

**IN THIS ISSUE****SUMMARY REPORT OF THE  
2001/02 ONTARIO "INFLUENZA  
AND RESPIRATORY OUTBREAK  
SURVEILLANCE SEASON"**

Disease Control Service, Public Health  
Branch

**COMMUNIQUÉ****THE POTENTIAL FOR WEST  
NILE VIRUS INFECTION AND  
OPTIONS FOR MOSQUITO  
CONTROL**

Hamilton-Wentworth PHRED Program,  
McMaster University, University of  
Guelph

**Statistics**

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8th Floor, 5700 Yonge Street,  
Toronto, Ontario, M2M 4K5  
Telephone (416) 327-7090  
Facsimile (416) 327-2625  
Email: Mariam.Pingel@moh.gov.on.ca

Editorial Board: C. D'Cunha, G. Kettel, K. Kurji,  
K. Rottensten, H. Brown, R. Jin

Contact: Mariam Pingel

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**Seasons Greetings**

In 2002, the public health system was faced with new challenges on many fronts, making this a very busy year for all of us. It is with great satisfaction that I take this opportunity to express my gratitude and acknowledge the countless accomplishments that have been achieved by our public health staff.

The 2002 Report of the Chief Medical Officer of Health on "Injury: Predictable and Preventable" was released at this year's Ontario Public Health Association's Annual Conference. The Report focuses on unintentional injuries and their impact on all Ontarians. The Report outlines the economic and social burden of injury in Ontario as well as risk factors, challenges in prevention, and future recommendations.

The year 2002 saw the creation of the Safe Water Unit in the Public Health Branch, with additional staff to strengthen the Branch's role in ensuring safe water post-Walkerton. Post - 9/11 and anthrax scare, the Branch increased its coordinating role in emergency planning matters. The Branch has been busy addressing West Nile virus prevention and control issues, which have magnified considerably in the past year. The Ministry provided a special one-time grant for West Nile virus surveillance and control.

As part of the branch's continued support of the Public Health Information System, the Public Health Branch and representatives of health units participated in two joint public health Surveillance projects with Health Canada; the End-to-End (E2E) Health Surveillance and Public Health Information System (PHIS) Mapping projects. Both projects facilitated and fast tracked the business requirements analysis required for the deployment of an integrated Ontario Public Health Information System.

On behalf of the Public Health Branch, I wish you and your loved ones a Happy Christmas and a healthy and prosperous New Year.



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## SUMMARY REPORT OF THE 2001/02 ONTARIO "INFLUENZA AND RESPIRATORY OUTBREAK SURVEILLANCE SEASON"

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### Background

Under the *Ontario Regulation 559/91* and amendments to the *Health Protection and Promotion Act*, *Respiratory Infection Outbreaks in Institutions* were included among the specified Reportable Diseases in 2001. Starting with the 2001/02 surveillance season, all respiratory outbreaks in institutions, irrespective of the causative organisms, became reportable to the Public Health Branch (PHB) of the Ministry of Health and Long-Term Care (MOHLTC), including those with unknown causes. Reporting of non-influenza respiratory outbreaks in institutions is necessary to assess the complete epidemiology of respiratory outbreaks, which is essential for adequate and timely control measures.

### Data Summary

Of the 317 respiratory outbreaks that occurred in provincial institutions, 195 (61.5%) were due to influenza and 44 (13.9%) were caused by other organisms. Data collected on non-influenza institutional respiratory outbreaks are included in this report.

Influenza surveillance in Ontario was conducted from October 29, 2001 to April 30, 2002. The influenza season in Ontario started early in the 2001/02 season, with the first institutional outbreak reported in early October 2001. Institutional outbreak activity started to rise in January, and peaked in March. The majority of institutional outbreaks involved influenza type A.

Outbreaks attributed to organisms other than influenza started later, in mid-November 2001. Of the 44 non-influenza outbreaks that occurred during the season, 32 (72.7%) were due to respiratory syncytial virus (RSV), and 7 (15.9%) were due to parainfluenza virus (PIV), with the remainder caused by a variety of other organisms.

During the reporting period of November 3, 2001 to May 4, 2002, (the period during which the national and Ontario's surveillance period most closely overlapped), participating laboratories across Canada reported 6,592 laboratory-confirmed cases of influenza to the Centre for Infectious Disease Prevention and Control (CIDPC). Specifically, 88% (5,805 cases) were influenza type A, and 12% (787 cases) were influenza type B during this period. The participating laboratories in the province of Ontario isolated

or detected 2,207 influenza isolates of which 69.6% (1,536 cases) were influenza A. Of the isolates characterized, predominant circulating strains in Ontario were identified as A/Panama/2007/99-like and B/Hong Kong/22/01-like.

Although the Reportable Disease Information System (RDIS) collects data on influenza activity in Ontario on a year-round basis, the majority of cases occur after October 1<sup>st</sup> of any given year and before April 30<sup>th</sup> of the following year. For this reason, RDIS data is reported for the 2001/02 influenza season from October 1<sup>st</sup> 2001 to April 30<sup>th</sup> 2002. Reports include information on laboratory-confirmed sporadic cases and those outbreak-related cases that had laboratory confirmation. In this period there were 2,138 confirmed influenza cases (1,536 influenza A, 602 influenza B) reported by health units through RDIS.

Of the 37 health units in Ontario, an average of 27 (73%) reported weekly on "influenza activity" throughout the influenza season, compared to 25 (68%) for the previous season.

The federal *Flu Watch* program co-ordinated the Ontario Sentinel Physician program during the 2001/02 season. Rates of visits to sentinel physicians for influenza-like-illness (ILI) ranged from 8 to 58 visits per 1,000 patients seen.

All long-term care facilities (LTCFs) in Ontario are required to submit data on vaccination rates for residents and staff by December 1 of each year. Additionally, hospitals are required to submit data on vaccination rates for staff by December 1 of each year. Results showed that median influenza vaccination coverage achieved for LTCF residents this season was 95.5% (range: 75.0%-100%) and long-term care median staff coverage was 86.4% this season.

Median influenza vaccine coverage for hospital staff was 50.8%.

### Introduction

Influenza has been a reportable disease in Ontario since 1923, and a provincial surveillance program is conducted annually from October to April. The objectives of the influenza component of the 2001/2002 influenza and respiratory outbreak surveillance season were:

- To identify the type of influenza virus circulating in Ontario, and to determine its relationship to national and international viral activity
- To monitor and conduct early detection of the antigenic shift in the circulating virus as early as possible
- To identify the incidence and prevalence of influenza

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in the various geographical regions of Ontario

- To determine the onset, duration, and severity of the influenza season in Ontario
- To evaluate the use and effectiveness of antiviral drugs in controlling influenza A outbreaks in long-term care facilities (LTCFs).

Respiratory infection outbreaks have been reportable since 2001. The objectives of the respiratory infection component of the 2001/02 influenza and respiratory surveillance season include:

- To assess the complete epidemiology of respiratory outbreaks in order to apply adequate and timely control measures.
- To improve the quality of diagnostic investigations, including laboratory diagnosis.
- To establish baseline morbidity and mortality data needed for the introduction of new, effective vaccines against some of the organisms responsible for respiratory outbreaks.

2001/02 was the second season for the provincial *Universal Influenza Immunization Program* (UIIP), where the entire population was eligible to receive publicly funded influenza vaccine. A continued emphasis of this program was the immunization of people at high-risk for complications associated with influenza; individuals who work in various healthcare facilities; emergency service workers; household contacts of persons at high-risk for complications from influenza; as well as those who wish to protect themselves from influenza.

## Methods

The PHB of the MOHLTC uses various data sources to track influenza activity in Ontario. The five components of influenza surveillance in the 2001/02 season included the following:

1. Laboratory surveillance, conducted by the Centre for Infectious Disease Prevention and Control (CIDPC), Health Canada;
2. Reportable Disease Information System (RDIS) reporting of laboratory-confirmed influenza cases by health units across Ontario;
3. Reporting of institutional respiratory outbreaks;
4. Influenza activity level reporting by health units across Ontario;

5. Sentinel Physician Influenza Surveillance coordinated by Health Canada/College of Family Physicians of Canada (CFPC) as part of the *FluWatch* Program.

In addition to the above, data regarding vaccination rates in LTCFs and Hospitals will also be included.

## 1. Laboratory Surveillance of Influenza

The laboratory surveillance component involves the reporting of positive isolates of influenza and other respiratory viruses, to the Centre for Infectious Disease Prevention and Control (CIDPC), Health Canada. Results include reports from both outbreak situations and sporadic cases of respiratory illness. These data are then reported back weekly to the PHB of the MOHLTC. During the 2001/02 influenza surveillance season, 15 laboratories in Ontario participated in laboratory surveillance. The participating laboratories included public health laboratories in Toronto, Kingston, Timmins, Windsor, Thunder Bay, Sault Ste. Marie, Orillia, Ottawa, Peterborough and Hamilton. Participating hospital-based laboratories included: Children's Hospital of Eastern Ontario (Ottawa), Toronto Medical Laboratory, Women's College Hospital, Hospital for Sick Children (Toronto); and St. Joseph's Hospital (London). All laboratory data were summarized in the weekly *Ontario Influenza Bulletin*.

## Results: Influenza Ontario

During the 2001/02 Ontario influenza season, influenza activity increased from late February to mid-March, similar to the 2000/01 season. The numbers provided below reflect data obtained during Ontario's October 2001 to April 2002 influenza and respiratory outbreak surveillance season. Between November 3, 2001 to May 4, 2002 (the period during which the national and Ontario's surveillance period most closely overlapped), participating laboratories in Ontario reported a total of 2,207 positive influenza isolates, a 152% increase over the previous season's 876 influenza isolates (based on data received from Health Canada on December 10, 2002). Of these 2,207 positive tests, 1,536 (69.6%) were influenza type A and 671 (30.4%) were influenza type B (Figures 1 and 2). The total number of laboratory isolates reported represented both outbreak activity and data on individual sporadic cases.

Data for the Ontario component of the entire September 2001 to August 2002 national CIDPC surveillance season were as follows: The CIDPC reported 2249 laboratory-confirmed cases of influenza, of which 1574 (70%) were

Figure 1

**Laboratory Confirmations of Influenza, Ontario, 2001/02\***

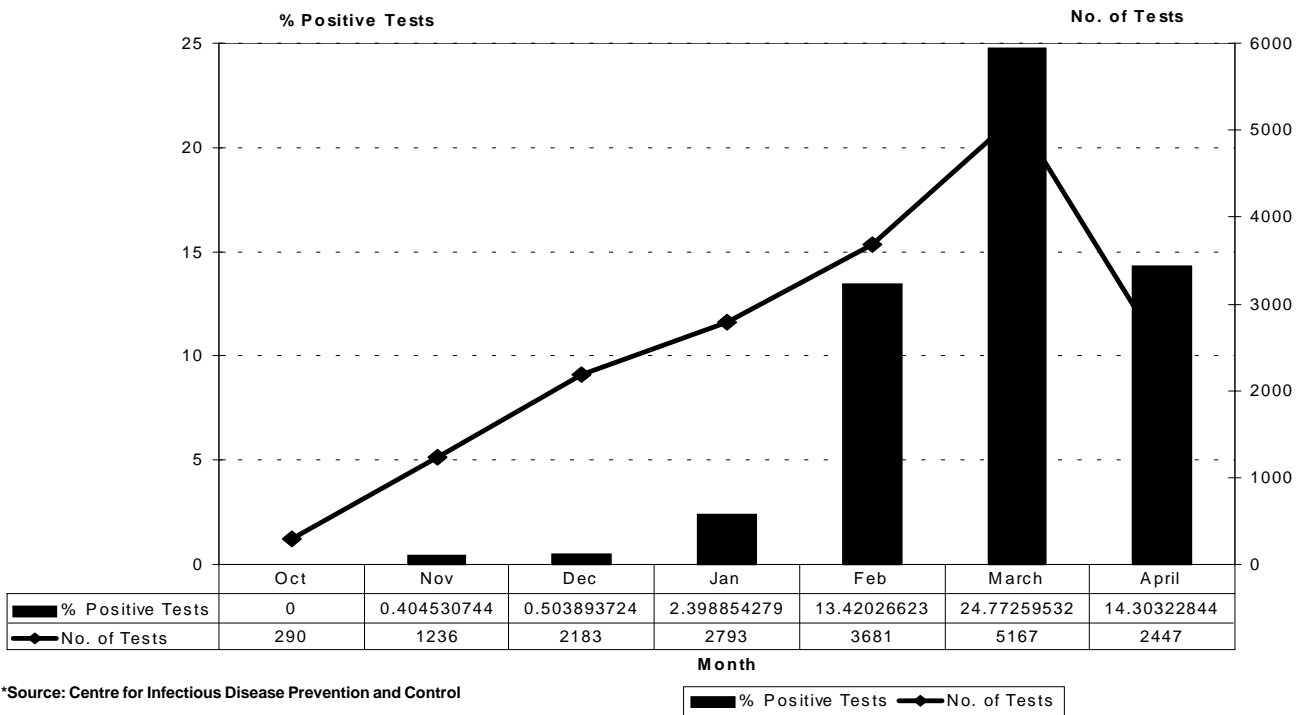
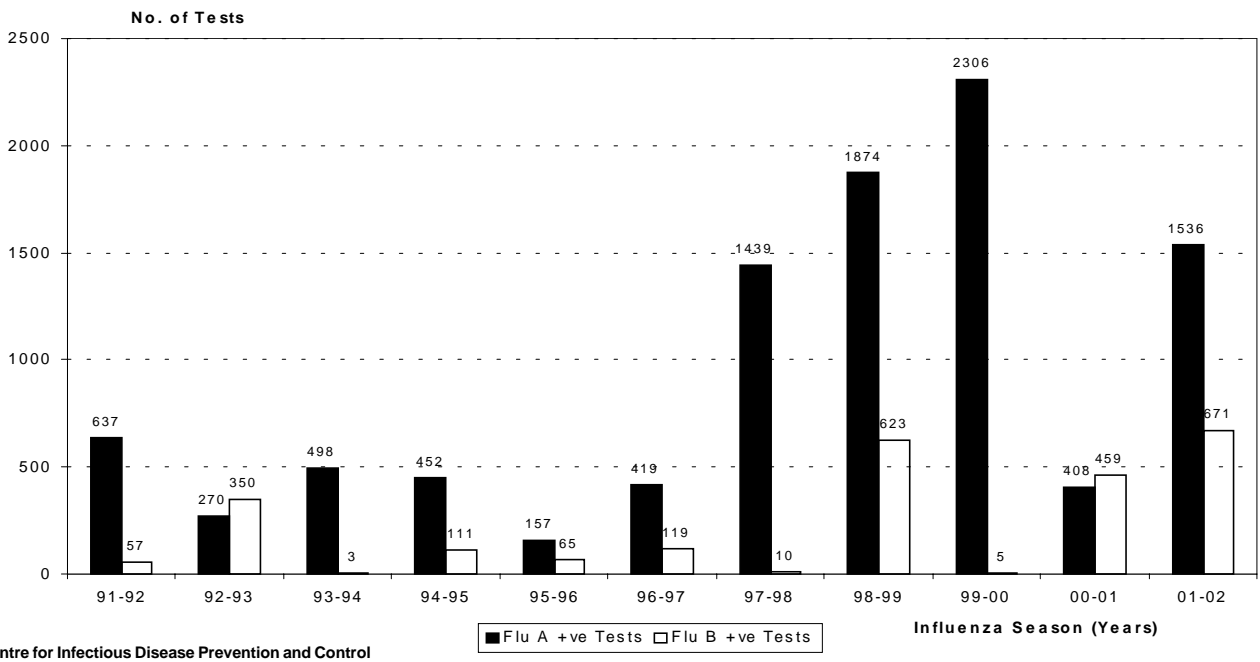


Figure 2

**Laboratory Confirmations of Influenza A and B, Ontario, 2001-02\***



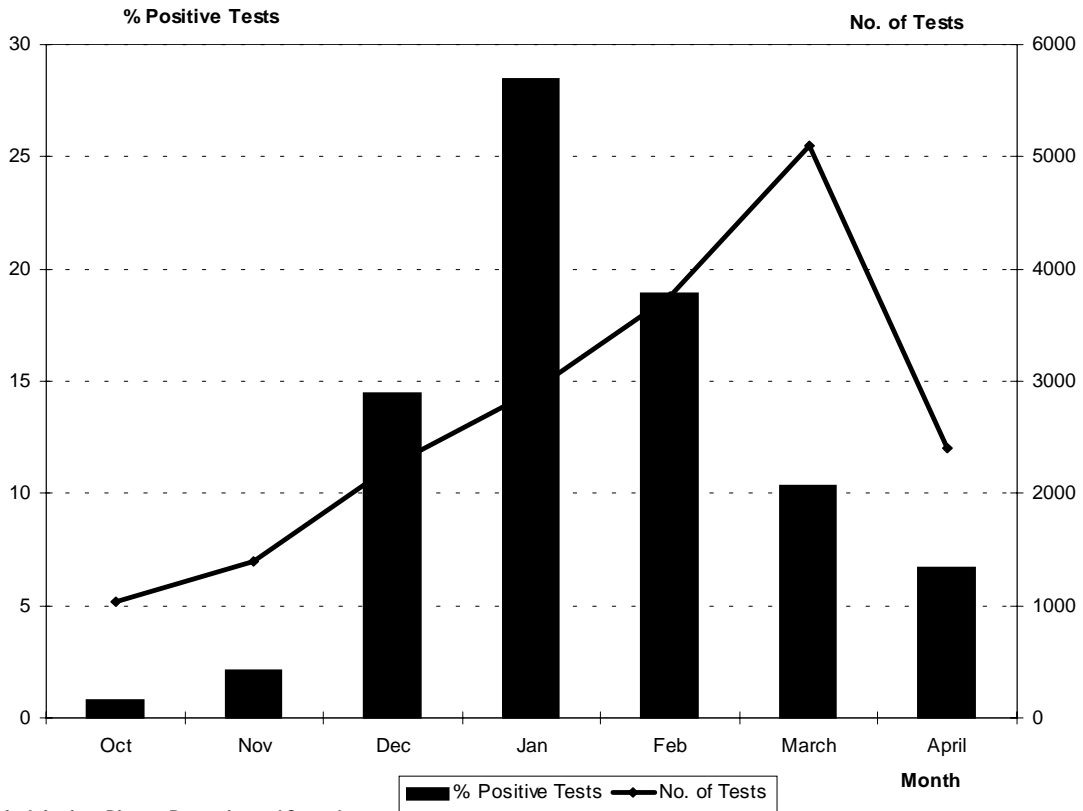
influenza A and 675 (30%) were influenza B. These figures represent a 156% increase in the total number of laboratory-confirmed influenza cases in Ontario from the September 2000 to August 2001 CIDPC influenza surveillance season when 880 laboratory-confirmed cases were reported.

**Results: Non-Influenza Organisms**

Other respiratory viruses isolated during the season are shown in Figure 3. RSV and PIV viruses predominated in the province during the early part of the season, while adenoviruses circulated in the province throughout the season.

Figure 3

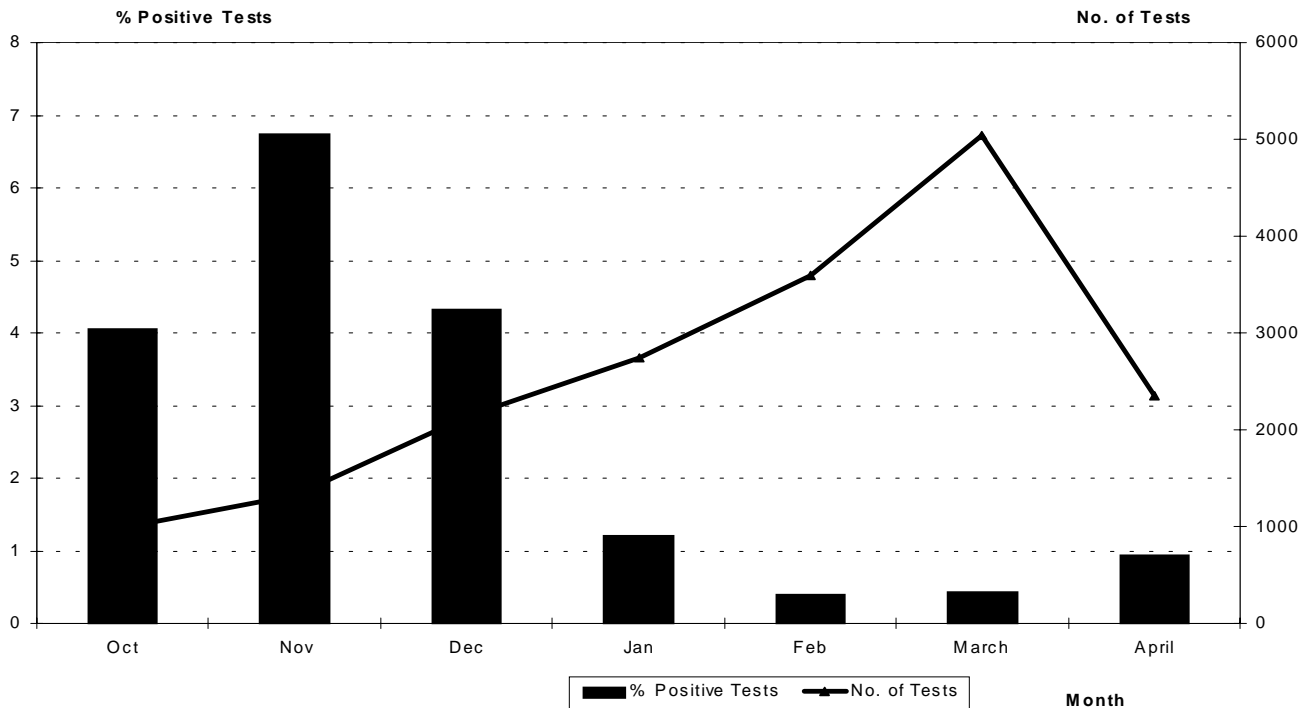
Laboratory Confirmations of Respiratory Syncytial Virus, Ontario, 2001/02\*



\*Source: Centre for Infectious Disease Prevention and Control

Figure 3

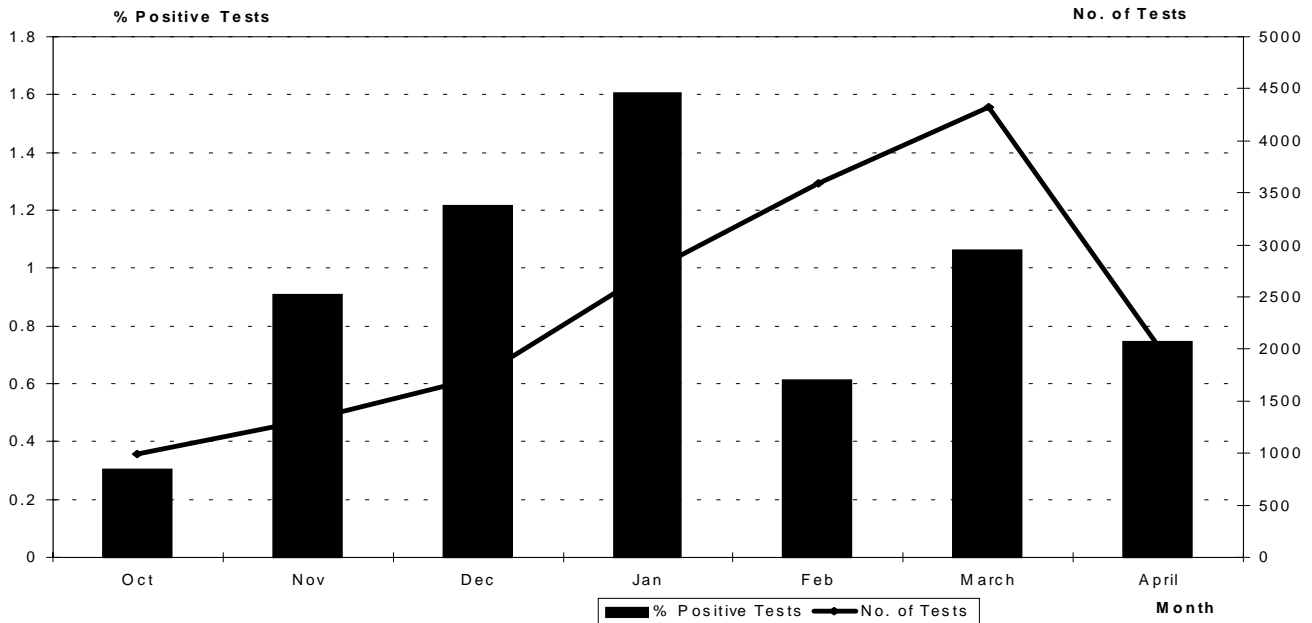
Laboratory Confirmations Of Parainfluenza, Ontario 2001/02\*



\*Source: Centre for Infectious Disease Prevention and Control

Figure 3

Laboratory Confirmations of Adenovirus, Ontario 2001/02\*



\*Source: Centre for Infectious Disease Prevention and Control

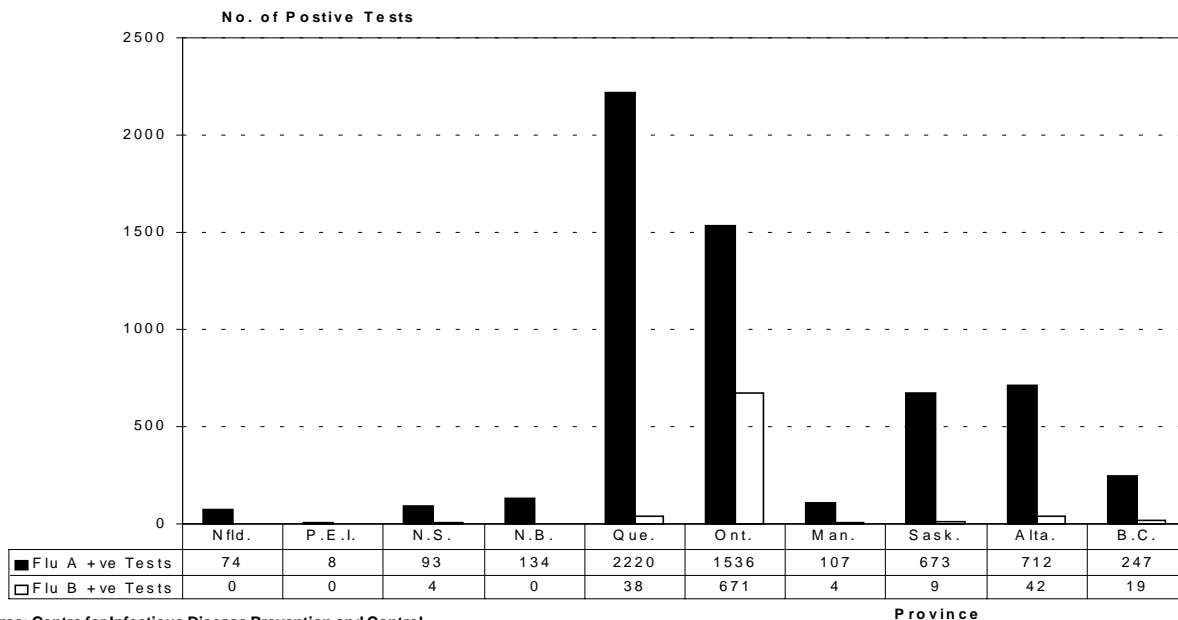
### Results: Influenza Canada

During Canada's 2001/02 influenza season, (corresponding to national surveillance dates of November 3, 2001 to May 4, 2002) the CIDPC reported 6,592 laboratory-confirmed cases of influenza, of which 5,805 (88%) cases were influenza A and 787 (12%) cases were influenza B. These figures represent a 57.6% increase in the total number of

positive influenza specimens as compared to Canada's 2000/01 influenza season, when a total of 4,182 positive influenza specimens were reported during the same period (based on data received from Health Canada on December 10, 2002). For 2001/02, Quebec reported the highest numbers of laboratory-confirmed influenza specimens: 2220 cases of influenza A and 38 cases of influenza B, while P.E.I reported the lowest numbers: 8 cases of influenza A with no cases of influenza B reported.

Figure 4

Laboratory Confirmations of Influenza A and B, Canada, 2001/02\*



\*Source: Centre for Infectious Disease Prevention and Control

CIDPC data for all of Canada from September 2001 to August 2002 were as follows: The CIDPC reported 6771 laboratory-confirmed cases of influenza, of which 5905 (87.2%) were influenza A and 866 (12.8%) were influenza B. These figures represent an 61.1% increase in the total number of laboratory-confirmed influenza cases in Canada from September 2000 to August 2001 when 4204 laboratory-confirmed cases were reported (based on data received from Health Canada on December 10, 2002).

## Results: Non-Influenza Organisms

### Canada

During Canada's 2001/02 surveillance period (corresponding to the national surveillance dates of November 3 to May 4, 2002), the CIDPC reported 587 laboratory-confirmed cases of PIV, 6260 cases of RSV and 655 laboratory-confirmed cases of adenovirus, the 3 respiratory viral organisms for which routine testing is conducted.

### Ontario

For the identical surveillance period, Ontario laboratories reported 272 laboratory-confirmed cases of PIV, 2584 cases of RSV and 160 laboratory-confirmed cases of adenovirus.

### Composition of the 2001/02 Influenza Vaccine

The influenza vaccine for the 2001/02 season was developed based on antigenic characteristics of current and emerging influenza virus strains. The trivalent influenza vaccine developed for the 2001/02 season included the

following: an A/Moscow/10/99 (H3N2)-like virus, an A/New Caledonia/20/99 (H1N1)-like virus, and a B/Sichuan/379/99-like virus. The B/Hong Kong/22/01-like viruses were antigenically different from the season's vaccine strains and the available vaccine was expected to provide limited cross-protection against these viruses. The A (H3N2), A (H1) and B/Sichuan/379/99-like viruses were similar to current vaccine strains.

### Influenza Strains Circulating in Canada

The predominant circulating strains in Canada were A/Panama/2007/99-like (H3N2), and B/Hong Kong/22/01-like. Additional circulating strains included A/New Caledonia/20/99 (H1N1), (H1N2), and B/Sichuan/379/99. During the 2001/02 influenza season, the National Microbiology Laboratory (NML) at Health Canada sub-typed and characterized 403 influenza isolates between October 4, 2001 and April 18, 2002. Of the total, 286 were A/Panama/2007/99 (H3N2)-like isolates, 103 were B/Hong Kong/22/01-like isolates, and 4 were B/Sichuan/379/99-like.

### Influenza Strains Circulating in Ontario

In Ontario, between October 2001 and April 2002, the strains identified and characterized by NML were: 64 A/Panama/2007/99-like (H3N2), 2 B/Sichuan/379/99-like, and 82 B/Hong Kong/22/01-like. Table 1 shows the influenza strains circulating in Ontario during surveillance seasons from 1999/00 to 2001/02, and the match between the circulating strains and those which were included in the vaccines for the respective season.

**Table 1.**

#### INFLUENZA STRAINS CIRCULATING IN CANADA 1999/00 TO 2001/02 SEASONS

Season	Main Circulating Strains	Season's Vaccine Strains
1999/00	A/Sydney/05/97-like (H3N2) B/Beijing/184/93-like	A/Sydney/5/97(H3N2)-like A/Beijing/262/95 (H1N1)-like B/Yamanashi/166/98-like
2000/01	A/New Caledonia/20/99-like (H1N1) A/Panama/2007/99-like(H3N2) B/Yamanashi/166/1998-like	A/New Caledonia/20/99-like (H1N1) A/Panama/2007/99-like(H3N2) B/Yamanashi/166/1998-like
2001/02	A/Panama/2007/99-like (H3N2) B/Hong Kong/22/01-like B/Sichuan/379/99-like	A/Moscow/10/99(H3N2)-like A/New Caledonia/20/99 (H1N1)-like B/Sichuan/379/99-like

Source: Respiratory viruses Section, National Microbiology Laboratory (NML) Population & Public Health Branch, Health Canada

## 2. Reportable Disease Information System (RDIS) Cases of Confirmed Influenza

In Ontario, influenza is a reportable disease under *Regulation 559/51* of the *Health Protection and Promotion Act* (HPPA) and boards of health are required to transmit data on all laboratory-confirmed cases of influenza to the PHB through RDIS. Since only laboratory-confirmed cases of influenza are entered through RDIS, the true number of influenza cases in Ontario is not completely depicted. Information obtained from reports on institutional outbreaks (section 3) enhances tracking of the total number of cases of influenza in the province.

The RDIS influenza case definition includes the following:

- clinically compatible signs and symptoms of influenza with either:
  - a laboratory confirmation by detection or isolation of influenza virus in pharyngeal or nasal secretions; or
  - demonstration of a four-fold or greater increase in hemagglutination antibody titres to influenza (seroconversion).

## Results

Between October 1, 2001 and April 30, 2002, a total of 2,138 cases of influenza were reported through RDIS. Of these cases, 1,536 (72%) were influenza type A, and 602 (28%) were influenza type B (Figure 5, Table 2). There was a 219% increase in influenza cases reported through RDIS during the 2001/02 surveillance season as compared to the previous season when only 670 cases were reported. Age distribution for influenza cases showed that most of the RDIS-reported cases occurred among the youngest and oldest residents of the province (Figure 6). Children aged less than 5 years represented 34% of all laboratory-confirmed influenza cases, with 577 cases of influenza A and 145 cases of influenza B cases for that age group.

Five hundred and sixty-one confirmed cases of influenza A and forty cases of influenza B were reported among individuals aged 70 years and greater. This age group comprised 28% of the total cases of influenza reported through RDIS during the season.

The majority of influenza B cases occurred among younger age groups. There were 145 (24%) cases of influenza B

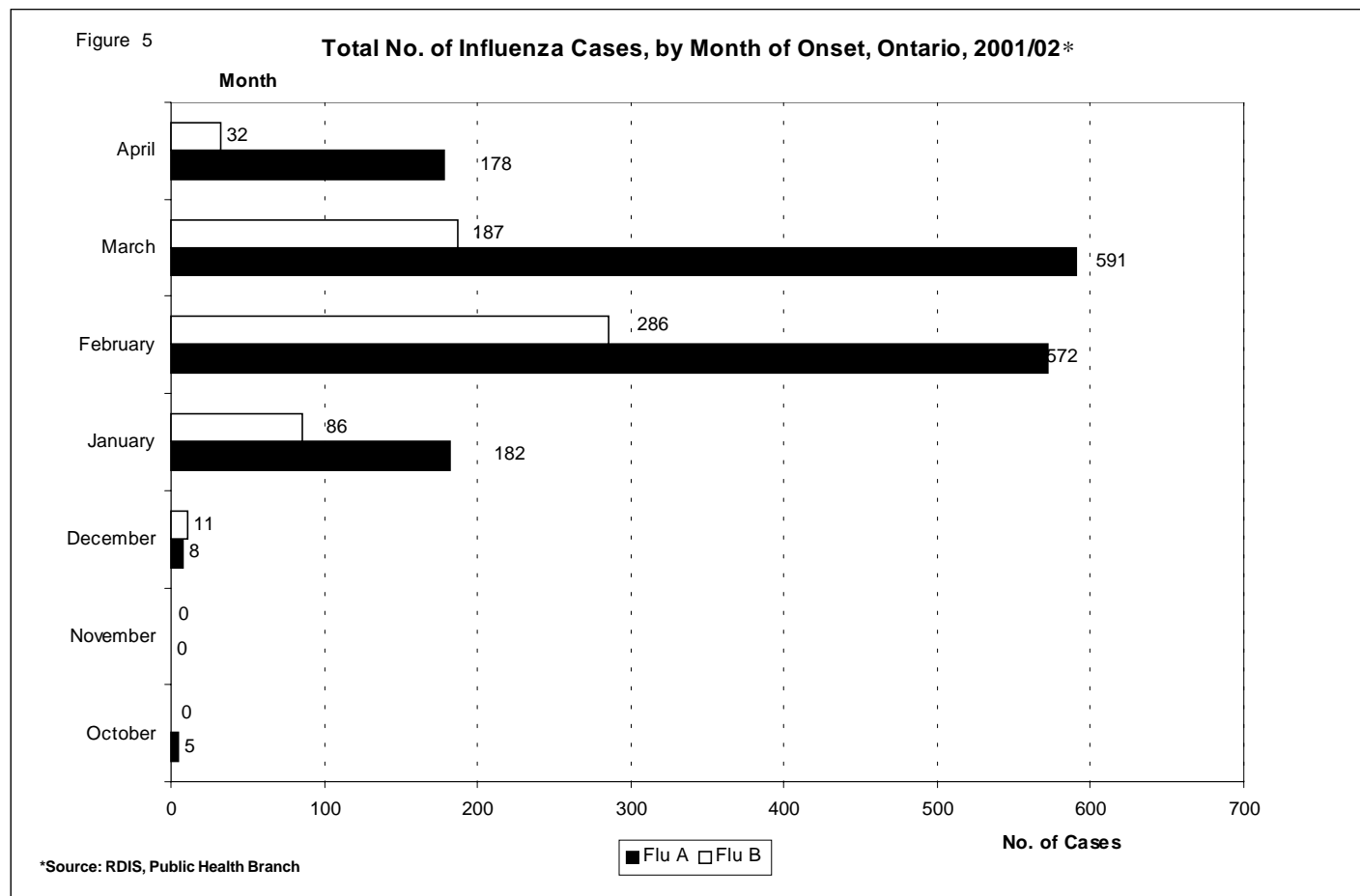
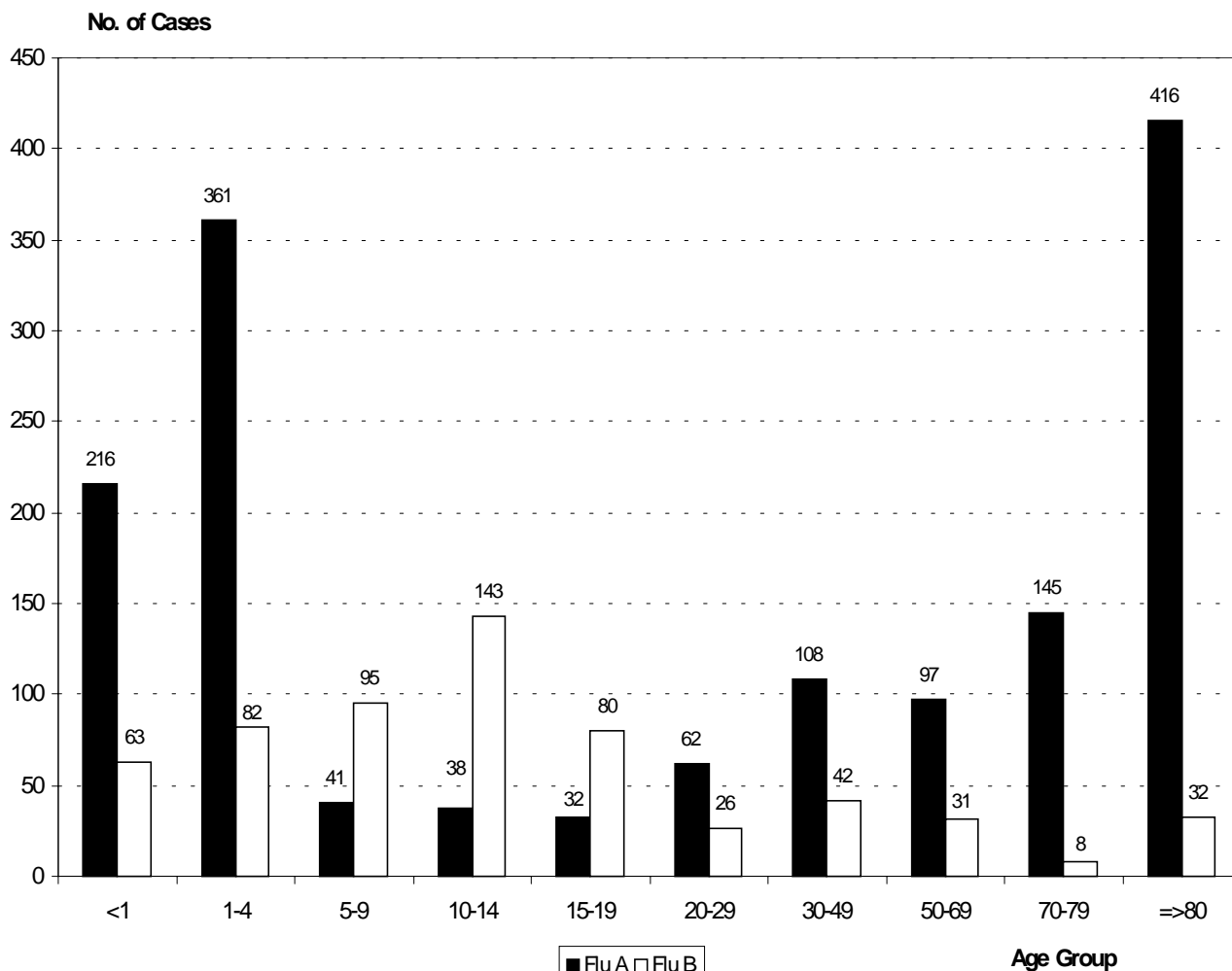


Figure 6

Influenza Cases by Age Group, Ontario, 2001/02 \*



Data was missing for 20 (0.9%) of cases

\*Source: RDIS, Public Health Branch

among infants and children younger than 5 years, while 143 cases (23.8%) of influenza B occurred among youths aged 10 to 14 years of age (Figures 5 & 6).

Table 2 shows the distribution of the influenza cases by health unit and region reported through RDIS. During the 2001/02 surveillance season, numbers of influenza cases per capita was highest in the Northern and Eastern regions of the province where rates of influenza cases were 43.7/100,000 population and 35.8/100,000 population respectively. The South West region had the lowest rate at 11.4/100,000 population; the rate for the Central East was 12.0/100,000 population and for the Central West region the rate was 19.8/100,000 population.

Health units reported 39 fatal cases of influenza through RDIS in the province during the 2001/02 season; a mortality rate of 0.3/100,000 population in Ontario. Of the 39 deaths, 36 (92%) were related to influenza A and 3 (8%) were attributed to influenza B. Influenza was the underlying cause of death in 9 cases, contributing in 18 cases, and incidental in 3 cases. The cause of death was unknown in 5 cases and undefined in 4. The majority of deaths occurred among elderly cases. Thirty-four (87%) of the deceased cases (32 influenza A and 2 influenza B) were older than 70 years and 28 (72%) were older than 80 years.

Table 2

**Influenza Cases by Health Unit and Region, Ontario, October 1, 2001 to April 30, 2002\***

<b>Region</b>	<b>Population (2000 est.)</b>	<b>Total No of Flu Cases</b>	<b>Rate per 100,000(popn)</b>
<b><u>NORTHERN</u></b>			
Algoma	113,500	52	45.8
North Bay	86,500	144	166.5
Northwestern	59,900	2	3.3
Porcupine	84,000	46	54.8
Sudbury	186,600	24	12.9
Thunder Bay	147,000	34	23.1
Timiskaming	33,900	9	26.5
<b>TOTAL NORTHERN</b>	<b>711,400</b>	<b>311</b>	<b>43.7</b>
<b><u>Eastern</u></b>			
Eastern Ontario	200,800	52	25.9
Hastings-Prince Edward	159,500	23	14.4
Kingston-Frontenac	180,200	79	43.8
Leeds, Grenville	163,100	94	57.6
Ottawa-Carleton	779,300	289	37.1
Renfrew	101,100	30	29.7
<b>TOTAL EASTERN</b>	<b>158,4000</b>	<b>567</b>	<b>35.8</b>
<b><u>Central East</u></b>			
Durham	512,300	62	12.1
Haliburton-Kawartha	168,000	9	5.4
Muskoka-Parry Sound	81,200	10	12.3
Peel Region	1,008,200.00	161	16.0
Peterborough	128,400	13	10.1
Simcoe County	377,200	71	18.8
Toronto (amalgamated)	2,542,800	282	11.1
York Region	724,900	58	8.0
<b>TOTAL CENTRAL EAST</b>	<b>5,543,000</b>	<b>666</b>	<b>12.0</b>
<b><u>Central West</u></b>			
Brant	130,200	12	9.2
Haldimand-Norfolk Region	11,000	7	63.6
Halton Region	375,700	46	12.2
Hamilton Wentworth	498,600	123	24.7
Niagara Region	423,600	120	28.3
Waterloo Region	446,800	45	10.1
Wellington-Dufferin	241,800	68	28.1
<b>TOTAL WEST</b>	<b>2,127,700</b>	<b>421</b>	<b>19.8</b>
<b><u>South West</u></b>			
Bruce, Grey-Owen Sound	157,700	25	15.9
Elgin-St Thomas	84,200	7	8.3
Huron	61,100	24	39.3
Chatham Kent	113,100	3	2.7
Lambton	132,400	1	0.8
Middlesex-London	413,200	38	9.2
Oxford	102,600	11	10.7
Perth	75,200	52	69.1
Windsor Essex	381,700	12	3.1
<b>TOTAL</b>	<b>1,521,200</b>	<b>173</b>	<b>11.4</b>
<b>PROVINCIAL TOTAL</b>	<b>11,487,300</b>	<b>2,138</b>	<b>18.6</b>

\*Source: RDIS, Public Health Branch, Ministry of Health and Long Term Care

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### 3. Reports of Influenza and Respiratory Infection Outbreaks in Institutions, Ontario, 2001/02 Season

Since 2001, in addition to reporting influenza outbreaks, all health units were required to report all respiratory infection outbreaks caused by known or unknown respiratory organisms that occurred in Long-Term Care Facilities (LTCFs) and health care institutions in their jurisdictions.

Data were collected and analyzed for outbreaks that occurred in LTCFs, retirement homes (RH) of more than 10 residents, acute care hospitals (ACH), chronic care hospitals (CCH), psychiatric hospitals, and schedule I and II facilities.

For this year's surveillance period, data on combined LTCFs (i.e., nursing homes/homes for the aged, nursing homes/retirement homes) were included in LTCF reports. In previous summary reports, LTCFs included only nursing homes and homes for the aged.

Criteria for a potential influenza outbreak in an institution are:

- one laboratory confirmed case - residents, patients or staff - with an organism such as influenza virus isolated or detected from a nasopharyngeal swab or with 4-fold or greater hemagglutination antibody titre; or
- two cases of acute respiratory tract illness occurring within 48 hours in a geographic area; or
- more than one unit (in a facility) having a case of acute respiratory illness within 48 hours.

The last two bullets are also criteria for a potential respiratory outbreak caused by organisms other than influenza.

Any further progression of the "potential outbreak" is to be considered an outbreak. Epidemiologically linked clinical cases are also included in the total number of cases for an institutional respiratory infection outbreak.

Reports on respiratory outbreaks in institutions include epidemiologic information on residents/patients and staff such as influenza immunization coverage rates, morbidity and mortality attributes, duration, seasonal distribution of outbreaks, and antiviral usage for prophylaxis or therapy to

control an outbreak. Information on vaccine efficacy would normally be included in the summary report. However, insufficient data were available to analyze this component for the 2001/02 surveillance season. This information will be collected for the 2002/03 season. Preliminary reports were faxed to the Public Health Branch, MOHLTC, within 24 hours of outbreak onset. Preliminary reports were useful for warning purposes and for monitoring respiratory outbreak activity in the province.

Final reports were submitted after outbreaks were declared over, and were used in the formulation of this summary report.

### Results

There were 317 confirmed institutional respiratory outbreaks reported to the MOHLTC during the 2001/02 season, of which 195 were attributed to influenza. This represents an increased number of influenza outbreaks over the 2000/01 season, in which only 9 such outbreaks occurred. The increase in influenza cases may be explained by an increase in influenza activity and the exceptionally light 2000/01 influenza season.

Thirty-four of 37 health units reported at least 1 respiratory outbreak this season, with the majority of outbreaks occurring in LTCFs.

### Data Analysis

#### Causative Organisms

Of the 317 reported respiratory outbreaks, 195 (61.5%) were laboratory-confirmed influenza outbreaks: 162 were due to influenza A, 12 were due to influenza B, 5 were due to A and B and, in 16 outbreaks, influenza was combined with another organism/s as shown in Table 3.

The 2001/02 surveillance season was the first year in which institutional outbreaks due to other respiratory organisms were reportable. A number of non-influenza organisms were detected in 44 of the outbreaks: 32 RSV, 8 by PIV, 1 outbreak combined both RSV and PIV. Three additional outbreaks were caused by 3 separate bacterial organisms; 1 each of *Streptococcus Pneumoniae*, *Mycoplasma* and *Haemophilus influenzae*. In 77 respiratory outbreaks, the causative organism was unknown.

**Table 3****CAUSATIVE ORGANISMS, RESPIRATORY OUTBREAKS 2001/02**

<b>Influenza Outbreaks</b>	<b>No. of Outbreaks</b>	<b>Non-Flu Outbreaks</b>	<b>No. of Outbreaks</b>
Influenza A	162	RSV	32
Influenza B	12	PIV	8
Combined A & B	5	RSV & PIV	1
A & RSV	10	H. Influenzae	1
A & RSV & PIV	2	Mycoplasma	1
B & Group A Strep	1	Strep Pneumoniae	1
B & RSV	3	Unknown	77
		Missing	1

**Distribution of Respiratory Outbreaks, Including Influenza, by Health Unit**

During the 2001/02 surveillance season, 34 of 37 (91.9%) health units reported at least one institutional respiratory infection outbreak. Of these 34 health units, 24 (70.6%) reported 5 or more outbreaks with 3 health units (Ottawa, Waterloo and the amalgamated city of Toronto) each reporting more than 20 outbreaks.

A total of 195 influenza infection outbreaks were reported by 33 of 37 (89.2%) health units. Seventeen of 33 health units reported 5 or more outbreaks, 4 health units reported 10 or more influenza outbreaks, while Toronto reported 32 influenza outbreaks.

A total of 121 respiratory infection outbreaks due to non-influenza organisms were reported by 28 of 37 (75.7%) provincial health units, of which 44 (36.4%) were attributed to a known causative organism. Eleven health units reported 5 or more outbreaks while 3 reported 10 or more outbreaks.

**Respiratory Outbreaks, Including Influenza, in Institutions**

There were a total of 317 respiratory infection outbreaks reported in institutions in the province during the 2001/02 season. Of these, 237 (74.8%) were reported from the following types of LTCFs: 176 (55.5%) occurred in Nursing Homes (NHs), 54 (17.0%) in Homes For the Aged (HFA) and 7 outbreaks (2.2%) were in combined facilities. Two outbreaks occurred in combined Nursing Home/Home for the Aged (NH/HFA) and 5 outbreaks in Nursing Home/Retirement Home (NH/RH) combinations.

Of the total number of respiratory infection outbreaks, 22 (6.9%) were in acute care hospitals (ACHs), 10 (3.2%) in chronic care hospitals (CCHs) and 42 (13.2%) occurred in RHs that had more than 10 residents. Additionally, 6 cases

(1.9%) occurred in “other” institutions, which included Schedule I and II facilities and psychiatric hospitals.

A total of 195 influenza infection outbreaks were reported in institutions. LTCFs made up 68.2% of reporting institutions: 100 occurred in NHs, 29 in HFAs, and 4 occurred in combined facilities (1 in NH/HFA, 3 in NH/RH). There were 20 influenza outbreaks in ACHs, 9 in CCHs, 29 in RHs with over 10 residents and 4 in “other” institutions.

There were a total of 44 institutional respiratory outbreaks caused by known organisms other than influenza. LTCFs made up 79.5% of the institutions that experienced this type of outbreak: 25 in NHs, 9 in HFAs, and 1 outbreak in a combined facility. There was 1 outbreak in an ACH, 7 in RHs with more than 10 residents and 1 occurred in an “other” institution. There were no reported outbreaks attributed to known non-influenza organisms in CCHs.

**Duration of Respiratory Outbreaks, Including Influenza**

For the 2001/02 season, outbreak duration was defined as *the number of days from the onset of illness in the first case until the outbreak was declared over*. This differs from earlier reports when outbreak duration was defined as the period between the onset of illness in the first case and onset of illness in the last case. The definition of duration was changed to ensure uniformity among health units in application of the definition.

Due to the wide range of data results, median results are reported.

For the 293 respiratory outbreaks in which duration was reported, the median duration was 19 days (range 2-70 days) (Table 4). For outbreaks in which the causative organism was unknown, the median duration was 16 days (2-70).

Median duration of the outbreaks caused by influenza organisms was 18.5 days (range 5-44 days), median duration of outbreaks caused by influenza B alone was 15.5 (range 12-28), while for influenza A outbreaks, mean duration was 18 days (range 6-44). Median duration for outbreaks caused by influenza A in conjunction with B was 24 (range 13-29) and outbreaks caused by influenza in combination with other organism/s was 19 days (range 5-33). Median duration for outbreaks due to non-influenza organisms was 25 with a range of 6-54 days.

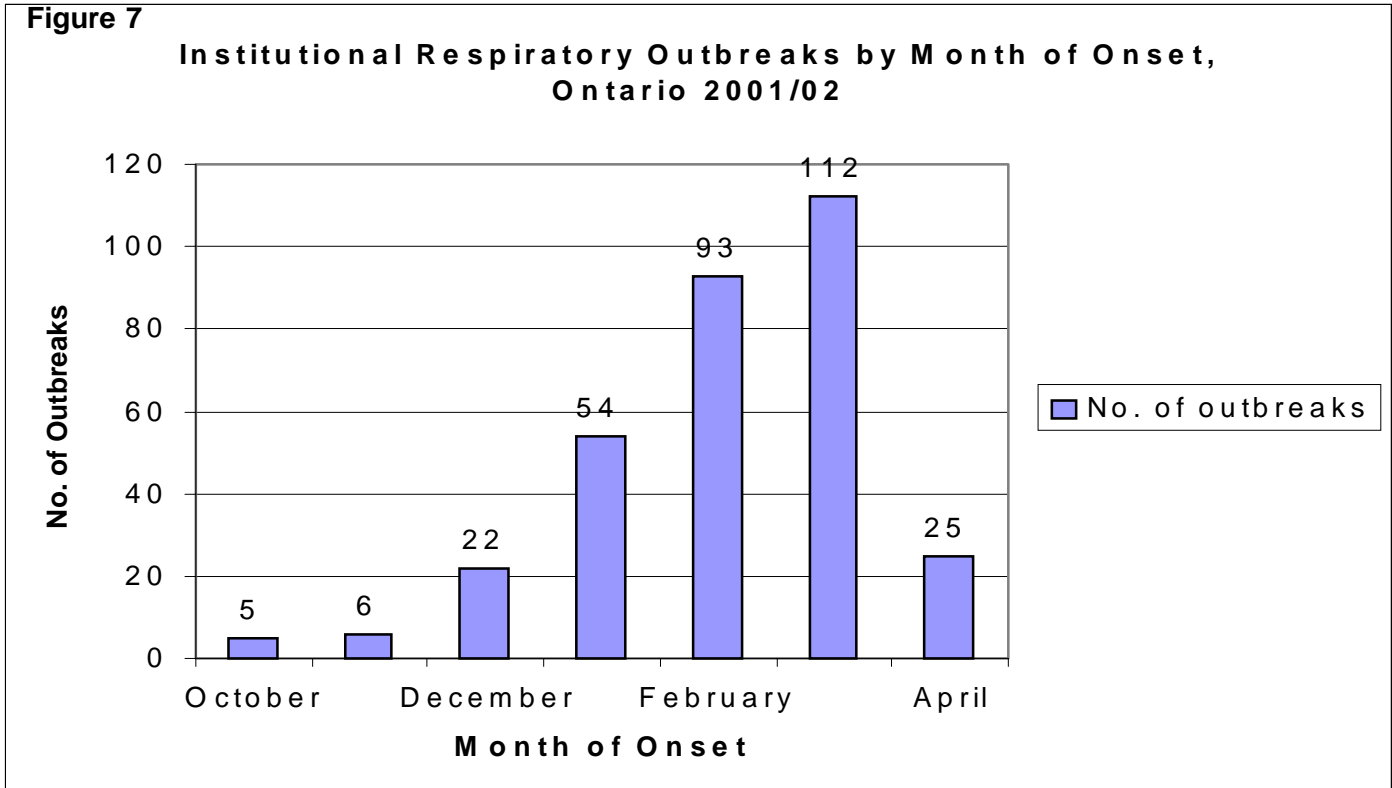
**Table 4**

**MEDIAN DURATIONS OF RESPIRATORY OUTBREAKS BY ORGANISM TYPE**

Influenza Outbreaks	No. of Days	Non-Flu Outbreaks	No. of Days
Influenza A	18	RSV	25
Influenza B	15.5	PIV	20
Combined A & B	24	Unknown	16
Flu and Other organisms	19	All Non-Flu O/Bs	25
All Influenza O/Bs	18.5		

**Occurrence of Respiratory Outbreaks, Including Influenza**

For all institutional respiratory outbreaks, peak activity occurred in March, with a total of 112 outbreaks (Figure 7). Outbreak activity due to influenza infection similarly peaked in March, while respiratory disease outbreaks due to non-influenza activity peaked in January. Peak activity for the 77 outbreaks for which a causative organism was not known occurred in January. Since respiratory outbreak activity due to organisms other than influenza similarly peaked in January, this may indicate a non-influenza etiology for the 77 outbreaks.



## Attack Rates and Vaccine Efficacy for Institutional Respiratory Outbreaks, Including Influenza

### Residents

During the 317 outbreaks, 5,370 cases were reported among 35,339 residents. The overall attack rate for the season (total number of resident cases for all outbreaks/total number of residents in affected areas of institutions involved in the outbreak) was 19.1%.

The median resident attack rate for respiratory outbreaks was 16.5% (range 0.7-90). The outbreak with the highest resident attack rate (90%) occurred in a retirement home where 9 out of the 10 at-risk residents experienced an influenza A infection.

The median attack rate for influenza infection outbreaks was 16.8% (range 0.7-90) while for non-influenza outbreaks this rate was 17.7% (range 0.8-52).

cases were reported among 28,501 residents. The overall attack rate for the season (total number of resident cases for all respiratory outbreaks/total number of residents in affected areas of LTCFs involved in the outbreak) was 18.2%. This calculation includes data only for those institutions that supplied both numerator and denominator to calculate attack rates.

As outlined above, the median attack rate for all institutions was 16.5% (range 0.7-90). The median attack rate for LTCFs was as follows: rate for NHs was 17.9% (range 0.8-62.5), for HFAs was 12.3% (range 0.9-51.7) and for combined facilities the rate was 10% (6.0-41.2).

For ACHs, the median attack rate was 23.3% (range 5.0-50), and for CCHs was 8% (3.7-35).

For "other" institutions, this rate was 16.9% (0.9-58.8).

**Table 5**

### MEDIAN RESIDENT ATTACK RATES, ALL RESPIRATORY OUTBREAKS, BY INSTITUTION TYPE (%)

Type of Institution	Resident Median Attack Rate (Range)	
Nursing Home	17.9	(0.8-62.5)
Home for the aged	12.3	(0.9-51.7)
Retirement Home	14.9	(0.7-90.0)
Acute Care Hospital	23.3	(5.0-50.0)
Chronic Care Hospital	8.0	(3.7-35.0)
Combined Facilities	10.0	(6.0-41.2)
Other Facilities	16.9	(0.9-58.8)

Vaccine efficacy among both resident and staff populations in institutional respiratory outbreaks could not be determined because sufficient data were not available. This data will be collected for the 2002/03 influenza and respiratory outbreak surveillance season.

### Attack rates for Respiratory Outbreaks, Including influenza, by Institution Type

#### Residents

For the 233 LTCF institutional respiratory outbreaks, including influenza, for which data were available, 4,528

### Attack Rate for Influenza Outbreaks

#### Residents

For the 129 LTCF institutional influenza outbreaks for which data were available, 2,769 cases were reported among 16,410 residents. The overall attack rate for the season (total number of resident cases for all influenza outbreaks/total number of residents in affected areas of LTCFs involved in the outbreak) was 16.7% (range 0.7-90) and was broken down as follows: NHs 18.6% (range 0.8-56.7) and HFAs 11.1% (0.9-48.2).

The median attack rate for all institutions was 16.7% (range 0.7-90). The median attack rate for ACHs was 22.2 % (range 5-50), for CCHs 7.9 % (3.7-35) and for RHs 13.7 % (0.7-90).

Median attack rates were not calculated for “other” or combined facilities due to small cell size (<5 outbreaks).

## **Attack Rates for Non-Influenza Outbreaks**

### **Residents**

For the 35 LTCF institutional non-influenza outbreaks for which data were available, 695 cases were reported among 4,281 residents. The overall attack rate for the season (total number of resident cases for all non-influenza outbreaks/ total number of residents in affected areas of LTCFs involved in the outbreak) was 16.2%. The median attack rate for all institutions was 17.7 % (range 0.8-52). Median attack rates were calculated for NHs, HFAs and RHs only, due to small cell sizes (<5) for other institutions. For NHs, the median rate was 17.9 % (range 0.8-52) for HFAs 27.7 (2.3-51.7) and for RHs 15.4 (2.3-36.4).

### **Staff Attack Rate**

A total of 1117 staff cases were reported among 27,231 exposed in 288 institutional respiratory outbreaks, giving an overall attack rate of 4.7%. For LTCFs alone, there were 978 cases among 27,231 at-risk staff during 214 outbreaks with an overall attack rate of 4.9%.

The median staff attack rate for respiratory outbreaks in all facilities was 2.5% (range 0-66.7) and for LTCFs the rate was 2.7% (0-37.5).

The median staff attack rate for influenza outbreaks in all institutions was 2.7% (range 0-66.7) and for non-influenza outbreaks was 0.9% (0-37.5).

Staff were excluded from work in 126 (49.6%) of 254 respiratory outbreaks for which data were available.

Due to insufficient data, the reason/s for staff exclusion could not be determined (i.e., if exclusion was in accordance with institutional policy or was ordered by the medical officer of health under s. 22 of the *Health Protection and Promotion Act*). This information will be collected for the 2002/03 influenza and respiratory outbreak surveillance season.

### **Resident Vaccination Rate**

For the 269 outbreaks for which reports on vaccination rates were available, the median vaccination rate was 95% (range 6.5-100). Of the 237 outbreaks reported in LTCFs,

resident vaccination rates were reported for 207 (77%). The median vaccination rate in LTCFs was 95.5% (range 6.7-100): 96% in NH (range 10.3-100) and 94.6% in HFA (6.7-100). Ninety-six LTCFs reported rates less than 95%, the rate recommended in the *Mandatory Health Programs and Services Guidelines*. One hundred and eleven institutions reported vaccination rates exceeding 95%, and 18 (8.7%) of the 207 LTCFs reported a 100% resident vaccination rate.

## **Complications and Mortality Among Residents for Respiratory Outbreaks, Including Influenza**

Institutions that reported respiratory infection outbreaks during the 2001/02 surveillance season experienced a total of 167 deaths attributed to the outbreak. Of these, 156 (93.4%) occurred in LTCF outbreaks in which the mean case fatality rate was 3.8%. The mean case fatality rate for all institutions that reported outbreaks was 3.2%.

For all institutional respiratory outbreaks, the number of cases hospitalized as a consequence of the outbreak was 368, of these, 287 (78%) occurred in LTCFs.

There were 267 radiologically confirmed cases of pneumonia as a result of respiratory outbreak activity, 206 (77.2%) of which occurred in LTCFs.

In institutions reporting influenza outbreaks, there were a total of 125 deaths, or 74.9% of the total number of deaths attributed to respiratory outbreaks. There were 165 radiologically confirmed cases of pneumonia (75.5% of the total number of cases) and a total of 165 cases were hospitalized (73.9%) as a consequence of the influenza outbreak.

LTCFs represented a significant proportion of institutions reporting complications as a result of an influenza outbreak. Of the 125 deaths that occurred as a result of influenza, 115 (92%) occurred in LTCFs. Of the total 201 cases of radiologically confirmed pneumonia, 152 (75.6%) occurred in LTCFs. Similarly, LTCFs represented 216 of the total 272 (79.4%) influenza-related hospitalizations.

Institutions reporting non-influenza outbreaks noted 15 patient deaths (9.0% of the total), 34 radiologically confirmed cases of pneumonia (12.7%), with a total of 55 patients hospitalized (14.9%) as a consequence of the outbreak.

In LTCFs, the total number of deaths attributed to non-influenza outbreaks was 14 (9.0% of the total number of respiratory outbreak related deaths). There were 26 cases of radiologically confirmed pneumonia (9.7%) and 32

cases were hospitalized (8.7%) as a result of respiratory outbreaks due to organisms other than influenza.

A total of 22 deaths occurred among residents for whom a causative organism was not found. Five deaths occurred in an outbreak where the causative organism was not recorded.

## Antivirals

In Ontario, antivirals have been in use for the prophylaxis and treatment of influenza A infections since 1988, and Amantadine is recommended for outbreak prophylaxis in institutions. Although neuraminidase inhibitors have not been approved by Health Canada for prophylactic use at this time, there is some evidence from randomised, controlled trials that these medications are also effective in prophylaxis.

During the 2001/02 season, antivirals were administered in 167 of 179 (93.3%) influenza outbreaks for which data were available. Amantadine was given to residents for prophylaxis in 109 of 167 (65.3%) influenza outbreaks this season, and a neuraminidase inhibitor, Oseltamivir (Tamiflu®) was also administered with Amantadine in 36 (21.6%) outbreaks for treatment or prophylaxis. Oseltamivir alone was administered in 20 (12.0%) outbreaks where antivirals were used. In 2 outbreaks the antiviral administered was not specified. Comparisons could not be made between the effects of Amantadine and Tamiflu® on the duration of outbreaks due to insufficient data on indications for antiviral use (prophylaxis or therapy). This data will be collected for the 2002/03 season.

## 4. Influenza Activity Level Reporting

Every week, influenza activity was assessed and reported

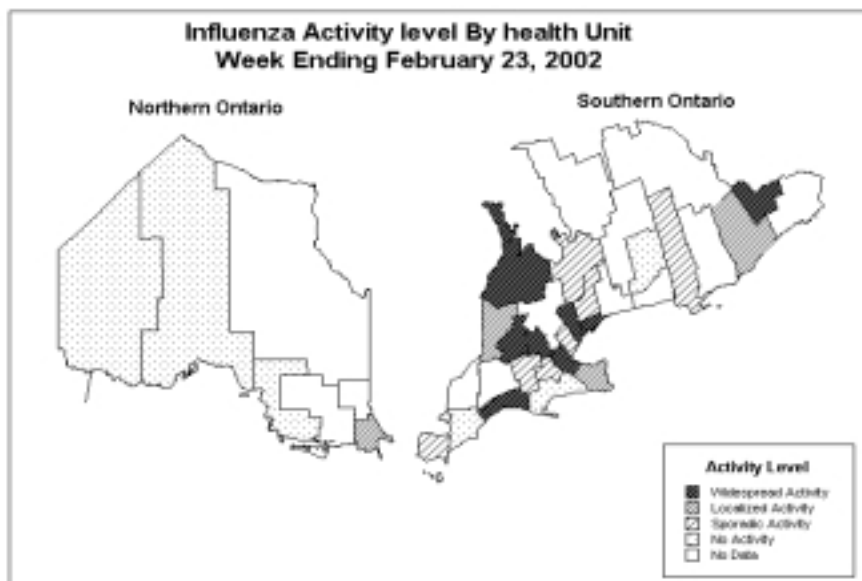
to the Public Health Branch by the medical officer of health of each health unit. The data was then mapped and published weekly in the *Ontario Influenza Bulletin*. Suggested indicators for determining local influenza activity included the following: influenza-like illness (ILI) rates reported by sentinel physicians, institutional and non-institutional (e.g., day care facilities) outbreaks and results from local virology laboratories.

For the *Bulletin*, influenza activity is defined as the level of influenza-like illness (ILI) prevalent in the local community. ILI is defined by the presence of all of the following: (fever  $\geq 38^{\circ}\text{C}$ , acute onset cough or sore throat, malaise, myalgia and/or fatigue).

Influenza activity was categorized into one of the following four designations:

- 1 = No Activity
- 2 = Sporadic Activity (sporadically occurring ILI or lab-confirmed influenza with no outbreaks detected)
- 3 = Localized Outbreaks (outbreaks affecting a single geographic area within the health unit jurisdiction; these can be institution-based and/or community outbreaks)
- 4 = Widespread Outbreaks (outbreaks affecting multiple/non-adjacent geographic areas within the health unit jurisdiction, and not involving two or more regions in a health unit).

The ranked data that is submitted to the PHB is presented graphically on a map of Ontario to show the ILI activity for the week ending February 23, 2002, the peak period for reported influenza activity.



## Results

On average, 27 (73%) of the 37 health units in Ontario reported weekly throughout the influenza season (range: 23-32). Activity levels fluctuated from “no activity” to “sporadic activity” from early November to early January, then progressed to “localized outbreaks” in late January until the end of April. A few health units reported “widespread outbreaks” from late January until the end of April.

## 5. Health Canada/College of Family Physicians of Canada (CFPC) *FluWatch* Program

Established in the 1999/00 influenza surveillance season, the Ontario Sentinel Physician Influenza Surveillance (SPIS) was discontinued for the 2000/01 season. In place of SPIS, sentinel physician data were collected, collated and disseminated through the national *FluWatch* program. The College of Family Physicians of Canada (CFPC) recruited 66 physicians by census divisions across Ontario, for the *FluWatch* program. Sentinel physicians were asked to report the number of cases of influenza-like-illness (ILI) per age group for one day each week, and the total number of patient visits per age group for the same day. The rates of visits to sentinel physicians for ILI ranged from 8 to 58 visits of ILI per 1,000 patients seen.

### Vaccination Rates in LTCFs and Hospitals All facilities

The *Mandatory Health Programs and Services Guidelines (MHPSG)* issued under the *HPPA* 1990, state that all LTCFs should achieve the provincial immunization target rate of 95% for residents. Under the “Influenza Prevention and Surveillance Protocol for Ontario Long-Term Care Facilities” released by the MOHLTC in November 1999 and the “Influenza Surveillance Protocol for Public Hospitals” issued by the Ontario Hospital Association in July 2000, influenza vaccine coverage rates from residents and staff of LTCFs and staff of public hospitals are to be reported to the local medical officer of health by December 1 of each year. The rates are then reported to the province by the health unit. The following information was reported in December 2001 for the 2001/02 influenza season.

#### Residents

Immunization data collected from 434 of 436 LTCFs indicated that the median influenza vaccination coverage achieved for residents this season was 95.5% as compared to the previous season, which was 95.2%.

LTCFs that reported respiratory outbreaks also reported median influenza immunization coverage of 95.5% (range 6.7-100) for residents.

#### Staff

Staff influenza immunization coverage rate was reported for 432 of 436 LTCFs. LTCF staff median coverage rate for this season was 86.4%, as compared to the previous season, which was 90.1%.

The median vaccination rate of staff who worked in LTCFs that experienced respiratory outbreaks was 87.5% (range 0-100).

Staff influenza coverage was reported for 134 of 136 hospitals operating under the *Public Hospital Act* in Ontario. Median staff coverage rate for the 2001/02 season was 50.8%, as compared to the previous season, which was 63.3%. There is no requirement for hospitals to report coverage rates for hospital patients.

The median immunization coverage rate for staff in hospitals that experienced respiratory outbreaks was 44.8% (range 7.1-82). The median patient vaccination rate for hospitals that experienced respiratory outbreaks was 68.9 (range 16.7-100).

Detailed data obtained in the last three years from the **Influenza Prevention and Surveillance Protocols for Ontario Long-Term Care Facilities** and the **Influenza Surveillance Protocol for Public Hospitals** will be published in a future edition of PHERO.

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#### SOURCES

Anne-Luise Winter, RN, BScN, MHSc  
Nurse Epidemiologist  
Influenza, Antimicrobial Resistance, and Infection Control Unit  
Disease Control Service, Public Health Branch  
Ministry of Health and Long-Term Care

Dr. Joyce Nsubuga MB, ChB, MHSc  
Research Assistant  
Influenza, Antimicrobial Resistance, and Infection Control Unit  
Disease Control Service, Public Health Branch  
Ministry of Health and Long-Term Care

#### CONTACT

Dr. Erika Bontovics, MD, CIC  
Unit Head/Infection Control Consultant  
Influenza, Antimicrobial Resistance, and Infection Control Unit  
Disease Control Service, Public Health Branch  
Ministry of Health and Long-Term Care

Tel: (416) 327-7418  
Fax: (416) 327-7439

## Communiqué

Public Health Research, Education and  
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en santé publique

### THE POTENTIAL FOR WEST NILE VIRUS INFECTION AND OPTIONS FOR MOSQUITO CONTROL

Since 1999, the number of cases of West Nile virus (WNV) among humans in North America has been rising and the geographic range of West Nile virus has expanded from New York City to encompass most of the Eastern and Central part of the United States. As a result, public health units in Ontario increased their surveillance activities to monitor the occurrence of WNV in humans, birds and mosquitoes.

#### West Nile Virus

The West Nile virus was first isolated from Uganda, Africa in 1937 from the blood of a febrile woman.<sup>9,2</sup> The virus is transmitted by mosquito vector – mosquitoes become infected by feeding primarily on infected birds. The virus is carried in the mosquitoes' salivary glands and can then be transmitted to birds, humans and mammals through blood feeding.<sup>9</sup> In humans, the incubation period for the virus ranges from three to 15 days.<sup>9</sup> Mild illness from WNV ("West Nile fever") is characterized by fever, fatigue and headache, while severe illness includes meningoencephalitis (inflammation of the brain and the meninges). The likelihood that severe neurologic illness will develop increases with age. Serologic WNV diagnosis in humans can be based on the presence of IgM antibodies.<sup>3</sup>

West Nile virus was detected for the first time in the Western Hemisphere in 1999 when an outbreak occurred in and around New York City. Sixty-two cases of illness were confirmed, with seven deaths.<sup>2</sup> Wild bird deaths were critical in identifying WNV as the cause of the human outbreak, in

addition to identifying the virus' geographic and temporal boundaries.<sup>4</sup> The virus may have been introduced to the New York area by transport of an infected mosquito via an aircraft, in a person incubating the virus, by migratory birds, or by the legal or illegal imports of birds.<sup>5</sup> The New York strain was phylogenetically most closely related to an Israel 1998 strain (based on envelope glycoprotein sequence data).<sup>6</sup> Worldwide, recent human outbreaks of WNV have occurred in Algeria in 1994, Romania in 1996-1997, the Czech Republic in 1997, the Democratic Republic of Congo in 1998, Russia in 1999, the United States in 1999-2001, and Israel in 2000.<sup>9</sup> Human cases have recently been confirmed in Ontario, Canada.

#### Geographic Distribution of West Nile Virus— North America

During the summer of 2000, West Nile virus spread several hundred kilometers from the previous year's epicentre of New York City to several other U.S. states and all the counties in New York State that border Ontario and Quebec.<sup>5</sup> It is suspected that in 2000, the virus passed undetected via birds from New York State into Ontario and Quebec.<sup>5</sup> In 2000, 21 human cases of WNV meningoencephalitis were reported in the United States, with 2 deaths in the New York City area.<sup>1,7</sup> The first detected human cases of WNV outside the North Eastern United States were reported in late summer 2001 in a rural Florida county.<sup>8</sup> For the year 2001 in the USA, a total of 48 human cases of WNV meningoencephalitis were reported; five of these died.<sup>1</sup> As of September 3, 2002, there have been 673 laboratory-positive human cases and 32 deaths during 2002 in the United States.<sup>18</sup>

In Canada, the surveillance for West Nile virus has included the examination and testing of dead birds (of the Corvid family) and adult mosquitoes. The Canadian Cooperative Wildlife Health Centre (CCWHC) has worked with Health Canada, provincial ministries of health and local public health units to implement a national dead bird surveillance program.<sup>5</sup> After the 1999 WNV outbreak in New York City, dead bird surveillance was implemented in Canada in 2000. Birds were collected in the Atlantic provinces, Ontario, Quebec, Manitoba and Saskatchewan; none of 185 birds with autopsy findings suggestive of WNV were found to be infected.<sup>5</sup>

Dead bird surveillance intensified in 2001, and while submissions for WNV testing occurred in same regions of Canada, only those from Southern Ontario were found

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infected with the virus. In 2002, all provinces except Newfoundland have submitted dead birds for testing. WNV-positive birds have been found in Nova Scotia, Ontario, Quebec, Manitoba and Saskatchewan.<sup>21</sup> In the United States, the West Nile virus surveillance system monitors the geographic and temporal spread of the virus over the contiguous United States. As of September 3, 2002, 31 states collect mosquito data; 27 states collected human data; and 45 states collected bird data.<sup>8</sup>

Wild bird surveillance was critical in identifying WNV as the cause of the 1999 human outbreak in New York City. However, a surveillance system relying solely on bird monitoring has its limitations. Surveillance of wild bird deaths requires the cooperation of the public and all levels of government. Large tracts of land cannot be adequately monitored without the cooperation of the public in reporting dead birds. Educating the public on the importance of reporting dead birds is critical for any West Nile virus surveillance system.<sup>4</sup>

### Human Health Risks of West Nile Virus

The human health risks associated with West Nile virus vary with age. For instance, the overall attack rate of clinical WNV infection in the New York City epidemic in 1999 was at least 6.5 cases per million population. However, the attack rate in persons 50 years of age and older in that epidemic was almost 20 times as high as the rate in those under 50 years.<sup>3</sup> In addition, individuals 50 years and older had a greater risk of developing severe illness as a result of WNV infection.<sup>9</sup> Overall, less than 1% of all infected persons develop severe illness.<sup>9\*</sup>

Of those with severe illness, case-fatality rates have ranged from 3% to 15%, with the highest rates among the elderly.<sup>9</sup> In the 1999 Volgograd, Russia, WNV outbreak, 75% of the 40 fatal cases (84 cases of meningoencephalitis in total) were over the age of sixty.<sup>10</sup> Statistical analysis of the 1999 New York City outbreak determined that older age (75 years and older) was an independent risk factor for death from WNV.<sup>3</sup> In 2000, two deaths occurred among 19 persons in New York and New Jersey hospitalized with encephalitis and who had IgM antibodies to the virus; both of the deceased were over 80 years old.<sup>7</sup>

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### Endnote

\* Peterson et al., estimated that approximately 1 in 150 persons infected with WNV would develop meningitis, encephalitis or meningoencephalitis.<sup>19</sup>

### Options for Mosquito Control

Decreasing the chance of exposure to vector mosquitoes would likely reduce the risk of human West Nile virus infection. Personal protective measures include staying indoors when mosquito activity is at its peak (usually around dusk and dawn), wearing light-coloured, long-sleeved clothing, and applying approved insect repellent containing DEET. Mosquitoes may be kept out of homes by maintaining intact screens on windows and doors. In areas where WNV activity has been anticipated or confirmed, health departments have launched public education campaigns encouraging not only personal protective measures but also elimination of common mosquito breeding sites around homes. The latter is accomplished for example, by draining standing water in rain barrels and swimming pool covers, overturning wheelbarrows, changing the water in birdbaths, or discarding old tires and other objects in which water stagnates. Studies of the effectiveness of such programs could improve future education campaigns.

Human exposure to mosquito vectors of West Nile virus may also be decreased by reducing the local populations of adult mosquitoes that are likely seeking blood meals. Mosquito control may involve the application of “larvicides” (insecticides which target mosquito larvae), “adulticides” (insecticides which target adult mosquitoes), or both.

In Canada, the approved larvicides include biological agents such as the bacterial spore, *Bacillus thuringiensis* (“Bt”, including the variant *israelensis* or “Bti”), the insect development inhibitor, methoprene, and the chitin-synthesis inhibitor, diflubenzuron. Larvicides are applied directly to water areas where mosquitoes are breeding; granular, pelletized or briquet forms of larvicides are applied by hand or by backpack- or aircraft-mounted “sprayers”.<sup>11</sup>

The adulticides are chemical agents such as the organophosphates malathion and chlorpyrifos, and the synthetic pyrethroid, resmethrin. Adulticides are applied by ground-based (e.g., truck-mounted) or aircraft-based equipment, and dispersed either as an “ultra-low volume fog” (“fogging”) or, less commonly, by the thermal “spraying” of oil-based liquid.

### Considerations in Deciding Whether to Undertake Chemical Mosquito Control

Decisions about implementing mosquito control are challenging due to the dynamic nature of human infection rates, the lack of high-quality evidence that large-scale

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mosquito control will reduce human infections, and the potential adverse effects of mosquito control for both humans and ecosystems. Thus, any decision about mosquito control must consider the human health impacts and effects, the frequency of application, the effectiveness of the intervention, the natural history of the virus, and other factors.

Adulticides and larvicides, while controlling mosquitoes, can have adverse human health effects, particularly for the persons involved in handling or applying the insecticide. Some adulticides may cause dose-dependent peripheral and central nervous system impairment.<sup>12</sup> Direct contact with larvicides can cause mild skin and eye irritation.<sup>13,14</sup> Due to the dose-dependence of adverse effects and to growth and developmental factors, children are more susceptible to the health effects of pesticides, although children's exposures are typically much less than those of handlers and applicators.

The frequency of application has both logistical and cost implications. Adulticiding would usually be reserved for infrequent use, employed only when adult mosquito populations are high and the risk of vector-borne disease is high. Larviciding, on the other hand, is often one of the first measures taken to control mosquito populations, for several reasons. Firstly, larvicides specifically target mosquito breeding grounds, unlike adulticides that rely on broad area application. Secondly, many breeding habitats, including ditches, reservoirs and swampland, tend to be located in rural or less densely populated areas which can be easily identified for larvicide application. (Structures such as storm-sewer catch basins are, however, important urban breeding sites). Thirdly, the adverse human health effects of larvicides are less frequently reported and less severe than those associated with adulticides.

A third consideration in deciding to undertake mosquito control is the effectiveness of the intervention. Both larvicides and adulticides are effective at controlling mosquito populations, given the right conditions. To be effective, larvicides should be applied to mosquito breeding sites, timed in relation to the mosquito life cycle and to weather events. This requires knowledge of the species' characteristics and breeding habitats, which should be part of mosquito surveillance. Adulticides must also be applied under particular meteorological conditions, where rain and wind will not interfere with their effectiveness.

A fourth consideration is the natural history of the virus –

how West Nile virus would likely affect human populations if no insecticide were undertaken to control mosquitoes. Since WNV is new to Canada, it remains difficult to predict the extent to which it will cause human morbidity and mortality in the various regions of the country. Information and risk estimates may be inferred from the experience of other regions such as the United States, but their geography, population demographics, species of mosquitoes, and mosquito control programs, may differ significantly from those in Canada. Even within Canada, the impact of WNV on human populations will likely vary. For instance, in Southern Ontario – where human populations are more concentrated and the mosquito-breeding season is longer – the impact of the virus may be more significant than in Northern Ontario where human populations are more dispersed and mosquito-breeding seasons are shorter. Finally, the U.S. experience suggests that WNV in humans is a dynamic situation that as yet precludes accurate predictions of future infection rates.

Additional considerations in deciding whether to undertake insecticidal mosquito control for WNV include the likely environmental impacts, the availability of pesticide application equipment or contractors, the amount and sustainability of funding available for pesticide purchase and its application, the human population characteristics of the area (rural versus urban and the percentage of elderly individuals), and knowledge of the mosquito populations, including their species, their breeding and feeding habits, and estimates of the percentage of mosquitoes carrying the virus. The seasonal climate – e.g., hot and dry summer versus a cooler, wet one – will influence mosquito populations. Local weather, particularly wind and rain, will affect the effectiveness of mosquitocide application. Finally, the extent of human morbidity and mortality from WNV will likely influence decisions about using mosquito control, particularly adulticiding.

In some parts of the USA, mosquito control is part of an Integrated Pest Management (IPM) program. An IPM program is a sustainable approach that combines biological, cultural, physical, and chemical methods of controlling animal or plant “pest” populations, while minimizing the adverse economic, environmental or human health risks.<sup>15</sup> In Ontario, one of the first municipal IPM programs began in Waterloo in the late 1970s to manage turfgrass. Since then, IPM has been refined into the city's Plant Health Care Program. In May 2002, the Halton Regional Council voted to accept Health and Social Services Committee

“Report No. 06-02” in which the non-essential use of pesticides on municipally-owned land had to be part of an IPM program.<sup>20</sup> Mosquito control for WNV could thus become incorporated into a jurisdiction’s IPM program, and should include surveillance, mosquito breeding site reduction, communications and public education, and if necessary, biological and chemical control of mosquitoes.<sup>16</sup> If an area does not have an IPM program, the decision to employ chemical means to control mosquitoes for West Nile virus could become a component of such a program.

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K. Feightner, Program, Policy and Planning Division, City of Hamilton, Hamilton, ON

A. Smith, Program, Policy and Planning Division, City of Hamilton, Hamilton, ON

W. Hunter, Regional Niagara Public Health Department, St. Catharines, ON (formerly with the Ministry of Health and Long-Term Care, Ontario)

R. Hall, Health Protection Branch, City of Hamilton, Hamilton, ON



## SOURCES

A. Toth  
McMaster Institute of Environment and Health  
McMaster University  
Hamilton ON

J. Eyles  
McMaster Institute of Environment and Health  
McMaster University  
Hamilton ON

M.Taha  
Health Protection Branch  
City of Hamilton  
Hamilton ON

B. Suggett  
Program, Policy and Planning Division  
City of Hamilton  
Hamilton ON

## CONTACT

Dr. R. Jin  
Senior Medical Consultant  
Environmental Health & Toxicology Unit, Public Health Branch  
Ministry of Health and Long-Term Care

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## Summary of Reportable Diseases in Ontario - October, 2002

Health Units by Region	Population 2000	AIDS	Campylo.	Chicken-pox	Chlamydia	Enceph./ Meningitis	GAS	Gonorrhea
Algoma	125,109		3	5	23			1
North Bay	93,505		3	1	10		3	
Northwestern	91,920				13			1
Porcupine	93,680		1	8	11			
Sudbury	199,619		5	1	21	1		
Thunder Bay	158,698		1		32			7
Timiskaming	37,721							
<b>Total - Northern</b>	<b>800,252</b>		<b>13</b>	<b>15</b>	<b>110</b>	<b>1</b>	<b>3</b>	<b>9</b>
Eastern Ontario	194,945		6	1	5		1	
Hastings & Prince Edward	159,088		3		19		1	
Kingston, Frontenac & Lennox	180,225				31	1		
Leeds, Grenville & Lanark	163,143		2				1	
Ottawa	779,274	1	26	25	109	2	2	17
Renfrew	101,131			2	6	1		
<b>Total- Eastern</b>	<b>1,577,806</b>	<b>1</b>	<b>37</b>	<b>28</b>	<b>170</b>	<b>4</b>	<b>5</b>	<b>17</b>
Durham	512,271		8		73	1		6
Haliburton-Kawartha	168,120		4		13			1
Muskoka-Parry Sound	86,218		1	2	2		1	
Peel	1,008,163		33	40	82	2		17
Peterborough	128,881		3	20	16	1		1
Simcoe	377,405		19	10	20	3		1
Toronto - total	2,542,844	1	111	119	610	6	6	187
<i>North</i>	627,021		26	55	120			31
<i>South</i>	688,584	1	43	34	217		1	95
<i>West</i>	509,302		28	8	174	4	2	43
<i>East</i>	717,937		14	22	99	2	3	18
York	724,969		38		45	3	2	4
<b>Total - Central East</b>	<b>5,548,871</b>	<b>1</b>	<b>217</b>	<b>191</b>	<b>861</b>	<b>16</b>	<b>9</b>	<b>217</b>
Grey Bruce	157,664		1		6			
Elgin-St. Thomas	84,182		2	9	9			
Huron	61,097		3		4		1	
Chatham-Kent	112,897			2	2			
Lambton	131,643							
Middlesex-London	412,976	1	3		38	3	2	8
Oxford	102,561		2		2			
Perth	75,238			3	4			
Windsor-Essex	381,672		8		49	2		1
<b>Total - Southwest</b>	<b>1,519,930</b>	<b>1</b>	<b>19</b>	<b>14</b>	<b>114</b>	<b>5</b>	<b>3</b>	<b>9</b>
Brant	126,481		3	14	21		1	1
Haldimand-Norfolk	109,536		2	1	4			
Halton	375,705		7	6	2		2	
Hamilton	498,553		7	35	66	6	1	6
Niagara	423,600		20		31		1	3
Waterloo	446,833		13		62			8
Wellington-Dufferin-Guelph	241,777		9	3	19			
<b>Total - Central West</b>	<b>2,222,485</b>		<b>61</b>	<b>59</b>	<b>205</b>	<b>6</b>	<b>5</b>	<b>18</b>
<b>October 2002</b>	<b>11,669,344</b>	<b>3</b>	<b>347</b>	<b>307</b>	<b>1,460</b>	<b>32</b>	<b>25</b>	<b>270</b>
<b>* Total YTD 2002</b>	<b>-</b>	<b>66</b>	<b>3,899</b>	<b>11,513</b>	<b>14,740</b>	<b>514</b>	<b>310</b>	<b>2,514</b>
<b>* Total YTD 2001</b>	<b>-</b>	<b>116</b>	<b>4,229</b>	<b>9,721</b>	<b>13,776</b>	<b>447</b>	<b>269</b>	<b>2,492</b>

The Toronto City regions above are now defined as: North - former North York; South - former City of Toronto; West - former Etobicoke and City of York; East - former Scarborough and East York

\* Adjusted for deletions and late reports.

# Summary of Reportable Diseases in Ontario - October, 2002

Health Units by Region	Population 2000	AIDS	PPNG	Hepatitis A	Hepatitis B	Hepatitis C	Hib	Influenza	Measles	Meningococcal
Algoma	125,109									
North Bay	93,505					2				
Northwestern	91,920					2				
Porcupine	93,680					1				
Sudbury	199,619			2		6				
Thunder Bay	158,698		1			3				
Timiskaming	37,721									
<b>Total - Northern</b>	<b>800,252</b>		<b>1</b>	<b>2</b>		<b>14</b>				
Eastern Ontario	194,945			1		1				
Hastings & Prince Edward	159,088									
Kingston, Frontenac & Lennox	180,225									
Leeds, Grenville & Lanark	163,143					1				
Ottawa	779,274	1		1		26				
Renfrew	101,131									
<b>Total- Eastern</b>	<b>1,577,806</b>	<b>1</b>		<b>2</b>		<b>28</b>				
Durham	512,271									
Haliburton-Kawartha	168,120					8				
Muskoka-Parry Sound	86,218					5				
Peel	1,008,163			4		23				2
Peterborough	128,881					11				1
Simcoe	377,405					12				
Toronto - total	2,542,844	1	5	5	2	109	1			
<i>North</i>	<i>627,021</i>					<i>29</i>				
<i>South</i>	<i>688,584</i>	<i>1</i>	<i>3</i>	<i>4</i>	<i>1</i>	<i>39</i>	<i>1</i>			
<i>West</i>	<i>509,302</i>		<i>1</i>	<i>1</i>	<i>1</i>	<i>23</i>				
<i>East</i>	<i>717,937</i>		<i>1</i>			<i>18</i>				
York	724,969			1		1				
<b>Total - Central East</b>	<b>5,548,871</b>	<b>1</b>	<b>5</b>	<b>10</b>	<b>2</b>	<b>169</b>	<b>1</b>			<b>3</b>
Grey Bruce	157,664					3				
Elgin-St. Thomas	84,182					2				
Huron	61,097									
Chatham-Kent	112,897									
Lambton	131,643									
Middlesex-London	412,976	1				8				1
Oxford	102,561									
Perth	75,238									
Windsor-Essex	381,672					12				
<b>Total - Southwest</b>	<b>1,519,930</b>	<b>1</b>				<b>25</b>				<b>1</b>
Brant	126,481		1		1					
Haldimand-Norfolk	109,536					2				
Halton	375,705			1		8				
Hamilton	498,553					37				
Niagara	423,600					24	1			
Waterloo	446,833					5				
Wellington-Dufferin-Guelph	241,777					4				
<b>Total - Central West</b>	<b>2,222,485</b>		<b>1</b>	<b>1</b>	<b>1</b>	<b>80</b>	<b>1</b>			
<b>October 2002</b>	<b>11,669,344</b>	<b>3</b>	<b>7</b>	<b>15</b>	<b>3</b>	<b>316</b>	<b>2</b>			<b>4</b>
<b>* Total YTD 2002</b>	<b>-</b>	<b>66</b>	<b>165</b>	<b>127</b>	<b>94</b>	<b>4,021</b>	<b>6</b>	<b>2,173</b>		<b>49</b>
<b>* Total YTD 2001</b>	<b>-</b>	<b>116</b>	<b>161</b>	<b>152</b>	<b>153</b>	<b>4,599</b>	<b>5</b>	<b>767</b>	<b>6</b>	<b>98</b>

The Toronto City regions above are now defined as: North - former North York; South - former City of Toronto; West - former Etobicoke and City of York; East - former Scarborough and East York

\* Adjusted for deletions and late reports.

## Summary of Reportable Diseases in Ontario - October, 2002

Health Units by Region	Population 2000	AIDS	Mumps	Pertussis	Rubella	Salmon.	higellosis	Syphilis (Prim/Sec)	VTEC
Algoma	125,109					2			
North Bay	93,505			1		4			1
Northwestern	91,920								
Porcupine	93,680			2					
Sudbury	199,619			1		3			1
Thunder Bay	158,698			1		5			
Timiskaming	37,721								
<b>Total - Northern</b>	<b>800,252</b>			<b>5</b>		<b>14</b>			<b>2</b>
Eastern Ontario	194,945			1		2			1
Hastings & Prince Edward	159,088					6			
Kingston, Frontenac & Lennox	180,225								
Leeds, Grenville & Lanark	163,143					1			1
Ottawa	779,274	1		6		13	1		4
Renfrew	101,131					2			
<b>Total- Eastern</b>	<b>1,577,806</b>	<b>1</b>		<b>7</b>		<b>24</b>	<b>1</b>		<b>6</b>
Durham	512,271					8			
Haliburton-Kawartha	168,120			2		3			1
Muskoka-Parry Sound	86,218					2			
Peel	1,008,163					20			5
Peterborough	128,881			6		1			1
Simcoe	377,405					2			1
Toronto - total	2,542,844	1	1	6		63	9	13	3
<i>North</i>	627,021			3		21			1
<i>South</i>	688,584	1				9	6	12	1
<i>West</i>	509,302			2		22	2		1
<i>East</i>	717,937		1	1		11	1	1	
York	724,969			2		17	1		2
<b>Total - Central East</b>	<b>5,548,871</b>	<b>1</b>	<b>1</b>	<b>16</b>		<b>116</b>	<b>10</b>	<b>13</b>	<b>13</b>
Grey Bruce	157,664			2					1
Elgin-St. Thomas	84,182								
Huron	61,097					4			
Chatham-Kent	112,897			1					
Lambton	131,643								
Middlesex-London	412,976	1		1		3			
Oxford	102,561					1			
Perth	75,238								
Windsor-Essex	381,672					21	1		
<b>Total - Southwest</b>	<b>1,519,930</b>	<b>1</b>		<b>4</b>		<b>29</b>	<b>1</b>		<b>1</b>
Brant	126,481					2			
Haldimand-Norfolk	109,536					3			
Halton	375,705			1		3			
Hamilton	498,553			1		9	1		2
Niagara	423,600					12			2
Waterloo	446,833			1		8			2
Wellington-Dufferin-Guelph	241,777			2		2			1
<b>Total - Central West</b>	<b>2,222,485</b>			<b>5</b>		<b>39</b>	<b>1</b>		<b>7</b>
<b>October 2002</b>	<b>11,669,344</b>	<b>3</b>	<b>1</b>	<b>37</b>		<b>222</b>	<b>13</b>	<b>13</b>	<b>29</b>
<b>* Total YTD 2002</b>	<b>-</b>	<b>66</b>	<b>11</b>	<b>390</b>	<b>2</b>	<b>2,087</b>	<b>785</b>	<b>114</b>	<b>323</b>
<b>* Total YTD 2001</b>	<b>-</b>	<b>116</b>	<b>11</b>	<b>392</b>	<b>15</b>	<b>2,200</b>	<b>195</b>	<b>20</b>	<b>297</b>

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\* Adjusted for deletions and late reports.

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# Summary of Reportable Diseases

## 3<sup>rd</sup> Quarter, 2002

Ministry of Health and Long-Term Care  
 Ontario

## Summary of Reportable Diseases in Ontario - 3<sup>rd</sup> Quarter 2002

Health Units by Region	Population 2000	AIDS	Campylo.	Chicken-pox	Chlamydia	Enceph./ Meningitis	GAS	Gonorrhoea
Algoma	125,109		17	2	76	1		1
North Bay	93,505		3	7	34		1	1
Northwestern	91,920		6	8	51	3	1	7
Porcupine	93,680		4		43	1		2
Sudbury	199,619		10	5	80	2		
Thunder Bay	158,698	2	11		93	5	1	6
Timiskaming	37,721				7			
<b>Total - Northern</b>	<b>800,252</b>	<b>2</b>	<b>51</b>	<b>22</b>	<b>384</b>	<b>12</b>	<b>3</b>	<b>17</b>
Eastern Ontario	194,945		28	3	25			
Hastings & Prince Edward	159,088		10	4	46	1	1	
Kingston, Frontenac & Lennox	180,225				91	3	2	4
Leeds, Grenville & Lanark	163,143		12			1	2	
Ottawa	779,274		108	42	295	14	4	55
Renfrew	101,131		6		27			
<b>Total- Eastern</b>	<b>1,577,806</b>		<b>164</b>	<b>49</b>	<b>484</b>	<b>19</b>	<b>9</b>	<b>59</b>
Durham	512,271	1	59	147	172	3	5	34
Haliburton-Kawartha	168,120		14		23			
Muskoka-Parry Sound	86,218		3	2	6			1
Peel	1,008,163		160	273	356	30	3	76
Peterborough	128,881	1	7	9	56	6		4
Simcoe	377,405		54	90	87	10	3	4
Toronto - total	2,542,844	8	467	219	1,646	87	15	484
<i>North</i>	627,021	1	114	41	368	8	1	74
<i>South</i>	688,584	6	142	52	544	48	11	231
<i>West</i>	509,302	1	143	23	420	15	3	105
<i>East</i>	717,937		68	103	314	16		74
York	724,969		197	31	138	16	1	9
<b>Total - Central East</b>	<b>5,548,871</b>	<b>10</b>	<b>961</b>	<b>771</b>	<b>2,484</b>	<b>152</b>	<b>27</b>	<b>612</b>
Grey Bruce	157,664		26		24		2	6
Elgin-St. Thomas	84,182		11	13	16	4		
Huron	61,097		24		8	1	1	
Chatham-Kent	112,897		10	7	25	1		2
Lambton	131,643				17			1
Middlesex-London	412,976		24		185	36	1	25
Oxford	102,561		17		28	1		4
Perth	75,238		26	2	13	3		
Windsor-Essex	381,672		68		131	20	1	7
<b>Total - Southwest</b>	<b>1,519,930</b>		<b>206</b>	<b>22</b>	<b>447</b>	<b>66</b>	<b>5</b>	<b>45</b>
Brant	126,481		11	28	48	1	2	1
Haldimand-Norfolk	109,536		15	9	10		1	
Halton	375,705		40	7	42	5	1	2
Hamilton	498,553	2	48	32	197	15	3	34
Niagara	423,600		68	144	106	4	1	16
Waterloo	446,833		68		161	8	2	8
Wellington-Dufferin-Guelph	241,777		43	8	70	2		5
<b>Total - Central West</b>	<b>2,222,485</b>	<b>2</b>	<b>293</b>	<b>228</b>	<b>634</b>	<b>35</b>	<b>10</b>	<b>66</b>
<b>3rd Quarter 2002</b>	<b>11,669,344</b>	<b>14</b>	<b>1,675</b>	<b>1,092</b>	<b>4,433</b>	<b>284</b>	<b>54</b>	<b>799</b>
<b>* Total YTD 2002</b>	<b>-</b>	<b>63</b>	<b>3,552</b>	<b>11,206</b>	<b>13,280</b>	<b>482</b>	<b>285</b>	<b>2,244</b>
<b>* Total YTD 2001</b>	<b>-</b>	<b>103</b>	<b>3,783</b>	<b>8,960</b>	<b>12,211</b>	<b>390</b>	<b>252</b>	<b>2,220</b>

The Toronto City regions above are now defined as: North - former North York; South - former City of Toronto; West - former Etobicoke and City of York; East - former Scarborough and East York

\* Adjusted for deletions and late reports.

## Summary of Reportable Diseases in Ontario - 3<sup>rd</sup> Quarter 2002

Health Units by Region	Population 2000	PPNG	Hepatitis A	Hepatitis B	Hepatitis C	Hib	Influenza	Measles	Meningococcal
Algoma	125,109				11				
North Bay	93,505			1	7				1
Northwestern	91,920				3				1
Porcupine	93,680			1	5				
Sudbury	199,619				20				1
Thunder Bay	158,698	2			19				
Timiskaming	37,721								
<b>Total - Northern</b>	<b>800,252</b>	<b>2</b>		<b>2</b>	<b>65</b>				<b>3</b>
Eastern Ontario	194,945			1	15				
Hastings & Prince Edward	159,088				2				
Kingston, Frontenac & Lennox	180,225			2	24				
Leeds, Grenville & Lanark	163,143				14				
Ottawa	779,274	2	3	2	97		1		1
Renfrew	101,131		1		2				1
<b>Total- Eastern n</b>	<b>1,577,806</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>154</b>		<b>1</b>		<b>2</b>
Durham	512,271		1						
Haliburton-Kawartha	168,120				10	1			
Muskoka-Parry Sound	86,218				12				
Peel	1,008,163	4	3	1	87		2		1
Peterborough	128,881		2		15				
Simcoe	377,405	3			63				
Toronto - total	2,542,844	30	35	17	295				4
<i>North</i>	<i>627,021</i>	<i>4</i>	<i>4</i>	<i>4</i>	<i>69</i>				
<i>South</i>	<i>688,584</i>	<i>16</i>	<i>8</i>	<i>5</i>	<i>102</i>				<i>2</i>
<i>West</i>	<i>509,302</i>	<i>3</i>	<i>15</i>	<i>6</i>	<i>64</i>				
<i>East</i>	<i>717,937</i>	<i>7</i>	<i>8</i>	<i>2</i>	<i>60</i>				<i>2</i>
York	724,969	7	5	1	29				1
<b>Total - Central East</b>	<b>5,548,871</b>	<b>44</b>	<b>46</b>	<b>19</b>	<b>511</b>	<b>1</b>	<b>2</b>		<b>6</b>
Grey Bruce	157,664			1	14				
Elgin-St. Thomas	84,182				8				
Huron	61,097				4	1			
Chatham-Kent	112,897				1				
Lambton	131,643			4	21				
Middlesex-London	412,976	1	2		38				
Oxford	102,561				4				
Perth	75,238		1		3		1		
Windsor-Essex	381,672				39				
<b>Total - Southwest</b>	<b>1,519,930</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>132</b>	<b>1</b>	<b>1</b>		
Brant	126,481		2		2				
Haldimand-Norfolk	109,536				4				
Halton	375,705				20				
Hamilton	498,553	2	2		65		1		
Niagara	423,600		1		60				
Waterloo	446,833	1			24				
Wellington-Dufferin-Guelph	241,777			3	15				
<b>Total - Central West</b>	<b>2,222,485</b>	<b>3</b>	<b>5</b>	<b>3</b>	<b>190</b>		<b>1</b>		
<b>3rd Quarter 2002</b>	<b>11,669,344</b>	<b>52</b>	<b>58</b>	<b>34</b>	<b>1,052</b>	<b>2</b>	<b>5</b>		<b>11</b>
<b>* Total YTD 2002</b>	<b>-</b>	<b>158</b>	<b>112</b>	<b>91</b>	<b>3,705</b>	<b>4</b>	<b>2,173</b>		<b>45</b>
<b>* Total YTD 2001</b>	<b>-</b>	<b>147</b>	<b>135</b>	<b>135</b>	<b>4,129</b>	<b>4</b>	<b>762</b>	<b>6</b>	<b>92</b>

The Toronto City regions above are now defined as: North - former North York; South - former City of Toronto; West - former Etobicoke and City of York; East - former Scarborough and East York

\* Adjusted for deletions and late reports.

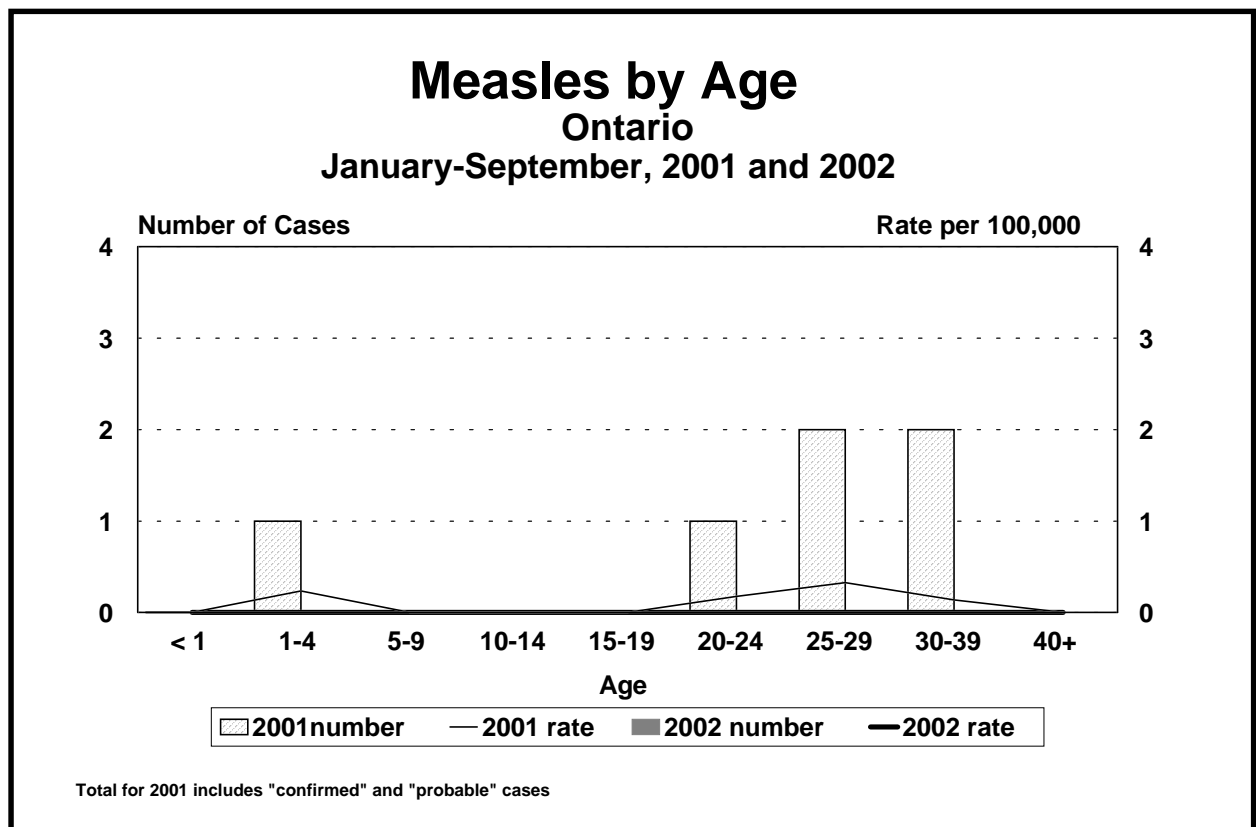
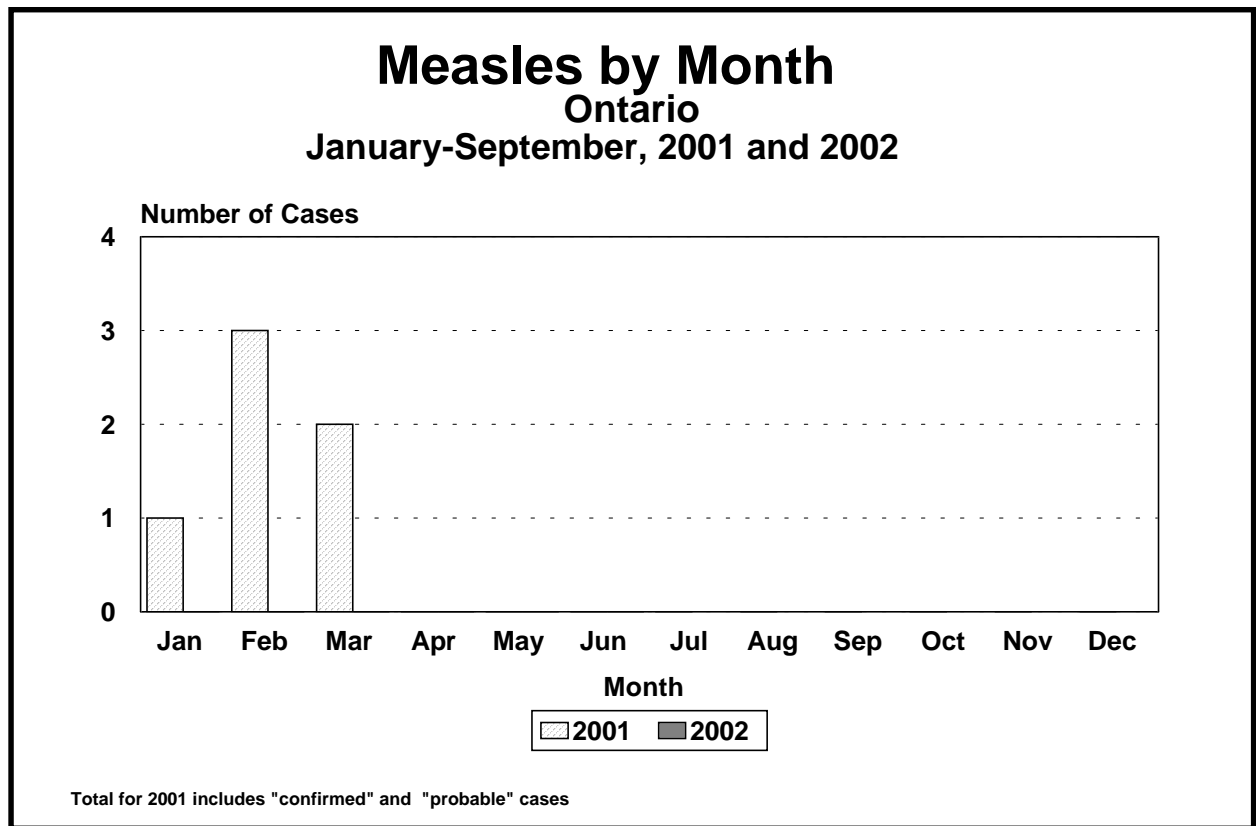
## Summary of Reportable Diseases in Ontario - 3<sup>rd</sup> Quarter 2002

Health Units by Region	Population 2000	Mumps	Pertussis	Rubella	Salmon.	Shigellosis	Syphilis (Prim/Sec)	VTEC
Algoma	125,109		5		2			1
North Bay	93,505		3		2			3
Northwestern	91,920				3			4
Porcupine	93,680		7		2			
Sudbury	199,619		6		7			
Thunder Bay	158,698		2		4			1
Timiskaming	37,721				1			
<b>Total - Northern</b>	<b>800,252</b>		<b>23</b>		<b>21</b>			<b>9</b>
Eastern Ontario	194,945		10		10		1	6
Hastings & Prince Edward	159,088		2		16			10
Kingston, Frontenac & Lennox	180,225		1					
Leeds, Grenville & Lanark	163,143		7		7			4
Ottawa	779,274		17	1	54	8	2	12
Renfrew	101,131		1		3			
<b>Total- Eastern</b>	<b>1,577,806</b>		<b>38</b>	<b>1</b>	<b>90</b>	<b>8</b>	<b>3</b>	<b>32</b>
Durham	512,271		1		35	6		7
Haliburton-Kawartha	168,120		2		9	1		6
Muskoka-Parry Sound	86,218		4		25			
Peel	1,008,163		4		76	10	1	8
Peterborough	128,881		13		2	1		
Simcoe	377,405		2		13			2
Toronto - total	2,542,844	2	35		228	35	45	18
<i>North</i>	627,021		11		65	3	3	4
<i>South</i>	688,584		15		58	27	35	6
<i>West</i>	509,302	1	6		63	3	5	4
<i>East</i>	717,937	1	3		42	2	2	4
York	724,969		9		76	2		16
<b>Total - Central East</b>	<b>5,548,871</b>	<b>2</b>	<b>70</b>		<b>464</b>	<b>55</b>	<b>46</b>	<b>57</b>
Grey Bruce	157,664				11			7
Elgin-St. Thomas	84,182		3		3	1		4
Huron	61,097		8		5			
Chatham-Kent	112,897				5			1
Lambton	131,643							
Middlesex-London	412,976				14	1		5
Oxford	102,561				5	2		7
Perth	75,238		1		8			6
Windsor-Essex	381,672		2		19	3		4
<b>Total - Southwest</b>	<b>1,519,930</b>		<b>14</b>		<b>70</b>	<b>7</b>		<b>34</b>
Brant	126,481				11			6
Haldimand-Norfolk	109,536				10			1
Halton	375,705		2		25	7		6
Hamilton	498,553		5		36	1	1	6
Niagara	423,600		1		37	4		11
Waterloo	446,833		2		42			13
Wellington-Dufferin-Guelph	241,777		2		19	1		9
<b>Total - Central West</b>	<b>2,222,485</b>		<b>12</b>		<b>180</b>	<b>13</b>	<b>1</b>	<b>52</b>
<b>3rd Quarter 2002</b>	<b>11,669,344</b>	<b>2</b>	<b>157</b>	<b>1</b>	<b>825</b>	<b>83</b>	<b>50</b>	<b>184</b>
<b>* Total YTD 2002</b>	<b>-</b>	<b>10</b>	<b>353</b>	<b>2</b>	<b>1,865</b>	<b>772</b>	<b>101</b>	<b>294</b>
<b>* Total YTD 2001</b>	<b>-</b>	<b>7</b>	<b>343</b>	<b>15</b>	<b>1,997</b>	<b>182</b>	<b>12</b>	<b>277</b>

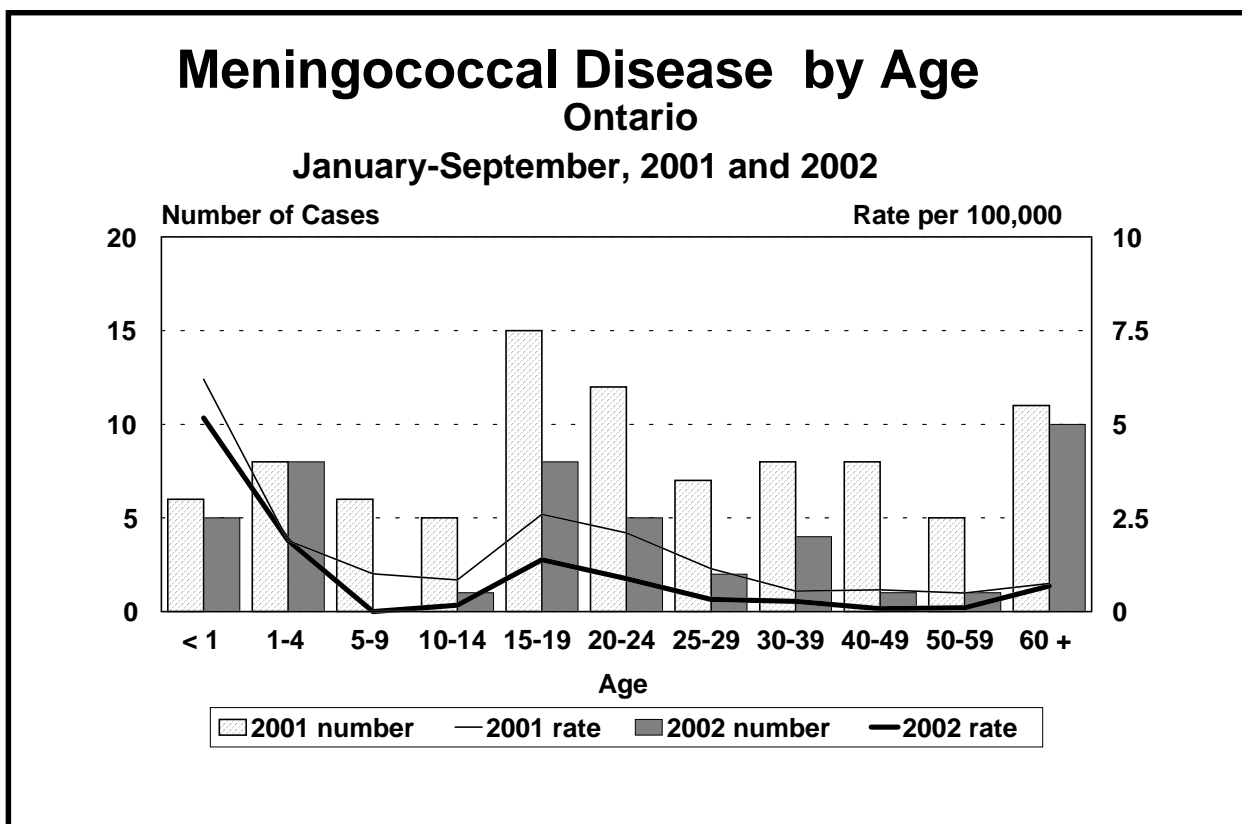
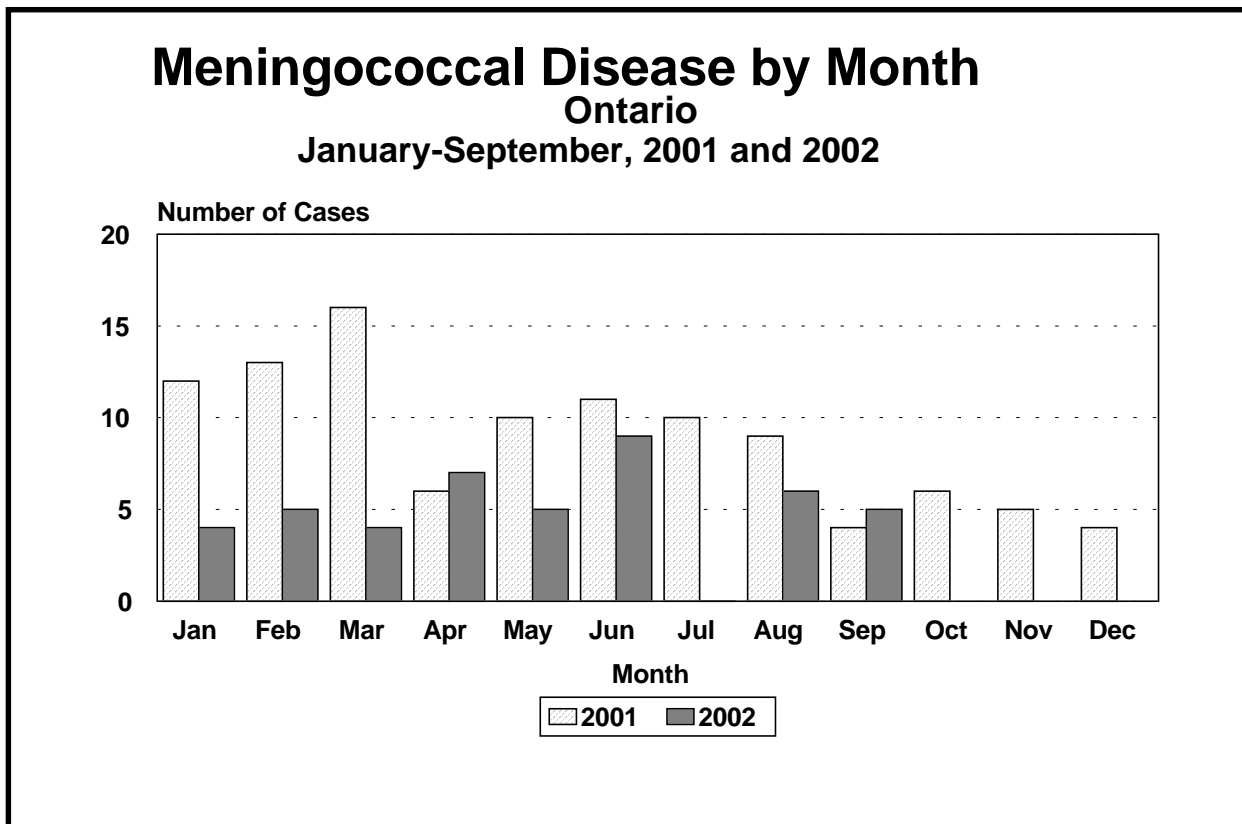
The Toronto City regions above are now defined as: North - former North York; South - former City of Toronto; West - former Etobicoke and City of York; East - former Scarborough and East York

\* Adjusted for deletions and late reports.

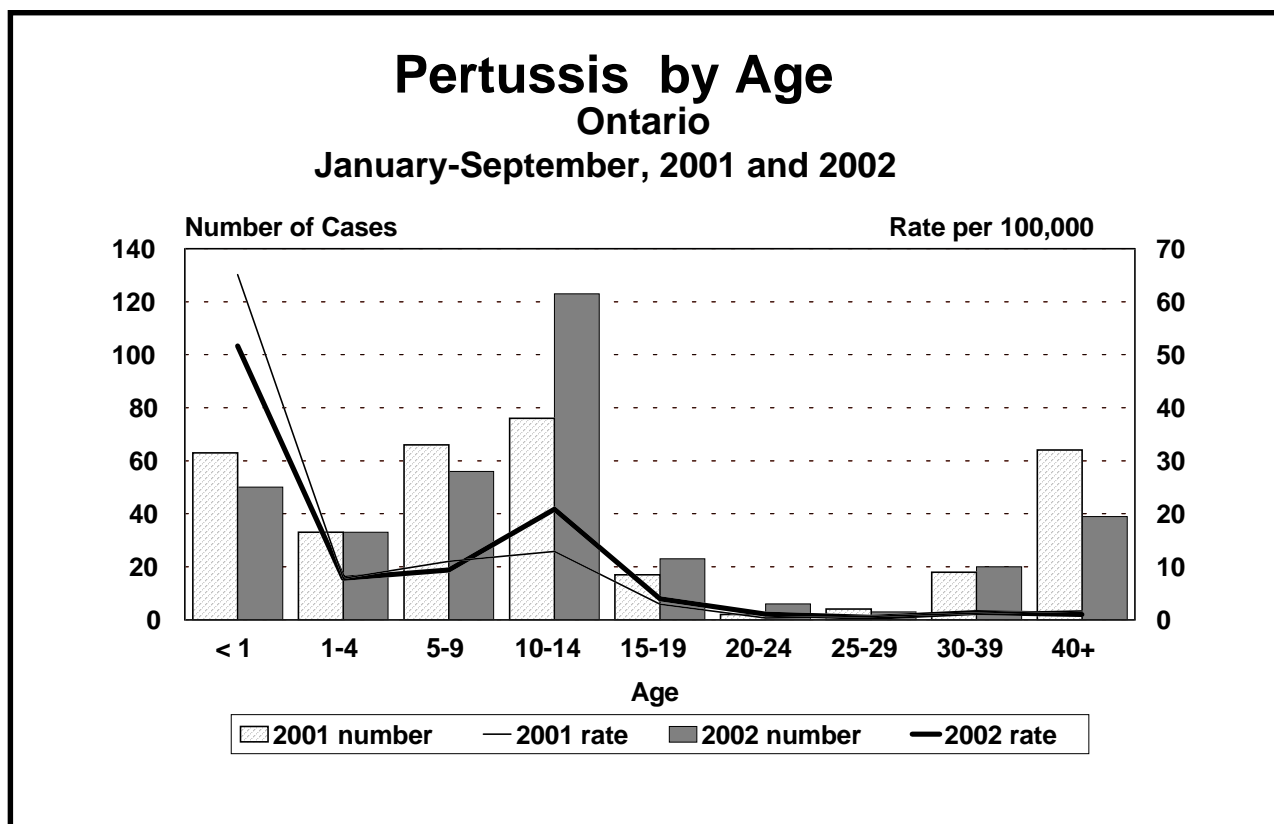
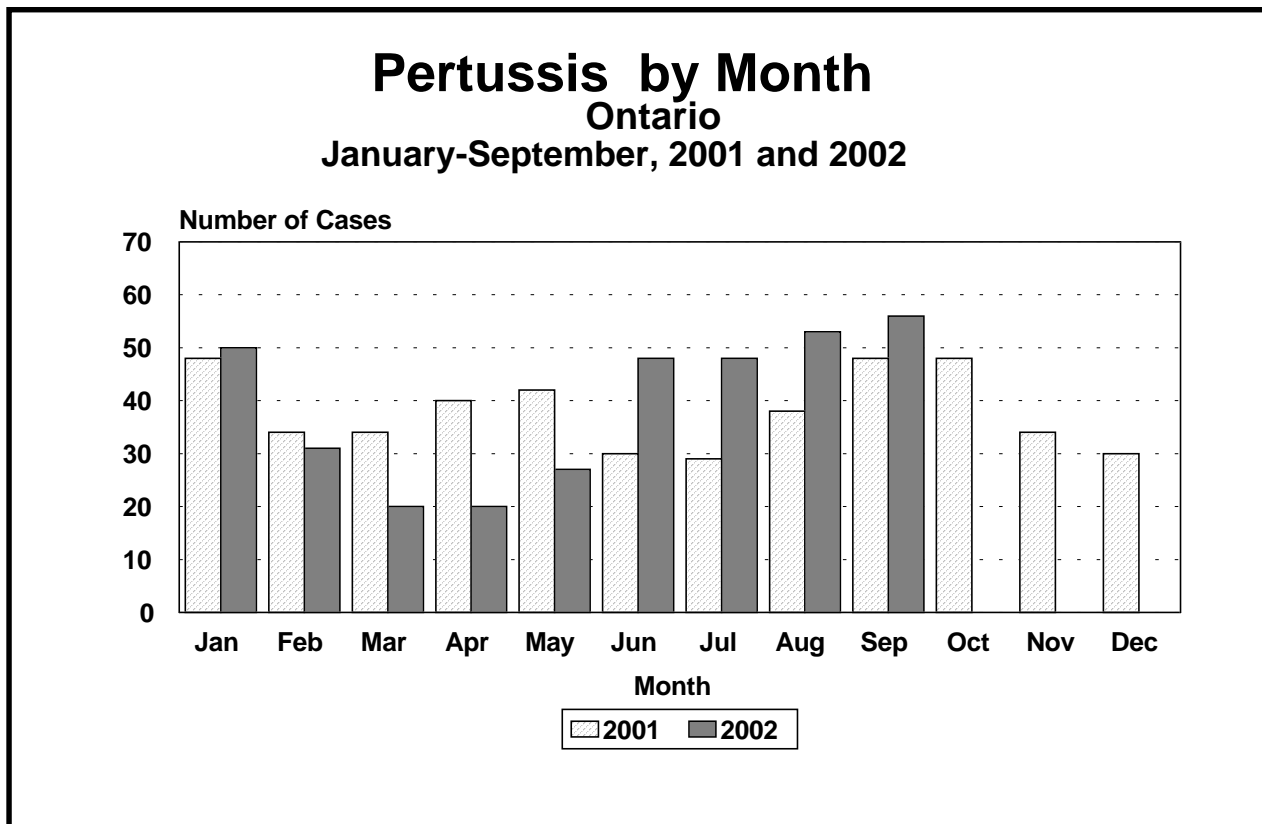
# Vaccine Preventable and Other Diseases



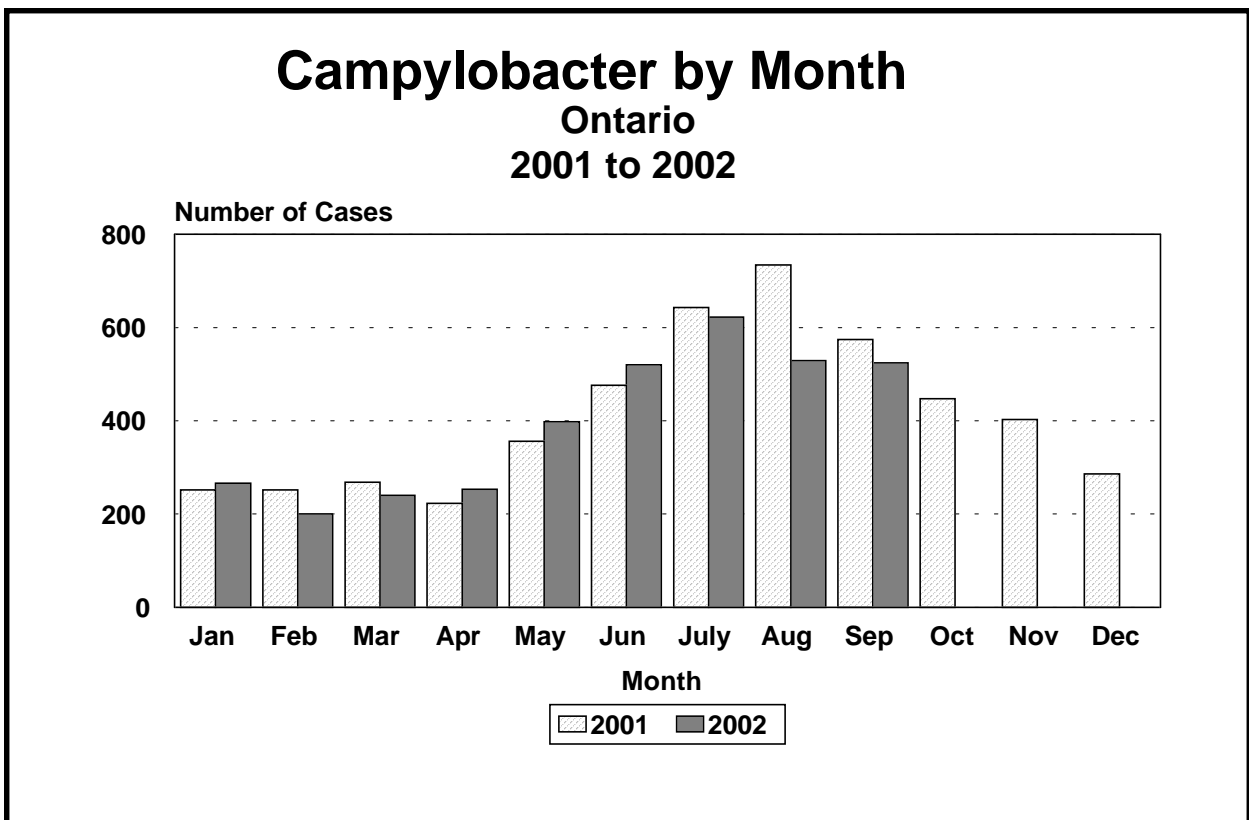
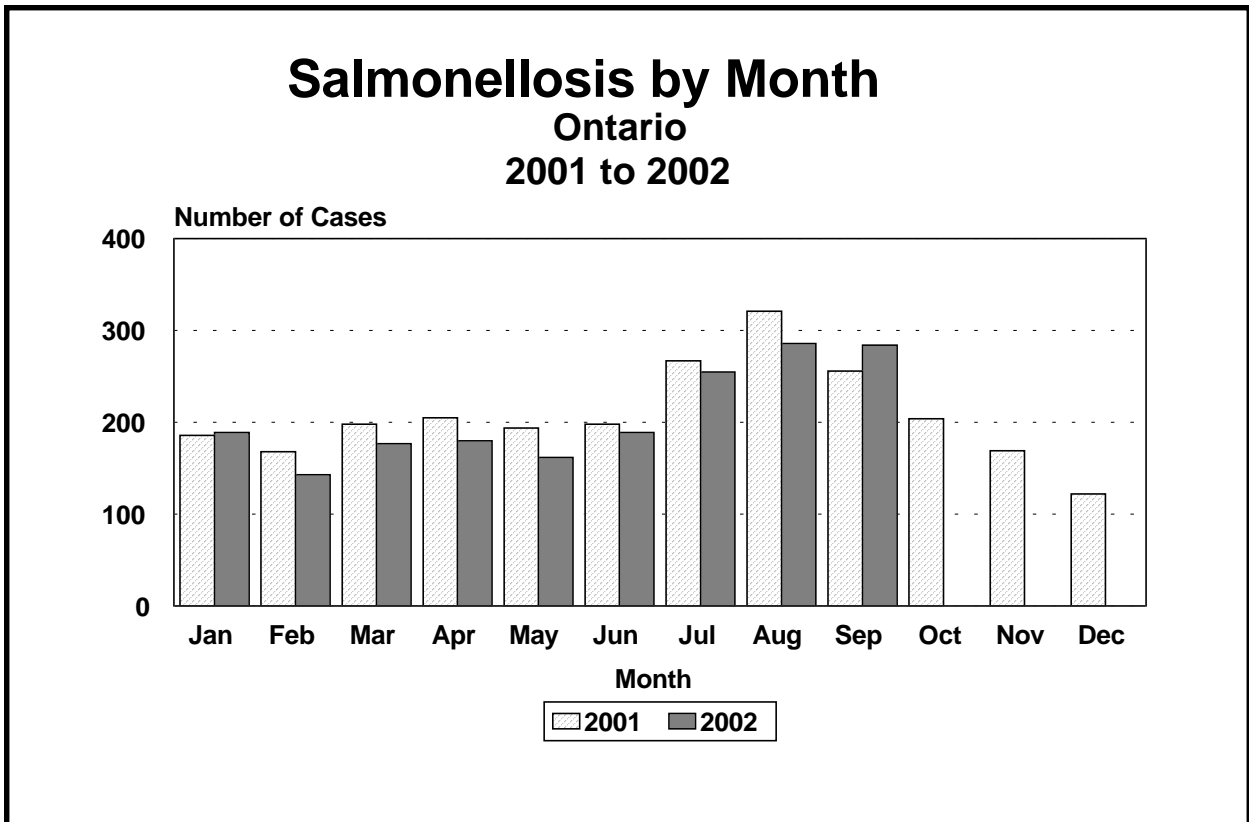
# Vaccine Preventable and Other Diseases



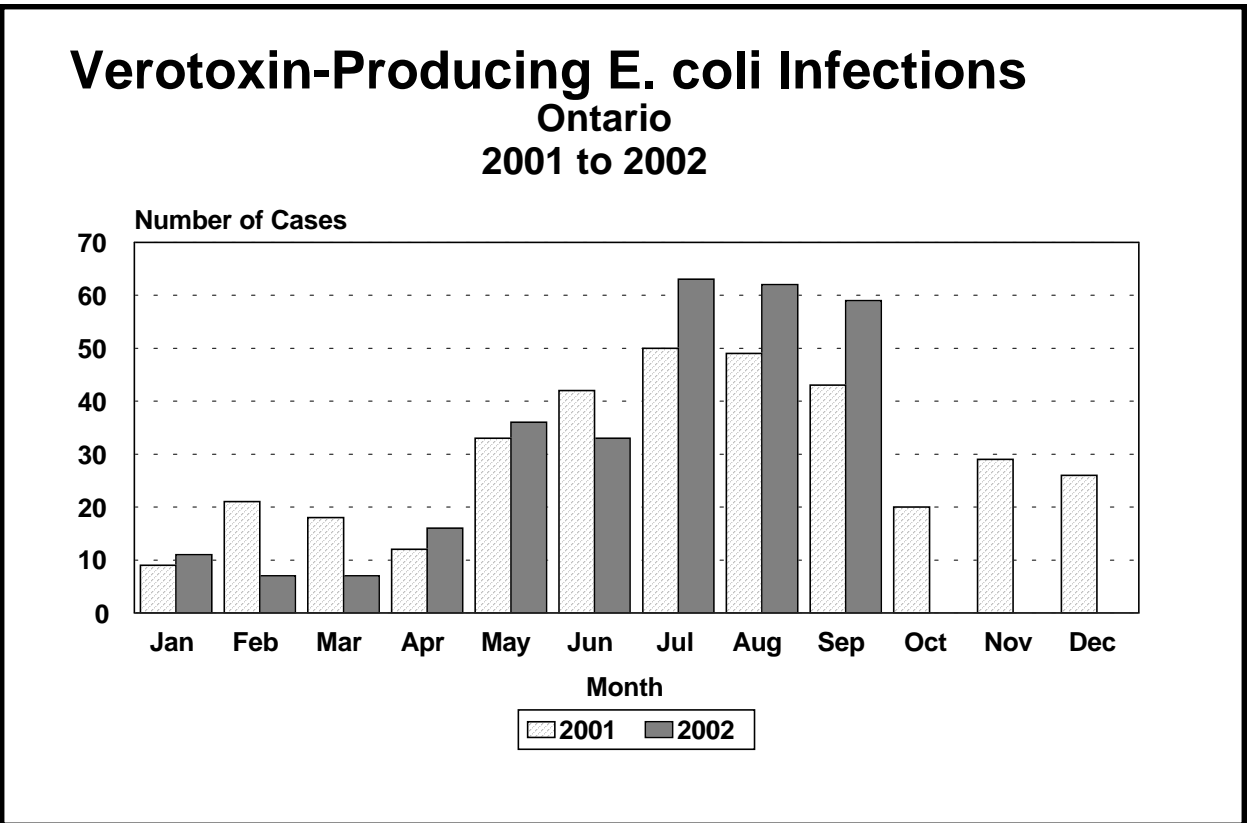
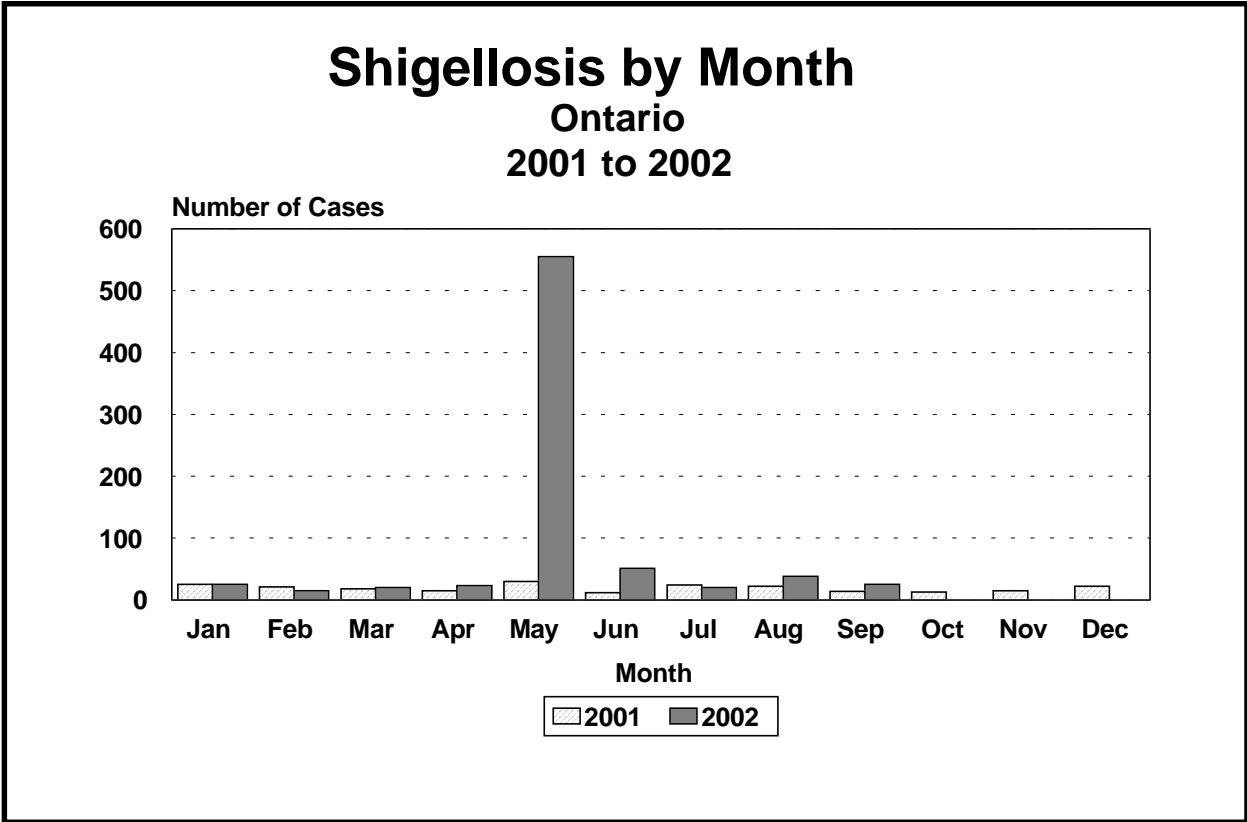
# Vaccine Preventable and Other Diseases



# Enteric Diseases



# Enteric Diseases



# PPNG as a Proportion of Total Gonorrhoea Ontario 2001 to 2002

