					
Low	1.00 (reference)	1.00 (reference)			1.00 (reference)
Middle	1.03 (1.02, 1.05)	1.15 (1.09, 1.21)			0.67 (0.56, 0.80)
High	1.03 (1.02, 1.05)	1.06 (1.00, 1.12)			0.81 (0.69, 0.94)
Income					
Low	1.00 (reference)				
Middle	1.01 (1.00, 1.03)				
High	1.00 (0.98, 1.01)				
Being immigrants					
Immigrant	0.98 (0.97, 1.00)				
Non-immigrant	1.00 (reference)				
Race					
White	1.04 (1.03, 1.06)	0.92 (0.88, 0.96)	1.31 (1.18, 1.47)		
Non-White	1.00 (reference)	1.00 (reference)	1.00 (reference)		
Physical activity					
Active	1.00 (reference)	1.00 (reference)	1.00 (reference)		
Moderate	1.01 (1.00, 1.02)	1.04 (0.99, 1.10)	0.84 (0.76, 0.94)		
Inactive	0.98 (0.97, 0.99)	1.16 (1.11, 1.21)	0.77 (0.71, 0.85)		
Major disease					
No	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Yes	0.92 (0.91, 0.94)	1.09 (1.04, 1.15)	1.50 (1.37, 1.64)	1.26 (1.13, 1.41)	1.25 (1.08, 1.46)
Non major disease					
No	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Yes	0.97 (0.96, 0.98)	1.04 (1.00, 1.08)	1.47 (1.35, 1.59)	1.21 (1.11, 1.33)	1.23 (1.09, 1.40)
Self-perceived health					
Excellent	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Very good	0.98 (0.97, 0.99)	1.08 (1.03, 1.14)	1.00 (0.90, 1.11)	1.15 (1.02, 1.30)	0.98 (0.84, 1.15)
Good	0.96 (0.94, 0.97)	1.05 (1.00, 1.11)	1.17 (1.05, 1.31)	1.40 (1.23, 1.59)	1.12 (0.95, 1.33)
Fair	0.93 (0.91, 0.95)	1.12 (1.03, 1.21)	1.34 (1.16, 1.56)	1.55 (1.30, 1.85)	1.28 (1.00, 1.61)
Poor	0.82 (0.77, 0.86)	0.95 (0.82, 1.10)	1.55 (1.27, 1.89)	1.90 (1.47, 2.43)	1.61 (1.14, 2.22)
Provinces					
Ontario	0.97 (0.96, 0.98)	1.19 (1.15, 1.24)	1.56 (1.45, 1.68)	1.63 (1.50, 1.78)	1.37 (122, 1.54)
Other provinces/ territories	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
History of influenza vaccination					
No	1.00 (reference)	1.00 (reference)		1.00 (reference)	1.00 (reference)
Yes	0.59 (0.58, 0.59)	2.73 (2.63, 2.85)		0.51 (0.46, 0.56)	0.66 (0.58, 0.75)

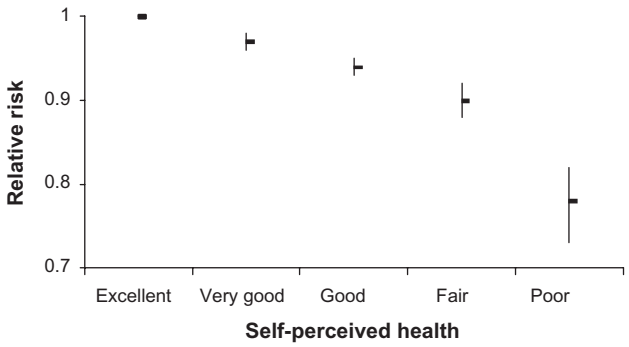

Figure 2 "Respondent did not think necessary" as a reason for not having influenza vaccination during the past year associated with self-perceived health after excluding chronic disease, Canadian Community Health Survey 2007–2008.

associated with "Respondent did not think it necessary" as a reason for not having an influenza vaccination in the past year and healthy people were more likely to report this reason, and relatively less likely to report other reasons. For those who had influenza vaccination previously, the main reason for not having an influenza vaccination in the last year was not having gotten around to it.

Table 4 (Appendix 1 for full models) shows the proportions of various reasons for reporting not having received an influenza vaccination during the past 12 months in Ontario and other regions. After adjustment for covariates, Ontarians were less likely to report "Respondent did not think it necessary" (adjusted RR: 0.97, 95% CI: 0.96, 0.98), but more likely to report "Have not gotten around to it" (adjusted RR: 1.19, 95% CI: 1.15, 1.24), "Bad reaction to previous shot" (adjusted RR: 1.56, 95% CI: 1.45, 1.68), "Fear" (adjusted RR: 1.63, 95% CI: 1.50, 1.78), and "Doctor did not think it necessary" (adjusted RR: 1.37, 95% CI: 1.22, 1.54).

Table 4 Reasons for not having influenza vaccination shot during the past year in Ontario and other regions, the Canadian Community Health Survey 2007–2008

Reason	Ontario (n = 24613)		Other (n = 56464)	
	No	%[a]	No	%[a]
Have not gotten around to it	4807	21.6	8294	15.3
Respondent did not think necessary	15535	65.7	39910	74.5
Doctor did not think necessary	674	2.7	1256	2.1
Personal/family responsibility	190	0.8	311	0.6
Not available when required	323	1.4	524	0.8
Not available in area	89	0.3	204	0.3
Waiting time was too long	66	0.3	96	0.2
Transportation problems	34	0.1	64	0.1
Language problem	5	0.1	10	0.0
Cost	27	0.1	456	0.9
Did not know where to go	172	0.7	542	1.2
Fear	1402	5.2	2256	3.5
Bad reaction to previous shot	1935	6.8	3036	4.5
Unable leave house/health	66	0.2	114	0.2
Other	313	1.3	563	1.0

Note: [a]The proportions were weighted to the Canadian general population.

Discussion

Our data demonstrated that in Canada, individuals who were male or young had a lower rate and those who had a chronic condition or poor self-perceived health had a higher rate of seasonal influenza vaccination. The most common reason for not having an influenza vaccination in the past year is that respondents did not think it was necessary, and this was more so in those who had never been immunized against influenza (83%) compared to those who had (49%). There was a notable age difference that children and youth as compared with adults were more likely to think a seasonal vaccination unnecessary compared with others. The results were comparable to previous findings observed in children[11] and youth and the elderly.[8,9,12] Those who had chronic disease and self-perceived poor health were less likely to think an influenza vaccination unnecessary, which echoes some previous results that having a chronic disease and self-perceived health status are important predictors for uptake of influenza vaccination.[13] The association between self-perceived health and belief that an influenza vaccination is unnecessary showed a linear trend in that those who had poorer self-perceived health were less likely to have this belief that influenza vaccination is unnecessary. Ontario has established the Universal Influenza Immunization Program, which provides free influenza vaccination to all residents excluding neonates and has promoted the program since 2000. The data demonstrated that Ontarians were less likely to report that influenza vaccination was unnecessary as a reason for not having an influenza vaccination compared with other regions. More jurisdictions have had these programs since the survey was conducted and the situation might have changed.

The second most common reason for reporting not having received the influenza vaccination was that respondents had not gotten around to it. Male sex, young age, smoking, physical inactivity, and non-White race were associated with an increased likelihood of reporting this reason. Immunization sites may not be open at the right time for some sub-groups. There may be prioritization issues in terms of time management for individuals with different characteristics. We noticed that those who reported having had influenza vaccination previously were substantially more likely to report that

they had not gotten around to having influenza vaccination compared to those who reported having no influenza vaccination history and Ontarians, with a large urban population, had a higher proportion of this response than people in other provinces.

Bad reaction to the previous influenza vaccination was the third most important reason for not having influenza vaccination in the previous year. The seasonal influenza vaccine in general is very safe and only a small number of people are reported to have some mild side effects after influenza vaccination,[14,15] such as crankiness, irritability, general malaise, soreness and pain, allergic reactions, mild fever, nausea, and headaches. There is a rare occurrence of neurological complications such as Guillain-Barré syndrome after influenza vaccination.[16–19] The proportion of individuals reporting not having received the influenza vaccine because they reported having had a previous bad reaction was higher in Ontario than other regions as a whole, which might be due to a higher vaccination rate in Ontario. Living in Ontario was associated with an approximately 50% increase in influenza vaccination rate during the 2007/2008 season [odds ratio (OR) 1.50, 95% confidence interval (CI) 1.45–1.55].[20]

Approximately 4% and 2% of those who had no influenza vaccination in the previous year reported "Fear" and "Doctor did not think it necessary." Female participants and those with chronic poorer health were more likely to report these reasons. People with chronic conditions were more likely to consult with physicians, which might increase the likelihood of obtaining the opinion from medical doctors. Not all physicians think that influenza vaccination is effective and/or necessary for all the people.

In Canada, at the time that the survey was conducted, Ontario was the only province that provided free influenza vaccination to its residents of all ages. In a previous study conducted in the United States,[21] one-third of vaccine recipients would refuse vaccination if asked to pay at least $10. Cost may be a primary reason for low coverage in Poland.[22] However, the affordability of the vaccine in general is not likely an important issue in Canada, and only less than 1 percent reported cost as a reason for not getting vaccinated.

The study has some limitations. The national survey did not include children under the age of 12 years and those living on Indian Reserves or Crown lands and residents of institutions, who may be at high risk of influenza infections. Information misclassification clearly existed, for example, some respondents (1%) who had not had influenza vaccination reported having a bad reaction to a previous one. Non-respondents accounted for about one quarter of the selected population. There might be considerable recall bias. We are not able to provide a reasonable estimation for the size of the bias. The analysis was based on existing data collected from Statistics Canada and some important answers to the question, "What are the reasons that you have not had a flu shot in the past year?" such as "worry about the adverse reaction" and "the flu shot makes me sick," were not included in the questionnaire.

It is important to understand the factors influencing the decision to receive a seasonal influenza vaccination, which will be helpful to guide the development and improvement of influenza vaccination programs for the general population. Since the vast majority of people who did not receive an influenza vaccination during the past year thought it was not necessary, it would be crucial to increase awareness of the importance of influenza vaccination among these people, especially those who perceived themselves to be healthy. More and stronger evidence for the effectiveness and personal/population benefits of seasonal influenza vaccination would be most helpful to motivate people to have the vaccination and improve uptake among the general population. Male and younger participants were more likely to report, "Have not gotten around to it" than female and older ones. Issues related to programmatic implementation of vaccine program need to be further examined and addressed to make flu shots easier to access for various subpopulations.

Disclosure

The authors report no conflicts of interest in this work.

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Appendix table

Appendix 1 Adjusted relative risks (95% confidence intervals) for reasons not having influenza vaccination during the past year associated with various factors, Canadian Community Health Survey 2007–2008 – full models

	Respondent did not think necessary	Have not gotten around to it	Bad reaction to previous shot	Fear	Doctor did not think necessary
Sex					
Male	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Female	0.98 (0.97, 0.99)	0.84 (0.81, 0.87)	1.32 (1.23, 1.43)	1.66 (1.52, 1.81)	1.51 (1.34, 1.71)
Age (years)					
12–24	0.90 (0.87, 0.92)	1.91 (1.71, 2.13)	0.30 (0.25, 0.37)	0.85 (0.69, 1.06)	0.66 (0.50, 0.87)
25–44	0.98 (0.96, 1.01)	1.43 (1.29, 1.58)	0.54 (0.48, 0.61)	0.94 (0.79, 1.12)	0.54 (0.44, 0.68)
45–64	1.02 (1.00, 1.04)	1.28 (1.16, 1.41)	0.56 (0.50, 0.62)	0.87 (0.74, 1.04)	0.68 (0.56, 0.83)
65+	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Married status					
Single	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Married/common law	1.01 (1.00, 1.03)	1.02 (0.97, 1.08)	1.12 (1.00, 1.26)	0.99 (0.88, 1.12)	1.10 (0.92, 1.32)
Separated/divorced/ widowed	1.01 (0.99, 1.03)	1.03 (0.95, 1.12)	1.24 (1.08, 1.43)	0.87 (0.73, 1.04)	1.22 (0.96, 1.55)
Unknown	0.93 (0.79, 1.04)	0.96 (0.55, 1.47)	1.17 (0.44, 2.39)	1.60 (0.65, 3.13)	1.46 (0.31, 4.00)
Smoking status					
Smoker	0.99 (0.98, 1.00)	1.08 (1.03, 1.14)	1.16 (1.05, 1.28)	1.13 (1.01, 1.26)	0.68 (0.57, 0.80)
Former smoker	1.00 (0.99, 1.01)	1.05 (1.01, 1.10)	1.04 (0.95, 1.14)	1.07 (0.97, 1.19)	0.85 (0.74, 0.97)
Non-smoker	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Unknown	0.99 (0.88, 1.06)	0.98 (0.69, 1.33)	1.22 (0.69, 1.98)	0.83 (0.35, 1.63)	0.67 (0.23, 1.52)
Education					
Low	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Middle	1.03 (1.02, 1.05)	1.15 (1.09, 1.21)	1.03 (0.92, 1.16)	0.93 (0.82, 1.05)	0.67 (0.56, 0.80)
High	1.03 (1.02, 1.05)	1.05 (1.00, 1.11)	1.13 (1.02, 1.26)	0.96 (0.86, 1.09)	0.80 (0.69, 0.94)
Unknown	1.02 (0.97, 1.07)	1.10 (0.89, 1.37)	1.05 (0.68, 1.56)	0.85 (0.51, 1.37)	0.67 (0.35, 1.22)
Income					
Low	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Middle	1.01 (1.00, 1.03)	0.95 (0.90, 1.00)	1.10 (0.99, 1.23)	0.96 (0.85, 1.08)	1.01 (0.86, 1.20)
High	0.99 (0.98, 1.01)	1.04 (0.98, 1.10)	1.03 (0.92, 1.16)	0.88 (0.78, 1.00)	1.15 (0.97, 1.37)
Unknown	0.96 (0.94, 0.98)	0.97 (0.91, 1.04)	1.15 (1.01, 1.30)	1.04 (0.90, 1.19)	1.08 (0.89, 1.31)
Being immigrants					
Immigrant	0.98 (0.97, 1.00)	0.97 (0.92, 1.02)	0.87 (0.78, 0.96)	0.81 (0.71, 0.92)	0.98 (0.83, 1.15)
Non-immigrant	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Unknown	0.99 (0.94, 1.04)	0.94 (0.75, 1.15)	0.72 (0.46, 1.11)	0.98 (0.61, 1.52)	1.33 (0.73, 2.26)
Race					
White	1.04 (1.03, 1.06)	0.90 (0.86, 0.95)	1.22 (1.08, 1.38)	1.01 (0.89, 1.15)	0.98 (0.82, 1.16)
Non-White	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Unknown	1.01 (0.97, 1.06)	0.89 (0.77, 1.03)	1.57 (1.18, 2.06)	1.04 (0.72, 1.46)	1.10 (0.68, 1.72)
Physical activity					
Active	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Moderate	1.01 (0.99, 1.02)	1.04 (0.99, 1.10)	0.85 (0.76, 0.94)	0.92 (0.81, 1.04)	0.87 (0.74, 1.03)
Inactive	0.98 (0.97, 0.99)	1.16 (1.11, 1.22)	0.78 (0.71, 0.85)	0.96 (0.86, 1.07)	0.97 (0.84, 1.12)
Unknown	0.96 (0.82, 1.06)	1.04 (0.51, 1.79)	0.25 (0.02, 0.96)	0.59 (0.07, 1.99)	1.15 (0.21, 3.37)
Major disease					
No	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Yes	0.92 (0.91, 0.94)	1.09 (1.04, 1.15)	1.49 (1.37, 1.63)	1.23 (1.10, 1.38)	1.25 (1.08, 1.46)
Non major disease					
No	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Yes	0.97 (0.96, 0.98)	1.04 (1.00, 1.08)	1.47 (1.35, 1.59)	1.21 (1.10, 1.32)	1.23 (1.09, 1.40)
Self-perceived health					
Excellent	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Very good	0.98 (0.97, 0.99)	1.08 (1.03, 1.14)	1.00 (0.90, 1.11)	1.15 (1.02, 1.30)	0.99 (0.84, 1.16)
Good	0.96 (0.94, 0.97)	1.06 (1.00, 1.12)	1.19 (1.06, 1.33)	1.40 (1.24, 1.60)	1.14 (0.96, 1.35)

(*Continued*)

Appendix 1 (*Continued*)

	Respondent did not think necessary	Have not gotten around to it	Bad reaction to previous shot	Fear	Doctor did not think necessary
Fair	0.93 (0.91, 0.95)	1.12 (1.04, 1.22)	1.38 (1.19, 1.60)	1.55 (1.29, 1.85)	1.30 (1.02, 1.65)
Poor	0.82 (0.77, 0.86)	0.96 (0.83, 1.11)	1.61 (1.31, 1.96)	1.93 (1.48, 2.47)	1.63 (1.15, 2.25)
Unknown	0.82 (0.59, 1.02)	1.07 (0.37, 2.17)	1.73 (0.59, 3.55)	1.22 (0.14, 4.10)	1.20 (0.09, 4.66)
Ontario					
No	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Yes	0.97 (0.96, 0.98)	1.19 (1.15, 1.23)	1.57 (1.46, 1.69)	1.69 (1.55, 1.85)	1.36 (1.20, 1.53)
Flu shot history					
No	1.00 (reference)	1.00 (reference)		1.00 (reference)	1.00 (reference)
Yes	0.59 (0.58, 0.60)	2.73 (2.62, 2.84)		0.51 (0.46, 0.56)	0.66 (0.58, 0.75)