

# The effect of universal influenza immunization on vaccination rates in Ontario

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## Abstract

### Objectives

This article examines the association between introduction of Ontario's Universal Influenza Immunization Program and changes in vaccination rates over time in Ontario, compared with the other provinces combined.

### Data sources

The data are from the 1996/97 National Population Health Survey and the 2000/01 and 2003 Canadian Community Health Survey, both conducted by Statistics Canada.

### Analytical techniques

Cross-tabulations were used to estimate vaccination rates for the total population aged 12 or older, for groups especially vulnerable to the effects of influenza, and by selected socio-demographic variables. Z tests and multiple logistic regression were used to examine differences between estimates.

### Main results

Between 1996/97 and 2000/01, the increase in the overall vaccination rate in Ontario was 10 percentage points greater than the increase in the other provinces combined. Increases in Ontario were particularly pronounced among people who were: younger than 65, more educated, and had a higher household income. Between 2000/01 and 2003, vaccination rates were stable in Ontario, while rates continued to rise in the other provinces. Even so, Ontario's 2003 rates exceeded those in the other provinces.

## Keywords

preventive health services, community health services, population-based health planning

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Annual influenza epidemics are responsible for substantial morbidity and mortality and impose a considerable economic burden on society in terms of health care costs and lost productivity.<sup>1</sup> Influenza is highly contagious and infects 10% to 25% of the population each year.<sup>2</sup> While most healthy adults and children recover, in vulnerable populations such as the elderly and people with chronic medical conditions, influenza can lead to serious complications, and even death.<sup>3</sup>

Prevention through vaccination is the cornerstone of influenza management. Seasonal flu shots are recommended for people at high risk of complications.<sup>4,5</sup> Vaccination is both safe and effective, reducing the number of cases by up to 70% in healthy adults<sup>6</sup> and 50% in the elderly.<sup>7</sup>

## Methods

### Data sources

This analysis was based on data from the 1996/97 National Population Health Survey (NPHS) and the first two cycles of the Canadian Community Health Survey (CCHS), conducted in 2000/01 (cycle 1.1) and 2003 (cycle 2.1). These Statistics Canada surveys cover the household population. Members of the Canadian Forces and residents of Canadian Forces bases, Indian reserves and some remote areas, as well as residents of institutions (nursing homes, prisons, etc.), are excluded. This study compares people aged 12 or older who lived in Ontario with those who lived in the other nine provinces (combined).

#### *National Population Health Survey*

Since 1994/95, the biennial NPHS has collected cross-sectional and longitudinal data, for the most part, through telephone interviews. For the cross-sectional component, socio-demographic data and basic health information were collected for each member of a household and stored in the General file. Additional health information, including data on influenza vaccination, was collected for one randomly selected household member and stored in the Health file. Details of the NPHS design and sampling techniques have been described previously.<sup>8</sup> The 1996/97 NPHS was conducted from June 1996 to August 1997; the overall response rate was approximately 83%. This analysis used data from the Health file for 73,402 respondents aged 12 or older, weighted to represent a population of approximately 24.6 million.

#### *Canadian Community Health Survey*

The CCHS, which began in 2000/01, is a cross-sectional survey conducted through telephone and in-person interviews over a two-year repeating cycle. Data on influenza vaccination were collected in 2000/01 (cycle 1.1) and in 2003 (cycle 2.1). Data collection for cycle 1.1 took place over 12 months starting in September 2000, but questions about influenza vaccination were asked only in the fourth quarter (June to August 2001). These questions were asked in all four quarters for cycle 2.1 (January to December, 2003). Details of the CCHS design and sampling techniques have been described previously.<sup>9</sup> The response rate for cycle 1.1 was approximately 85%; for cycle 2.1, 81%. The samples used in this study comprise 35,187 respondents aged 12 or older for cycle 1.1,

and 133,026 respondents aged 12 or older for cycle 2.1, weighted to represent 25.9 million and 26.5 million individuals, respectively. Selected characteristics of the sample population surveyed in 2003 are presented in Appendix Table A.

### Analytical techniques

Based on NPHS and CCHS data, cross-tabulations were used to estimate the proportion of people aged 12 or older who reported that they had had a flu shot in the previous year, by selected socio-demographic characteristics, and by risk group for influenza immunization (seniors and people of any age with specific chronic conditions). In the unadjusted analysis, Z tests were used to examine the proportions vaccinated in 1996/97 versus 2000/01, and 2000/01 versus 2003, and to compare the absolute changes in vaccination rates over time in Ontario with the corresponding changes in the other provinces combined. In the adjusted analysis, multiple logistic regression was used to model the effect of the introduction of the Universal Influenza Immunization Program (UIIP) in Ontario on vaccination status, stratified by age group and chronic condition status. The unit of analysis was the individual respondent; the response variable was their influenza vaccination status; the main predictor variable was the interaction between presence of the UIIP (Ontario versus other provinces) and time (1996/97 versus 2000/01 or 2000/01 versus 2003); and the potential confounders were age, sex, province, household income, education, smoking status, and having a regular doctor. The p value of the interaction term between UIIP presence and time was used to test the significance of the change in vaccination rates over time in Ontario compared with the change in other provinces. Separate analyses stratified by age group (12 to 49, 50 to 64, and 65 or older) and the presence of one or more chronic medical conditions were conducted.

Because of the multi-stage design of the NPHS and CCHS, the bootstrap technique<sup>10</sup> was used to calculate coefficients of variation and to test the statistical significance of differences. A significance level of  $p < 0.05$  was used. However, the large sample sizes resulted in small changes in the proportion vaccinated being statistically significant, so only changes greater than 5 percentage points were considered "clinically significant."

Despite the benefits, influenza vaccination rates have remained relatively low. A national consensus conference in 1993 set a target coverage rate of 70% for seniors and for all adults with chronic medical conditions.<sup>11</sup> Results from the 1996/97 National Population Health Survey indicated that 51% of seniors and 21% of 20- to 64-year-olds with chronic conditions had had a flu shot in the previous year.<sup>12</sup>

By 2000, most provinces and territories had publicly funded programs to offer free flu shots to seniors, people with chronic medical conditions, and health care workers.<sup>13</sup> In July that year, Ontario established a universal influenza immunization program (UIIP) to provide free vaccinations to the entire population aged six months or older.<sup>14</sup> This was the first large-scale program of its kind in the world, and Ontario remains the only province in Canada to have such a policy.

This study evaluates the effect of Ontario's UIIP on vaccination rates. Data from the National Population Health Survey (NPHS) and the Canadian Community Health Survey (CCHS) were used to assess whether the introduction of UIIP was associated with a greater increase in vaccination rates in Ontario than occurred in the other provinces (see *Methods, Definitions and Limitations*). Risk groups and population subgroups that experienced the most and least change in vaccination rates associated with UIIP introduction are identified.

### Initial effect (1996/97 versus 2000/01)

Between 1996/97 (pre-UIIP) and 2000/01 (post-UIIP), the percentage of Ontario residents aged 12 or older who had a flu shot rose from 18% to 36%. The increase for the other provinces combined was from 13% to 21% (Table 1) (see "Flu shots—National and provincial/territorial trends" in this issue for the percentages vaccinated in individual provinces). Therefore, UIIP introduction in Ontario was associated with an additional 10 percentage-point absolute increase in the overall proportion vaccinated, compared with the other provinces combined.

In Ontario, the 20-to-64 age group had the largest increase in the percentage immunized, while in the

## Definitions

Ontario's Universal Influenza Immunization Program (UIIP) was officially announced in July 2000, but since influenza vaccines are not available until October, the start of the program was defined as October 2000.

Respondents to the 1996/97 National Population Health Survey and the 2000/01 and 2003 Canadian Community Health Survey were asked, "Have you ever had a flu shot?" If they said "yes," they were asked when they had last been vaccinated. Those who stated that they had received a flu shot within the last year were considered to be actively immunized.

To determine *chronic condition* status, respondents were asked if they had any "long-term conditions that had lasted or were expected to last six months or more and that had been diagnosed by a health professional," and a list of conditions was read to them. Those who reported heart disease, diabetes, cancer, effects of stroke, asthma, or emphysema/chronic bronchitis were considered to have a condition for which influenza immunization is recommended.

Two sets of *age groups* were considered: 1) 12 to 19, 20 to 49, 50 to 64, 65 to 74, 75 to 84, 85 or older and 2) 12 to 49, 50 to 64, 65 or older.

*Risk groups* were defined as high or low. People aged 65 or older and 12- to 64-year-olds with at least one chronic condition were deemed high risk. Individuals aged 12 to 64 with no chronic conditions were considered low risk.

*Education* was defined as the highest level attained: less than secondary graduation, secondary graduation, or at least some postsecondary.

*Household income* was based on the number of people in the household and total income from all sources in the previous 12 months:

Household income group	People in household	Total household income
Lowest	1 or 2	Less than \$15,000
	3 or 4	Less than \$20,000
	5 or more	Less than \$30,000
Lower-middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

Three *smoking status* categories were considered: never, former, or daily/occasional.

Respondents were asked if they had a *regular medical doctor*.

Table 1  
Percentage vaccinated for influenza in past year, by selected characteristics, household population aged 12 or older, Ontario and other provinces, 1996/97 and 2000/01

	Ontario			Other provinces			Difference in change (Ontario-other provinces)
	1996/97	2000/01	Percentage-point change	1996/97	2000/01	Percentage-point change	
	%			%			
<b>Total</b>	18.1	36.0	17.9*	12.7	20.8	8.1*	9.8*
<b>Sex</b>							
Male	17.0	32.2	15.2*	11.0	17.9	6.9*	8.3*
Female	19.1	39.6	20.5*	14.3	23.6	9.3*	11.2*
<b>Age group</b>							
12-49	9.3	27.0	17.7*	5.6	11.5	5.9*	11.8*
12-19	15.8	28.7	12.9*	5.6	9.4	3.8*	9.1*
20-49	8.0	26.6	18.6*	5.6	11.9	6.3*	12.3*
50-64	20.5	41.6	21.1*	14.6	22.6	8.0*	13.1*
65+	59.5	72.5	12.9*	46.0	63.2	17.2*	-4.2
65-74	54.3	69.5	15.2*	42.2	57.8	15.6*	-0.4
75-84	69.6	78.7	9.1*	54.0	71.0	17.0*	-7.9*
85+	67.2	73.4	6.2	44.0	70.5	26.5*	-20.4*
<b>Chronic condition<sup>†</sup></b>							
At least one	37.5	56.3	18.8*	27.3	37.8	10.4*	8.4*
None	14.3	31.3	17.0*	10.0	17.0	7.1*	10.0*
<b>Education</b>							
Less than secondary graduation	24.8	40.3	15.5*	16.2	24.3	8.1*	7.4*
Secondary graduation	17.3	33.1	15.8*	11.5	17.9	6.4*	9.5*
At least some postsecondary	14.9	34.8	19.9*	10.9	19.9	8.9*	11.0*
<b>Household income</b>							
Lowest	21.8	33.1	11.3*	15.7	21.9	6.2*	5.1
Lower-middle	22.4	40.4	18.0*	14.2	23.7	9.5*	8.4*
Upper-middle	16.5	37.7	21.2*	10.7	19.4	8.7*	12.5*
Highest	12.0	33.3	21.3*	10.3	19.3	8.9*	12.3*
<b>Smoking status</b>							
Never	17.7	34.8	17.0*	12.9	20.6	7.6*	9.4*
Former	23.2	42.3	19.0*	17.0	25.9	8.9*	10.2*
Daily/Occasional	12.9	29.2	16.3*	8.0	13.9	5.9*	10.3*
<b>Has regular doctor</b>							
Yes	18.8	37.9	19.0*	14.3	24.1	9.7*	9.3*
No	6.7	18.5	11.8*	4.3	8.0	3.7*	8.1*

**Data sources:** 1996/97 National Population Health Survey, cross-sectional sample, Health file; 2000/01 Canadian Community Health Survey, cycle 1.1, fourth quarter

<sup>†</sup> Heart disease, effects of stroke, diabetes, cancer, asthma, emphysema/chronic bronchitis

\* Significantly different from 0 at 0.05 level (unadjusted analysis using Z test)

other provinces combined, the increase was greatest among seniors, especially those aged 85 or older. In fact, for people aged 65 or older, the increase in vaccination rates between 1996/97 and 2000/01 in the other provinces exceeded that in Ontario. This was probably because the 1996/97 rate for

Ontario seniors had been much higher than that in the other provinces (60% versus 46%), and as a result, further gains were harder to achieve. Even so, in 2000/01, the percentage of Ontario seniors who had had a flu shot was still well above that in the other provinces: 72% versus 63%.

Introduction of universal influenza immunization was also associated with significantly greater increases in vaccination rates for Ontario residents with chronic conditions (heart disease, effects of stroke, diabetes, cancer, asthma, and emphysema/chronic bronchitis). Among Ontarians with any of these conditions, the vaccination rate rose from 38% to 56%; in the other provinces combined, the figure went from 27% to 38%. Vaccination rates for people without these conditions were lower, but again, the increase in Ontario exceeded that in the other provinces.

An examination of the data for each age group, with and without chronic conditions, shows that vaccination rates were higher in Ontario than in the other provinces in both 1996/97 and 2000/01 (Table 2). Ontario's UIIP was associated with significantly greater increases in vaccination rates for people aged 12 to 64, whether or not they had a chronic condition. Adjusting for potential

confounders (age, sex, education, household income, smoking status, having a regular doctor, and province) in a multivariate analysis did not change these results. However, for seniors with a chronic condition, the increase in the vaccination rate in the other provinces was actually greater than that in Ontario.

A socio-economic gradient was evident. The difference between the increases in Ontario vaccination rates versus those in the other provinces widened at higher levels of education and household income (Table 1). For instance, among people in the lowest income households, the vaccination rate in Ontario rose 5 percentage points more than did the rate in the other provinces combined, a difference that was not significant. However, among people in the highest income households, the increase in Ontario's rate exceeded that in the other provinces by 12 percentage points.

Table 2  
Percentage vaccinated for influenza in past year, by age group and presence of chronic condition(s),<sup>†</sup> household population aged 12 or older, Ontario and other provinces, 1996/97 and 2000/01

Age group and chronic condition	Ontario			Other provinces			Difference in change (Ontario-other provinces)
	1996/97	2000/01	Percentage-point change	1996/97	2000/01	Percentage-point change	
	%			%			
<b>12-49</b>							
At least one chronic condition	17.7	39.3	21.6*	12.8	18.4	5.6*	16.0* <sup>‡</sup>
No chronic condition	8.2	25.2	16.9*	4.7	10.4	5.8*	11.2* <sup>‡</sup>
<b>50-64</b>							
At least one chronic condition	39.5	58.3	18.7*	26.9	35.5	8.6*	10.1* <sup>‡</sup>
No chronic condition	15.9	36.4	20.5*	11.7	18.7	7.0*	13.5* <sup>‡</sup>
<b>65+</b>							
At least one chronic condition	68.7	81.6	12.9*	52.3	70.9	18.6*	-5.8 <sup>‡</sup>
No chronic condition	54.4	66.4	12.0*	42.9	58.4	15.6*	-3.5 <sup>‡</sup>

**Data sources:** 1996/97 National Population Health Survey, cross-sectional sample, Health file; 2000/01 Canadian Community Health Survey, cycle 1.1, fourth quarter

<sup>†</sup> Heart disease, effects of stroke, diabetes, cancer, asthma, emphysema/chronic bronchitis

\* Significantly different from 0 at 0.05 level (unadjusted analysis using Z test)

<sup>‡</sup> Significantly different from 0 at 0.05 level (adjusted analysis using logistic regression that controlled for age, sex, education, household income, smoking status having a regular doctor, and province)

### Sustained UIIP effect (2000/01 versus 2003)

Between 2000/01 and 2003, Ontario's overall vaccination rate was stable, whereas the rate in the other provinces combined rose by 2 percentage points (Table 3). As well, in the other provinces, clinically significant increases in vaccination rates occurred among those aged 50 to 64 and people with at least one chronic condition. This

contrasted with no clinically significant change or slight decreases for these groups in Ontario. Even so, in 2003, vaccination rates among Ontarians in both of these groups were still substantially above the corresponding figures for the other provinces combined.

A more detailed picture of the changes in influenza immunization rates between 2000/01 and 2003 emerges when the presence of chronic

Table 3  
Percentage vaccinated for influenza in past year, by selected characteristics, household population aged 12 or older, Ontario and other provinces, 2000/01 and 2003

	Ontario			Other provinces			Difference in change (Ontario-other provinces)
	2000/01	2003	Percentage-point change	2000/01	2003	Percentage-point change	
	%	%		%	%		
<b>Total</b>	36.0	35.1	-0.9	20.8	22.8	2.0*	-2.8*
<b>Sex</b>							
Male	32.2	31.4	-0.8	17.9	20.5	2.6*	-3.4*
Female	39.6	38.6	-1.0	23.6	25.0	1.4*	-2.4
<b>Age group</b>							
12-49	27.0	24.0	-3.0*	11.5	12.1	0.6	-3.7*
12-19	28.7	28.1	-0.6	9.4	10.0	0.6	-1.3
20-49	26.6	23.0	-3.6*	11.9	12.6	0.6	-4.2*
50-64	41.6	45.5	3.8*	22.6	29.3	6.7*	-2.8
65+	72.5	74.2	1.8	63.2	62.8	-0.4	2.2
65-74	69.5	70.7	1.2	57.8	58.7	0.9	0.3
75-84	78.7	79.8	1.1	71.0	68.3	-2.7	3.8
85+	73.4	78.4	5.0	70.5	70.8	0.3	4.7
<b>Chronic condition<sup>†</sup></b>							
At least one	56.3	55.0	-1.3	37.8	42.4	4.6*	-5.9*
None	31.3	30.4	-0.9	17.0	18.3	1.3*	-2.2*
<b>Education</b>							
Less than secondary graduation	40.3	41.0	0.7	24.3	26.5	2.2*	-1.5
Secondary graduation	33.1	33.3	0.2	17.9	19.5	1.6	-1.4
At least some postsecondary	34.8	33.2	-1.7	19.9	21.8	2.0*	-3.7*
<b>Household income</b>							
Lowest	33.1	38.5	5.3	21.9	24.4	2.5	2.8
Lower-middle	40.4	40.1	-0.3	23.7	24.7	0.9	-1.3
Upper-middle	37.7	36.0	-1.7	19.4	22.1	2.7*	-4.4*
Highest	33.3	30.8	-2.5	19.3	20.5	1.2	-3.6*
<b>Smoking status</b>							
Never	34.8	34.9	0.1	20.6	22.1	1.5	-1.4
Former	42.3	40.8	-1.4	25.9	27.6	1.7*	-3.2*
Daily/Occasional	29.2	26.0	-3.2*	13.9	15.3	1.4	-4.7*
<b>Has regular doctor</b>							
Yes	37.9	36.8	-1.1	24.1	26.0	1.9*	-3.0*
No	18.5	16.5	-2.0	8.0	8.1	0.1	-2.0

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1, fourth quarter; 2003 Canadian Community Health Survey, cycle 2.1

<sup>†</sup> Heart disease, effects of stroke, diabetes, cancer, asthma, emphysema/chronic bronchitis

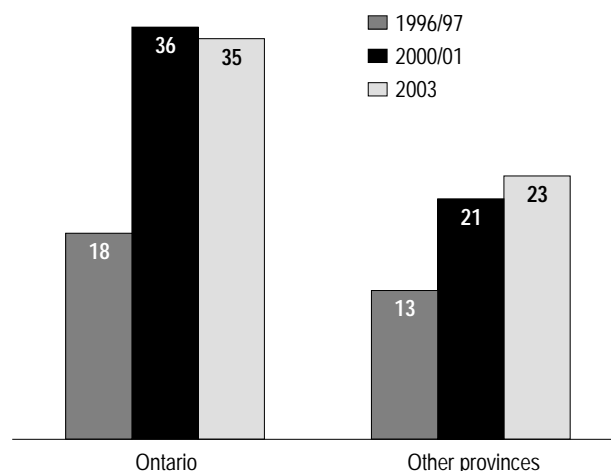
\* Significantly different from 0 at 0.05 level (unadjusted analysis using Z test)



conditions is considered for each age group (Table 4). For people aged 50 to 64, rates in Ontario increased only among those without chronic conditions, whereas in the other provinces, rates rose for everyone in this age range. When the effects of age, sex, education, household income, smoking status, having a regular doctor, and province were taken into account, the other provinces experienced greater increases in vaccination rates for people aged 12 to 64 with chronic conditions, compared with Ontario. On the other hand, among seniors without chronic conditions, the increase in Ontario surpassed the change in other provinces.

Since 2000/01, Ontario has sustained, but has generally not increased, its vaccination rates (Chart 1). At the same time, the other provinces combined have continued to improve influenza vaccination rates among certain subgroups, but have not attained Ontario's levels, even for high-risk groups.

Chart 1  
Percentage vaccinated for influenza in past year, household population aged 12 or older, Ontario and other provinces, 1996/97, 2000/01 and 2003



**Data sources:** 1996/97 National Population Health Survey, cross-sectional sample, Health file; 2000/01 Canadian Community Health Survey, cycle 1.1, fourth quarter; 2003 Canadian Community Health Survey, cycle 2.1

Table 4  
Percentage vaccinated for influenza in past year, by age group and presence of chronic condition(s),<sup>†</sup> household population aged 12 or older, Ontario and other provinces, 2000/01 and 2003

Age group and chronic condition	Ontario			Other provinces			Difference in change (Ontario–other provinces)
	2000/01	2003	Percentage-point change	2000/01	2003	Percentage-point change	
	%			%			
<b>12-49</b>							
At least one chronic condition	39.3	36.0	-3.4	18.4	21.0	2.6	-5.9 <sup>†</sup>
No chronic condition	25.2	22.2	-3.0*	10.4	10.8	0.4	-3.4*
<b>50-64</b>							
At least one chronic condition	58.3	59.2	0.9	35.5	45.3	9.8*	-8.9* <sup>†</sup>
No chronic condition	36.4	41.0	4.6*	18.7	24.3	5.6*	-1.0 <sup>†</sup>
<b>65+</b>							
At least one chronic condition	81.6	80.3	-1.3	70.9	71.0	0.1	-1.3
No chronic condition	66.4	69.9	3.5	58.4	57.3	-1.1	4.6 <sup>†</sup>

**Data sources:** 2000/01 Canadian Community Health Survey, cycle 1.1, fourth quarter; 2003 Canadian Community Health Survey, cycle 2.1

<sup>†</sup> Heart disease, effects of stroke, diabetes, cancer, asthma, emphysema/chronic bronchitis

\* Significantly different from 0 at 0.05 level (unadjusted analysis using Z test)

<sup>‡</sup> Significantly different from 0 at 0.05 level (adjusted analysis using logistic regression that controlled for age, sex, education, household income, smoking status, having a regular doctor and province)

### Limitations

Because young children and institutionalized seniors are high-risk groups, accurate and ongoing assessment of their vaccination coverage rates is important. However, the National Population Health Survey (NPHS) and the Canadian Community Health Survey (CCHS) do not have influenza immunization data for children younger than 12 or for residents of long-term health care institutions such as nursing homes.

Another limitation of these health surveys is that the information is self-reported, and it is not possible to verify participants' responses. Nonetheless, previous studies have demonstrated that self-reports of influenza immunization status are reasonably accurate.<sup>15-17</sup>

The latest Canadian Immunization Guide<sup>18</sup> recommends vaccination for all people with the following conditions: chronic cardiac and pulmonary disorders, diabetes mellitus, cancer, immunodeficiency, immunosuppression, renal disease, anemia, and hemoglobinopathy. However, the chronic condition status variable in the NPHS and CCHS included only six conditions that fall within these categories: heart disease, effects of stroke, diabetes, cancer, asthma, and emphysema/chronic bronchitis. Therefore, the group identified in this article as having one or more chronic conditions is actually a subset of those for whom vaccination is recommended.

Differences in the timing of the surveys (June 1996 to August 1997 for the NPHS, June to August 2001 for cycle 1.1 of the CCHS - fourth quarter, and January to December 2003 for cycle 2.1 of the CCHS) and the methods of data collection (mainly telephone interviews for the NPHS; a mix of telephone and in-person interviews for the CCHS) may have influenced participant recall. For instance, people may be more likely to remember having had a flu shot if asked during the winter rather than the summer.

The analysis is based on estimates for only three seasons over an eight-year period; annual data are not available. This lack of data prevents a potentially more accurate examination of trends in vaccination rates over time.

Finally, all provinces besides Ontario were considered as a single group, but interprovincial variations in vaccination rates are substantial (see "Flu shots—National and provincial/territorial trends" in this issue). Because the aim was to examine how a universal program affected the proportion of people being vaccinated, the provinces were categorized based on whether they had such a program. The logistic regression model included a province term to account for the heterogeneity in influenza vaccination programs and vaccination rates between provinces.

As of 2003, Ontario and the other provinces combined had reached the 70% target coverage rate for people aged 65 or older who had chronic conditions. Among seniors who did not have chronic conditions, that target was achieved in Ontario, but not in the other provinces combined. For younger people with chronic conditions, Ontario's vaccination rates were higher than those in the other provinces, but well below 70%: 59% versus 45% at ages 50 to 64, and 36% versus 21% at ages 12 to 49.

### Concluding remarks

Influenza vaccination rates increased substantially in Canada between 1996/97 and 2003, but after introduction of universal immunization, Ontario saw a sharper increase than that in the other provinces combined.

While the results of this analysis indicate that influenza vaccination rates are rising across the country, the sharp upturn in Ontario between 1996/97 and 2000/01 suggests that introduction of universal immunization in the fall of 2000 had an additional positive impact, especially among groups not typically covered by vaccination programs. It is not known, however, whether it was availability of free flu shots for everyone, greater ease of getting vaccinated, extensive advertising by provincial and local public health bodies, or some other cause, that led to the increase in Ontario's rates.

By 2003, the target coverage rate of 70% had been attained in Ontario for elderly people with and without chronic conditions, while in the other provinces, the target was achieved only for seniors with chronic conditions. For younger people with chronic conditions, immunization rates were well below 70% in all provinces. Thus, even in the context of a universal vaccination program, there is room for improvement. ●



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## Appendix

Table A

Distribution of selected characteristics, household population aged 12 or older, Ontario and other provinces, 2003

	Ontario			Other provinces		
	Sample size	Estimated population		Sample size	Estimated population	
		'000	%		'000	%
<b>Total</b>	<b>42,777</b>	<b>10,279</b>	<b>100.0</b>	<b>90,249</b>	<b>16,228</b>	<b>100.0</b>
<b>Sex</b>						
Males	19,595	5,048	49.1	41,351	8,006	49.3
Females	23,182	5,231	50.9	48,898	8,222	50.7
<b>Age group</b>						
12-49	23,823	6,773	65.9	50,610	10,475	64.6
12-19	5,826	1,296	12.6	12,533	2,008	12.4
20-49	17,997	5,477	53.3	38,077	8,467	52.2
50-64	9,520	2,048	19.9	20,553	3,429	21.1
65+	9,434	1,458	14.2	19,086	2,323	14.3
65-74	5,226	848	8.2	10,259	1,331	8.2
75-84	3,472	507	4.9	7,002	806	5.0
85+	736	103	1.0	1,825	186	1.1
<b>Influenza vaccination in past year</b>						
Yes	16,861	3,495	35.1	23,278	3,564	22.8
No	24,687	6,461	64.9	63,961	12,064	77.2
<b>Chronic condition<sup>†</sup></b>						
At least one	10,108	1,999	19.4	20,087	3,091	19.1
None	32,669	8,280	80.6	70,162	13,136	80.9
<b>Education</b>						
Less than secondary graduation	12,393	2,486	24.6	30,187	4,423	27.9
Secondary graduation	7,999	1,971	19.5	14,508	2,749	17.3
At least some postsecondary	21,779	5,645	55.9	43,862	8,676	54.7
<b>Household income</b>						
Lowest	3,649	653	7.4	10,481	1,363	10.3
Lower-middle	7,317	1,501	17.0	17,644	2,864	21.6
Upper-middle	12,914	2,893	32.8	25,894	4,695	35.5
Highest	13,142	3,770	42.8	19,703	4,322	32.6
<b>Smoking status</b>						
Never	16,150	4,167	40.8	30,751	5,724	35.5
Former	16,736	3,768	36.9	37,541	6,630	41.1
Daily/Occasional	9,619	2,271	22.3	21,439	3,786	23.5
<b>Has regular doctor</b>						
Yes	39,182	9,433	91.8	75,532	13,338	82.2
No	3,573	840	8.2	14,550	2,859	17.6

*Data source: 2003 Canadian Community Health Survey, cycle 2.1*

*† Heart disease, effects of stroke, diabetes, cancer, asthma, emphysema/chronic bronchitis*