



MEASLES *update*



Volume 2

Number 4

November/December 1994

OUTBREAK OF MEASLES IN A RELIGIOUS GROUP — MONTREAL, QUEBEC (May to September, 1994)

Louise Valiquette, Lucie Bédard, and the professionals of the Infectious Diseases Unit, Public Health Department, Health and Social Services Board, Montreal Centre Region, Montreal, Quebec

Epidemiologic Information

Between May 1 and September 3, 1994, 44 cases of measles were reported to the public health authorities of the Health and Social Services Board for the Montreal Centre Region. Distribution of cases by week of onset is shown in Figure 1. Thirty-nine of those cases met the national case definition for measles⁽¹⁾ and almost half (n=19) were serologically confirmed by the detection of immunoglobulin M (IgM). Since the beginning of the year, the observed incidence of measles in this region has been 3.4 cases per 100,000 person years. The overall incidence of confirmed cases in the Montreal area exceeds the total (2.4 per 100,000 person years) for all other regions in Quebec combined. The last major measles epidemic in Quebec occurred in 1989.

The cases are mainly concentrated in the north-eastern part of Montreal Island, which is located adjacent to the Lanaudière region where measles had been reported in early summer. The sex distribution of cases was equal. Almost half of the cases (n=18) were in children < 5 years of age, including one infant < 1 year old. The age distribution of other cases was as follows: 5 to 9 years (n=10), 10 to 14 (n=8), over 14 years (n=3) (Figure 2). The average age of cases was 7 years (median: 4.5 years), with a range from 8 months to 32 years. No fatalities or serious complications have been reported to date. Twenty-four (69%) of the 35 cases with known immunization status had not been immunized. Twenty-two of the 24 cases belonged to families that were members of a religious group, *la Mission de l'Esprit Saint*.

The first reported case was a teacher in a secondary school where there were no other reported cases. This case may have resulted from exposure while in the Lanaudière region where cases were being reported. Three weeks later, eight cases occurred in four families belonging to the above religious group but living in different areas. The information available was insufficient to establish the chain of transmission.

Table of Contents

- 1 *Outbreak of Measles in a Religious Group — Montreal, Quebec (May to September, 1994)*
- 3 *Measles in Canada, 1994 (as of November 30)*
- 6 *Measles — United States, First 26 Weeks, 1994*
- 8 *Measles Elimination by 2000*



Generalized measles rash

Although eight cases developed in four schools before the end of the school year (June), no secondary cases could be identified among the school contacts. A home day care was the source of transmission for two cases; another case occurred in a counsellor in a summer camp outside Montreal where other cases had been identified in July 1994. A number of cases involved members of the same family.

Public health intervention

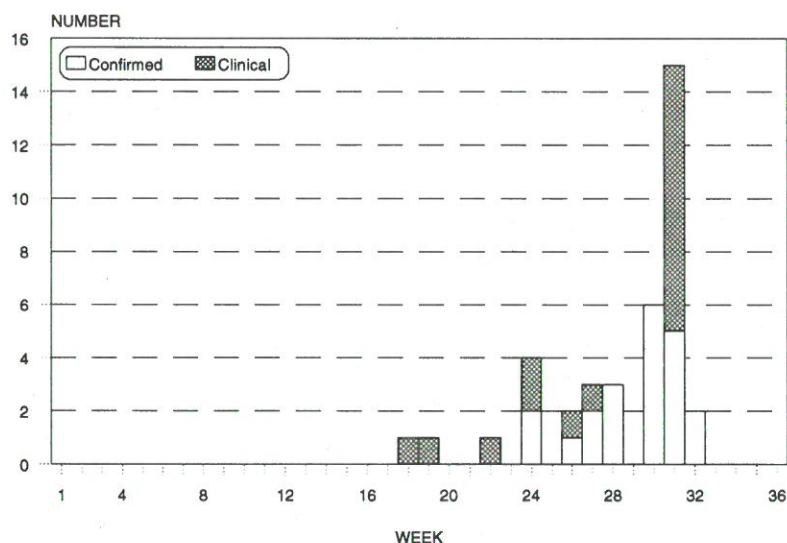
Each reported case was investigated to verify diagnosis and immunization status, and to identify the index case and contacts. Because of the growing number of cases, an information letter was sent to the local centres for community services (CLSC) and to all general practitioners, pediatricians and microbiologists in the region, alerting them to the epidemic situation. The letter also reminded them of the recommended control measures, and of the importance of promptly reporting and confirming all measles cases. School nurses were asked to pay particular attention to any absenteeism that occurred in the following weeks.

Intervention with the religious group

The recurrence of certain unusual first names in a number of the measles cases made it possible to identify the religious group at the centre of this outbreak. This religious group, which was

founded in Quebec early in the century, may have several thousand members, mainly throughout Quebec, but also in other Canadian provinces, and in Massachusetts and California in the United States. In Quebec, the members are mainly concentrated in the north-eastern part of Montreal Island, Laval and the Lanaudière region. According to information obtained from group members, those in Quebec appear to be divided into several independent groups, each with its own leader, and there apparently is no formal contact between these groups.

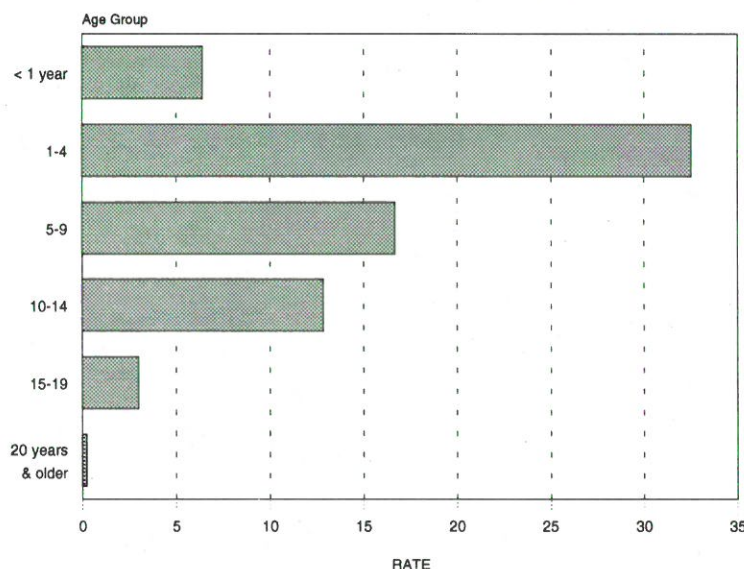
Figure 1
Number of measles cases by week of receipt of report,
Montreal Centre Region, 1994 (as of 3 September)



Source: Central Registry for Reportable Diseases, Ministère de la santé et des services sociaux (94-09-03).

Prepared by: Bureau de surveillance épidémiologique, Montreal Centre Region.

Figure 2
Measles incidence* by age group in Montreal Centre Region, 1994
(as of 3 September)



* per 100,000 person-years

Source: Central Registry for Reportable Diseases, Ministère de la santé et des services sociaux (94-09-03).

Prepared by: Bureau de surveillance épidémiologique, Montreal Centre Region.

The parents contacted by telephone were cooperative in providing information on the clinical nature (signs and symptoms) of the disease in each of their sick children. Most refused immunization and immunoglobulin, but did not hesitate to cooperate in limiting the social contact of cases and susceptible contacts. A number of parents refused to identify contacts of the case(s) in their family, but the information provided by a few indicates the possibility of more than 50 additional unreported cases within this community.

After numerous attempts, the leaders of the two groups involved were identified and contacted. The situation was explained to them and they agreed to distribute an information letter to their members, but they did not agree to meet with public health officials. No

further attempt has been made to convince group members to have susceptible individuals immunized.

As of September 3, there have been no new cases of measles reported on Montreal Island.

Comments

This outbreak illustrates, once again, how quickly measles can spread in an unimmunized population. The low number of secondary cases reported outside the religious group may be explained by the following: 1) very limited contact with other children in the area; 2) the high measles vaccine coverage among school children immunized in the eastern part of Montreal Island, including those in kindergarten (> 90%); and 3) the timing of the outbreak, i.e., at the end of the school year and during summer holidays.

The implementation of the usual preventive measures to break the chain of transmission proved difficult in this group for the following reasons: 1) physicians were only consulted by parents after a considerable time had passed, or not at all; 2) reporting delays (the reporting lag time was up to 10 days); 3) refusal to disclose names of cases or potentially susceptible contacts; and 4) refusal to accept immunization and the administration of immunoglobulin, even for young infants and potentially susceptible pregnant women.

Measles outbreaks involving religious groups occurred in Illinois, Missouri, Nevada and Utah in the United States between January 1 and June 10, 1994⁽²⁾. These outbreaks have accounted for approximately 50% of all measles cases reported in the U.S. up to July 1, 1994. The overall proportion of measles cases attributed to unimmunized religious groups in Quebec is minimal.

Excluding those individuals not immunized because of religious or philosophical reasons, and despite a measles vaccine

coverage of over 95% at 2 years of age, there appears to be still a relatively high number of susceptible individuals in Quebec⁽³⁾. In fact, 10% to 15% of individuals given the measles vaccine at 12 months (the age recommended in the immunization schedule) (De Serres et al, unpublished data) may be lacking adequate immunity⁽⁴⁾. Implementation of a two-dose measles immunization program, in conjunction with a catch-up strategy to reach the 18-month to 20-year-old cohort, would make it possible to reduce quickly the pool of susceptible individuals.

Acknowledgments

We wish to express our thanks to Mrs. Louise Marcotte and Mrs. Carla Sabini for their data processing support, Mr. Réal Viau, Information Officer, for his assistance in gathering information on the religious group, and the physicians, laboratory staff and school nurses involved in case reporting.

References

1. LCDC. *Canadian communicable disease surveillance system: disease-specific case definitions and surveillance methods*. CDWR 1991;17S3:26.
2. CDC. *Outbreak of measles among Christian Science students - Missouri and Illinois, 1994*. MMWR 1994;43:463-65.
3. Landry M, Valiquette L, Allard R, Ciorti M. Taux de couverture vaccinale et ses déterminants chez les enfants âgés de 24 à 30 mois habitant Laval et l'Est de Montréal. Presented at the 3^e colloque québécois sur les maladies infectieuses, Québec, November, 1992.
4. Rivest P, Bédard L, Arruda H et al. *Risk factors for measles and vaccine efficacy during an epidemic in Montreal*. Can J Public Health. In press.

MEASLES IN CANADA, 1994 (as of November 30)

Paul Varughese, Childhood Immunization Division, Bureau of Communicable Disease Epidemiology, LCDC, Ottawa

From January 1 to November 30, 1994, a provisional total of 495 measles cases (1.72 per 100,000) has been reported in Canada. This is 166% higher than the 186 cases reported for the same period in 1993. Ontario accounted for 62% (308 cases or 2.87 per 100,000) of the total, followed by Quebec with 25% (125 cases or 1.73 per 100,000). Eight of the 10 provinces reported measles, and the number of cases ranged from 1 in both Manitoba and Nova Scotia to 308 cases in Ontario. To date, no cases have been reported from Prince Edward Island, New Brunswick, Yukon, and the Northwest Territories.

In the summer, Quebec reported 2 small outbreaks — one of which involved a group of people who oppose immunization for religious reasons (a preliminary report appears in this issue). In

Ontario, the highest frequency of cases was reported in June (53), followed by July (52).

Although several Ontario health regions have reported sporadic cases, only 2 regions have reported outbreaks (both occurred in May). The Middlesex-London Health Unit reported 57 cases (the number of cases peaked in the 2nd week of May) and the Haliburton Health Unit reported 150 cases (the number of cases peaked in the last week of May). Summaries of these outbreaks were published in previous issues of the *Measles Update*. Case-by-case information for certain epidemiologic variables is presently available for 488 (98.6%) of the total reported cases to date. One hundred and twenty-five (25.6%) have been confirmed by serology.

Figure 1 shows the distribution of these cases by month of onset since January 1994. The highest number of cases (186) was recorded in May, followed by June (119). Although the data for the most recent months are likely to be incomplete (as it is

currently being updated), it is obvious that measles activity for the current year has reached its lowest level in recent months.

Age Distribution

Ages of the cases ranged from <1 month to 57 years (median: 12). One third of the cases were among those aged 15 to 19 years, with the highest frequency being among those 16 years of age followed by those 5 to 9 years old (23%) (Figure 2). Infants

< 1 year of age accounted for 21 cases (4%) and most of these were 7 to 11 months of age. Persons born before 1957 accounted for 8 cases (1.6%).

Severity

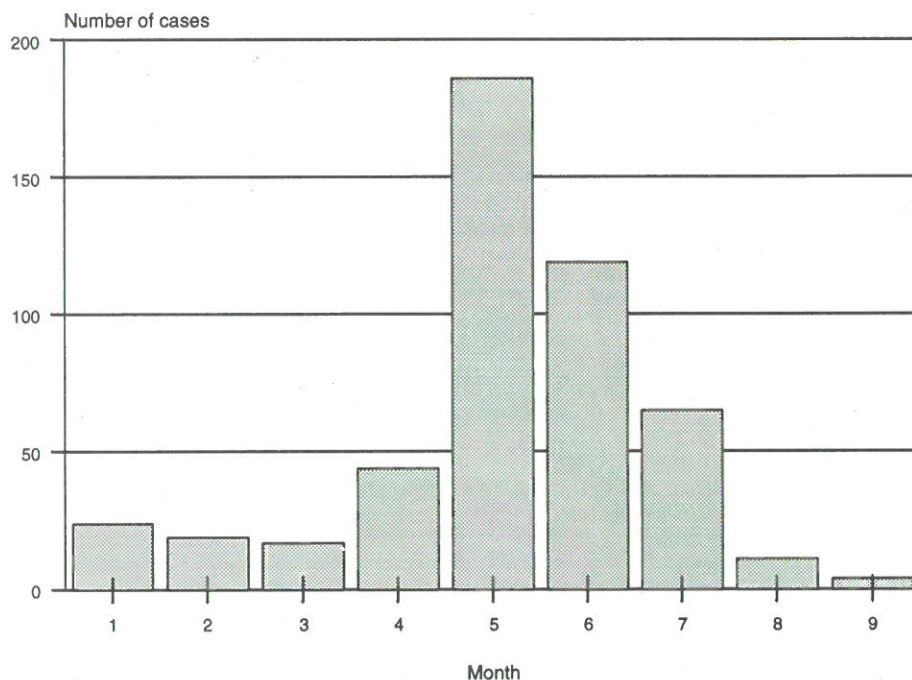
Available data indicate that at least 10 cases required hospitalization. No deaths have been reported.

Immunization and Preventability Status

Of the 488 cases, 348 (71.3%) had been vaccinated against measles and 459 (94%) belonged to the age group of individuals who were eligible for measles vaccination according to the current recommendations (i.e., they were either born after 1957 or were older than 12 months of age). Of these cases, 348 (75.8%) had an immunization history — with or without a documented date of measles vaccine administration. Such a high proportion of cases with a vaccination history is expected in Canada due to the high immunization coverage of a vaccine with less than 100% vaccine efficacy.

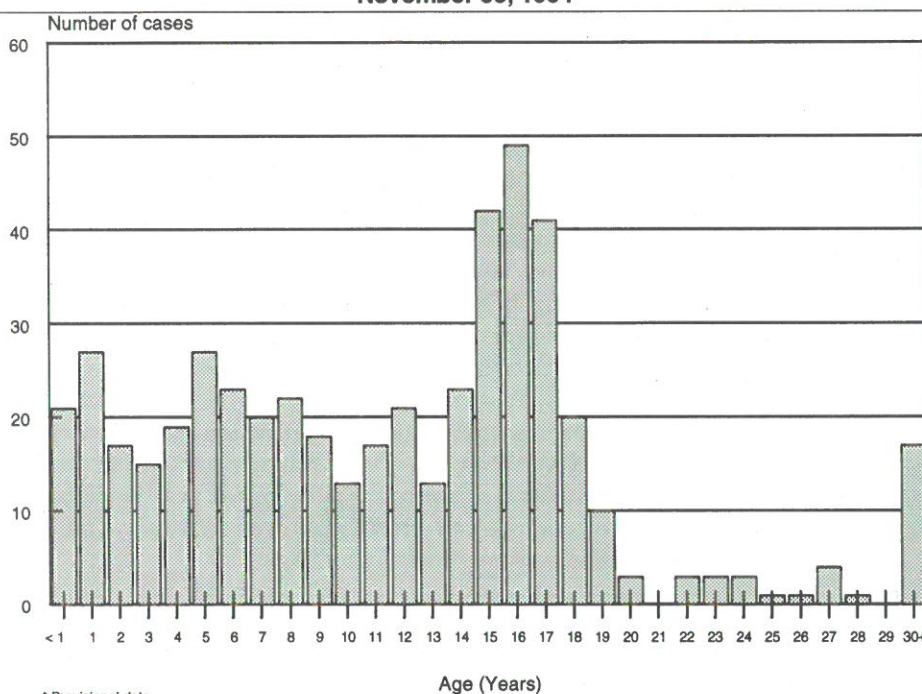
The remaining 111 (22.7%) cases were categorized as having "no prior vaccination" or their vaccination status was either "unknown" or "unavailable". Although it is known that some cases

Figure 1
Reported cases of measles, by month, Canada
November 30, 1994*



* Provisional data

Figure 1
Distribution of measles cases by age, Canada,
November 30, 1994*



* Provisional data

have occurred in the unvaccinated population, the true proportion of cases in this category is not known because of the lack of immunization records. Also, it appears that, in some regions, vaccine-specific immunization, such as the date of vaccine administration, is not systematically collected.

Editorial Comment

In 1994, the occurrence of measles in Canada has been characterized by sporadic cases, or clusters in small foci or small outbreaks, often involving vaccinated individuals or the unimmunized (eg., those not immunized for religious or philosophic reasons).

The ongoing occurrence of measles suggests that there is a pool of susceptibles that has build up over the years, which can result in larger outbreaks if the situation is not corrected.

The diagnosis of the majority of cases is reported to be "clinical" measles (in accordance with the national case definition) while approximately 25% are supplemented by a positive laboratory diagnosis.

The availability of certain epidemiologic variables for the vast majority of cases, on a case-by-case basis, is a remarkable breakthrough in the national surveillance of measles; however, the system needs improvement. The timeliness of reporting of cases as well as the standardization of the variables collected at the national level and, more importantly, the core variables needed to identify risk factors, such as the vaccination status, date of administration of vaccine, method of diagnosis, confirmation status and source of exposure (as outlined in the Measles Consensus Conference⁽¹⁾) are indispensable for effective surveillance.

It is obvious that the majority of the cases in Canada occurred in those vaccinated with a single dose of measles antigen. A second dose of the vaccine, as recommended by the National Advisory Committee on Immunization (NACI) and the National Measles Consensus Conference, would have prevented the occurrence of many of these cases. Moreover, the implementation of such a policy will avert potential outbreaks in the future (such as the 1989 Quebec outbreak).

The allocation of additional resources for protecting the susceptible Canadian children, such as the unvaccinated and the victims of primary and secondary failure, in general, is cost effective both in the short term and the long term.

A two-dose strategy has been used in many countries including Norway, Sweden, Finland, Bulgaria, Czechoslovakia, Hungary, Denmark, Israel, Netherlands, New Zealand⁽²⁾, and the United States.

Finland has implemented a two-dose measles-mumps-rubella program for over 12 years. This, supplemented with tracing the unvaccinated, was responsible for the remarkable success in the virtual elimination of indigenous measles⁽³⁾.

Several other countries, such as the English-speaking countries of the Caribbean, have achieved measles elimination by adopting appropriate strategies, such as additional mass immunization campaigns targeting all those < 15 years of age (regardless of previous immunization status) in addition to the one-dose routine policy. No cases of indigenous measles have been reported in over 4 years in the Caribbean despite intensified measles surveillance with nearly 500 units reporting each week in all of the English-speaking Caribbean and Suriname⁽⁴⁾.

Recently, the UK has enhanced its measles elimination effort through a mass immunization campaign (a brief report by Dr. D.M. Salisbury is to follow in the next issue).

Although recommended in Canada by several advisory groups and experts, no region has yet adopted a two-dose policy. This delay in implementing this policy is attributed to other provincial/territorial public health priorities or lack of resources allocation. A two-dose policy, when adopted, will undoubtedly speed up measles control, reduce the disease burden, eliminate extra resources required for outbreak control measures and assist in the global measles elimination efforts. Comprehensive efforts to eliminate measles are cost effective and technically feasible. We hope that public health experts will get adequate support to implement a two-dose policy in Canada, which may be over due.

Acknowledgement

The assistance and co-operation of all provincial and territorial epidemiologists, medical officers of health and other health care personnel, as well as Ms. Carole Scott, Ms. Mary-Jane Garnett, and Mr. John Koch from LCDC, are greatly appreciated.

References

1. LCDC. *Consensus conference on measles*. Measles Update 1993;1(1):1-7.
2. Tulchinsky TH, Ginsberg GM, Abed Y et al. *Measles control in developing and developed countries: the case for a two-dose policy*. World Health Organ Bull 1993;71:93-103.
3. Peltola H, Heinonen OP, Valle M et al. *The elimination of indigenous measles, mumps, and rubella from Finland by a 12-year, two-dose vaccination program*. N Engl J Med 1994;331:1397-402.
4. PAHO-EPI, Eleventh Meeting of Caribbean EPI Managers, November 14-18, 1994, Nassau, Bahamas.

MEASLES — UNITED STATES, FIRST 26 WEEKS, 1994

Morbidity and Mortality Weekly Report, Vol 43, No 37, 1994

As of July 2, 1994 (week 26), local and state health departments in 31 states had reported a provisional total of 730 measles cases* to CDC for 1994⁽¹⁾ (Figure 1). This represents a greater than fourfold increase over the historic low of 167 cases reported by 18 states during the same period in 1993. In addition, 250 cases were reported in 1994 for the U.S. territories of Guam (211) and the commonwealths of the Northern Mariana Islands (26) and Puerto Rico (13). This report summarizes the epidemiologic characteristics of measles cases reported in the United States for the first 26 weeks of 1994.

Characteristics

Case classification: Of the 730 reported cases, most (696 [95%]) were indigenous to the United States, including 588 (80%) acquired in the state reporting the case and 108 (15%) that resulted from spread from another state†. Fifteen states reported a total of 30 (4%) internationally acquired cases — one of which initiated a college outbreak in New Jersey resulting in approximately 100 cases. The 30 international importations originated from or occurred among persons who had travelled in Asia (Hong Kong, Indonesia, Japan, Korea, and Vietnam), Europe (England, France, Germany, Spain, and Switzerland), Latin America (Dominican Republic, Ecuador, and Mexico), Canada, Iran, and Israel. Of the 30 persons with internationally acquired measles, 11 were aged < 5 years; 10, aged 5 to 19 years; and nine, aged ≥ 20 years. Six of the 20 persons for whom data were available were U.S. citizens.

Age: Of the 725 persons with cases for whom age was known, 172 (24%) occurred among persons aged < 5 years, 368 (51%) among persons aged 5 to 19 years, and 185 (26%) among persons aged ≥ 20 years. Of the 172 cases among persons aged < 5 years, 49 (28%) occurred among persons aged < 12 months. Of the 71 cases for whom serologic testing for measles was reported, 70 were serologically confirmed.

Vaccination Status

Of 274 reported patients for whom vaccination data were available, 44 (16%) had received at least one dose of measles-containing vaccine (MCV) on or after their first birthday and > 14 days before the onset of symptoms. A total of 81 (30%) patients considered to be unvaccinated received a first dose of MCV ≤ 14 days before the onset of symptoms; most vaccinations were administered during an outbreak involving previously

unvaccinated persons⁽²⁾. Five cases were reported among persons who had received two doses of MCV; for two of these five persons, the second dose was administered ≤ 14 days before symptom onset.

Of the 230 patients who were either unvaccinated or vaccinated ≥ 14 days before illness onset, 166 (72%) had a religious or philosophic exemption to vaccination. Forty-three (19%) patients were unvaccinated but vaccine-eligible (i.e., U.S. citizen aged ≤ 16 months with no medical, religious, or philosophic exemption to vaccination), and 21 (9%) were younger than the recommended age for vaccination. Vaccination status varied by age group. Of measles patients aged 5 to 19 years, 14% had received at least one dose of MCV at an appropriate age, compared with 23% of patients aged 1 to 4 years.

Outbreaks

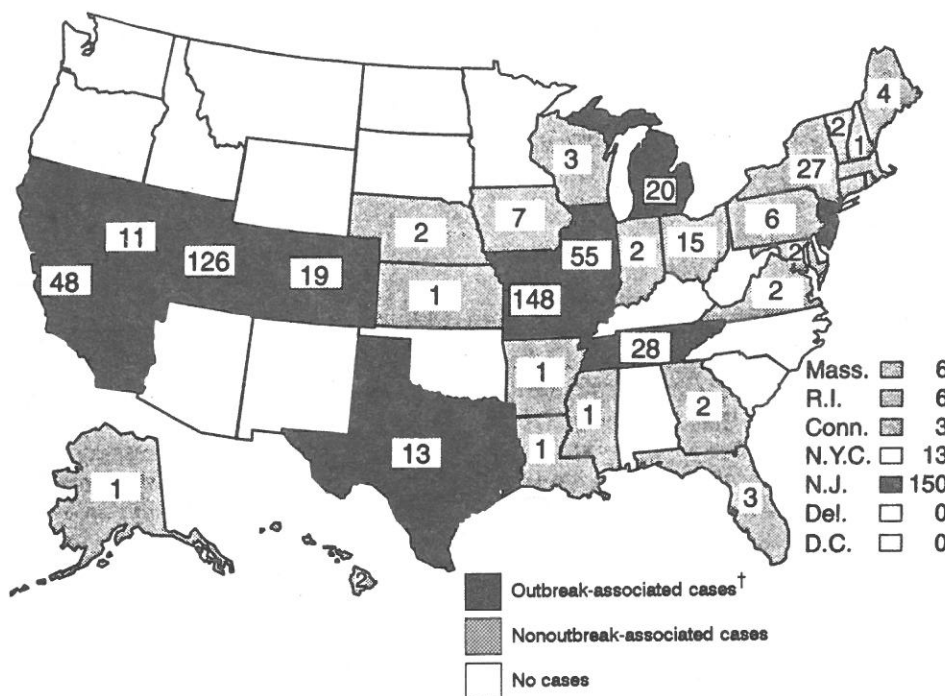
Fifteen measles outbreaks (clusters of five or more epidemiologically linked cases) were reported by 10 states during the first 26 weeks of 1994 and accounted for 82% of all cases reported for this period. Six outbreaks (range: 25 to 148 cases) occurred in high schools or colleges, five (range: 5 to 32 cases) among preschool-aged children, and four (range: 5 to 126 cases) in other settings. All high school and college outbreaks occurred in institutions with no vaccination requirements (two institutions) or a requirement for only one dose of MCV (four institutions). Three of the largest outbreaks occurred among persons who do not routinely accept vaccination in St. Louis County, Missouri (148 cases, high school); Jersey County, Illinois (52 cases, college); and Salt Lake County, Utah (126 cases, community). In addition to these outbreaks, a large outbreak (approximately 200 cases) occurred predominantly among preschool-aged children in Guam.

CDC performed genomic sequencing of measles viruses isolated from seven outbreaks in the continental United States during 1993-1994. Preliminary analysis indicates that all of the viruses from these recent outbreaks (most from 1994) are genotypically different from viruses isolated during the 1989-1991 measles resurgence. All viruses obtained during 1989-1991 were closely related by sequence analysis, even though they were obtained from cases in different geographic regions. In contrast, isolates from recent U.S. outbreaks were genotypically similar to viruses from European or Japanese sources.

* Comprises cases reported to CDC's National Notifiable Diseases Surveillance System through July 2, 1994 (week 26), and cases reported subsequently that occurred during this period.

† Acquired in another state or linked within two generations to an out-of-state importation.

Figure 1
Reported cases* of measles, by state — United States, first 26 weeks, 1994



* n=730.

† State reporting more than five epidemiologically linked cases.

MMWR Editorial Note: Although measles incidence has increased since the historic low reported in 1993, measles incidence during the first 26 weeks of 1994 remains substantially lower than in previous years. In addition, epidemiologic characteristics of cases reported in 1994 are consistent with patterns observed since the end of the measles resurgence during 1989-1991. These patterns include 1) a shift in age incidence from preschool-aged children to older age groups, 2) the importance of international importations in the spread of measles, and 3) the spread in groups whose members do not routinely accept vaccination — in particular, cases among groups with religious or philosophic exemption to vaccination accounted for 45% of all cases reported during the first 26 weeks of 1994. Maintaining communication with these groups permits rapid detection of cases and prompt implementation of outbreak-control measures when cases occur and may encourage some members to accept vaccination.

During 1994, measles cases have occurred predominantly among high school- and college-aged persons, many of whom previously had received one dose of measles vaccine. In contrast, during the 1989-1991 measles resurgence, cases occurred predominantly among preschool-aged children. Since 1991, the proportion of cases among persons aged < 5 years has decreased substantially — from 49% to 50% during 1991-1992 to 24% during the first 26 weeks of 1994. This decline may have resulted from systematic efforts to increase measles vaccination coverage (approximately 85% in 1993) among preschool-aged children at 24 months of age⁽³⁾.

The outbreaks among previously vaccinated high school- and college-aged persons emphasize the importance of implementing and enforcing vaccination with a second dose of MCV among persons in these age groups. Findings of a recent assessment indicated that the risk of measles outbreaks is lower among colleges that enforce prematriculation requirements for measles vaccination when compared with those that do not have or do not enforce such policies⁽⁴⁾.

The laboratory findings during 1994 are consistent with other epidemiologic data suggesting that measles transmission may have been interrupted in the United States in late 1993⁽⁵⁾ and indicate that international importations account for a substantial proportion of disease attributable to measles in 1994. Although only one large outbreak has been epidemiologically linked to a known importation, genomic sequencing of measles viruses suggests that cases in 1994 resulted from reintroduction of measles by international importations.

Although indigenous measles transmission in the United States may have been transiently interrupted, the continued occurrence of measles among U.S. residents demonstrates that additional efforts are required to attain the Childhood Immunization Initiative goal of sustained elimination of indigenous measles in the United States by 1996. These efforts should include 1) rapid detection of cases and implementation of appropriate outbreak-control measures, 2) achievement and maintenance of high levels of vaccination coverage among preschool-aged children in all geographic regions, and 3) greater implementation and enforcement of the two-dose

recommendation among high school and college students. In addition, the source of measles infection should be established for all cases to define better the chains of disease transmission and to help develop more effective control measures.

References

1. CDC. Table II. *Cases of selected notifiable diseases, United States, weeks ending July 2, 1994, and July 3, 1993 (26th week)*. MMWR 1994;43:478.
2. CDC. *Outbreak of measles among Christian Science students - Missouri and Illinois, 1994*. MMWR 1994;43:463-65.
3. CDC. *Vaccination coverage of 2-year-old children - United States, third quarter, 1993*. MMWR 1994;43:556-59.
4. Baughman AL, Williams WW, Atkinson WL et al. *The impact of college prematriculation immunization requirements on risk for measles outbreaks*. JAMA 1994. In press.
5. CDC. *Absence of reported measles - United States, November 1993*. MMWR 1993;42:925-26.

MEASLES ELIMINATION BY 2000

In October 1994, the Pan American Sanitary Conference voted unanimously to adopt the goal of measles elimination by the year 2000.

In order to monitor progress in achieving this goal, timely measles surveillance will play an increasingly important role. Enhanced fever and rash surveillance allows the early detection and investigation of suspected measles cases, rapid onset of control activities, and confirmation of the absence of measles via negative reporting. A sensitive surveillance system is essential to any measles control and elimination program.

With the goal of improving international communication concerning the regional measles situation, the Pan American

Health Organization has recently introduced the PAHO Weekly Measles Bulletin. This bulletin has been compiled by reviewing individual country reports and by summarizing sub-regional measles bulletins from Mexico, the English-speaking Caribbean and Central America.

Editorial Comment

Canada has been providing, on a weekly basis, national data to PAHO for this new measles bulletin. The provinces are encouraged to participate in this endeavour. Improving international communication regarding regional measles trends will assist in achieving the goal of measles elimination by the year 2000.

We need your help! We need photographs or slides. Our readers have reminded us that "a picture is worth more than a thousand words".

Would any one like to share photographs of classic measles presentation in a child or in an adult? If so, please send us a copy of the photograph(s) or slide(s) for future publication in the "Measles Update". Photographs will be printed with the source (your name), if indicated.

In addition, we would be pleased to receive any case reports or outbreak investigations that would be of public health interest to the readers.

Submissions of pertinent reports/epi notes are welcome and success of this endeavour depends upon the readers' interest and cooperation. Priority for inclusion in the newsletter is determined by the article's relevancy. This is not a formal publication, and the views and interpretation may not necessarily reflect Health Canada's position. Distribution is free of charge. Anyone wishing to receive a copy on a regular basis should contact the Childhood Immunization Division, Bureau of Communicable Disease Epidemiology, LCDC, Ottawa, Ontario, K1A 0L2; telephone (613) 957-1340; Fax (613) 998-6413.

Editors:
Paul Varughese (613) 957-1344
Philippe Duclos
Childhood Immunization Division
FAX: (613) 998-6413

Preparation:
Editorial and Production Division

Bureau of Communicable Disease Epidemiology
Laboratory Centre for Disease Control
Health Canada
Tunney's Pasture, Ottawa, Ontario K1A 0L2