

# Evaluation of the Completeness of Reporting of Invasive Meningococcal Disease

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In Quebec, the annual number of reported cases of invasive meningococcal disease (IMD) increased from 37 in 1984 to 124 in 1990.<sup>1</sup> The increase and the emergence of a virulent strain of serogroup C prompted the *Ministère de la Santé et des Services sociaux* (Provincial Ministry of Health) to immunize all children aged 6 months to 19 years in 1992.<sup>2</sup>

The increased incidence of IMD was more pronounced in certain regions of the province than in Montreal.<sup>1</sup> We wanted to assess the completeness of reporting of these infections in the region of Montreal by applying a capture-recapture method.<sup>3-5</sup>

## METHODS

Two data sources were used: 1) the provincial computerized reportable diseases central registry (Maladies à déclaration obligatoire (MADO) registry) that contains reported cases that meet criteria of confirmed or clinical case definition;<sup>6</sup> and 2) the hospital discharge data registry (Maintenance et exploitation des données par l'étude de la clientèle hospitalière (MED-ECHO)).

From the MADO registry, only Montrealers who were hospitalized in Quebec and had been reported between 1 April 1993 and 31 March 1995 were included in the study.

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**TABLE I**  
Estimate of the Total Number of Cases of Invasive Meningococcal Disease Infections Using the Capture-recapture Method

MADO*	MED-ECHO†		Total
	Listed	Unlisted	
Reported	51 (D)	4 (n <sub>2</sub> )	55 (N <sub>2</sub> )
Not reported	3 (n <sub>1</sub> )		
Total	54 (N <sub>1</sub> )		58 (N <sub>1</sub> )‡

\* reportable diseases central registry  
 † provincial hospital discharge data bank  
 ‡  $N_1 = e(N_1) = [(N_1+1)(N_2+1)/(D+1)] - 1$   
 § Completeness of reporting =  $N_2/N_1$

**TABLE II**  
Number of Reported Cases, by Reporting Delay

Number of Days	Frequency (%)	Cumulative (%)
≤ 1	28 (50.9)	28 (50.9)
2	8 (14.5)	36 (65.4)
3	4 (7.3)	40 (72.7)
4	3 (5.5)	43 (78.2)
5	2 (3.6)	45 (79.8)
6	3 (5.5)	46 (85.3)
≥ 7	7 (12.7)	55 (100.0)

Hospitalizations of Montreal residents associated with IMD were extracted from the MED-ECHO data bank using the following specific ICD-9 codes: 036.0 to 036.9 (meningococcal disease), 320.5 (meningococcal bacterial meningitis), or 255.5 (Waterhouse-Friderichsen syndrome). Hospitalizations identified by one of the following non-specific codes were also verified: 038.9 (unspecified septicaemia), 320.9 (unspecified bacterial meningitis), 322.9 (unspecified meningitis), or 286.6 (defibrination syndrome). Consent was obtained from the director of professional services of each hospital.

Identification data, clinical data, and variables on reporting were collected using a standardized questionnaire for both hospital and public health charts. The two files created from the data sets were compared and the total number of cases was

then estimated using the capture-recapture method.<sup>3-5</sup>

## RESULTS

Fifty-eight cases of IMD were retrieved from the MADO registry. One case was excluded because he was hospitalized outside Quebec and two others because they were not hospitalized (one death before hospitalization and one bacteremia treated as outpatient). Of the 55 eligible cases, 51 were confirmed cases and 4 were clinical cases.

Sixty-four hospitalizations were retrieved from the MED-ECHO data bank using the specific codes. Of these hospitalizations, one was excluded because the patient did not live in Montreal, two because they had been transferred from another Montreal hospital, five because of coding

errors and another five because of diagnosis errors. Of the remaining 51, 47 were confirmed cases and 4 were clinical.

Lastly, 199 hospitalizations were identified by non-specific codes. Of the 199 episodes, 14 were not eligible (11 post-transfer hospitalizations, 3 non-residents of Montreal); files for 21 others were not accessible. Of the remaining 164 episodes, 3 met the clinical case definition and were included in the calculations.

After matching the two files, 51 cases were found in both files, 4 only in the MADO file, and 3 only in the MED-ECHO file (Table I). The estimated total number of meningococcal diseases was 58 (95% CI: 57.2-59.2).

The overall rate of completeness of reporting of IMD was 94.8%. In all, 5 (9.0%) cases were reported by physicians only, 17 (30.9%) by hospital or provincial laboratories only, and 33 (60.0%) by both. Physicians were first to report for 31 (56.4%) cases. The median reporting delay was 1 day, and 78.2% of cases were reported within 4 days (Table II).

## DISCUSSION

A useful intervention of public health authorities is highly dependent on the proportion of cases of a disease that are detected by a surveillance system and the delay between the time of diagnosis and time of reporting of the case. Periodic evaluation of these surveillance system attributes are necessary.<sup>3</sup>

Capture-recapture methods have been used increasingly to estimate the number of cases of reportable infectious diseases<sup>7-15</sup> but they must meet four requirements: the study population must be closed, matches must be identified with a minimum risk of error, all cases must be true cases, and data sources must be independent.<sup>16,17</sup> We can assume that these requirements were met in our study.

In Montreal, nearly 95% of cases of IMD hospitalized during the study period were reported; 78.2% were reported within the average incubation period. Media attention around the increase in cases of meningococcal disease in 1991 which was followed by a vaccination campaign in 1992 may have bolstered case reporting.

The ratio of the number of cases in the MADO registry vs the number of cases in the MED-ECHO data bank seems to confirm this increase: in '91-'92, the ratio was 44/54 (0.815) compared to 84/88 (0.955) in '93-'95 (unpublished data extracted from MED-ECHO and MADO registries). Moreover, the percentage of cases reported by both physicians and laboratories has risen from 39.5% in '91-'92 to 55.6% in '93-'94.

High completeness of reporting by both physicians and laboratories is probably specific to IMD. In '93-'94, a total of 79.9% of cases of hepatitis A and 80.5% of cases of hepatitis B were reported by laboratories only, even though both are on the list of diseases that must be reported by physicians and laboratories. Regarding  $\beta$ -hemolytic group A Streptococcus, which has been reportable since 1995, 70.2% of cases were reported by laboratories only in 1995 and 1996 (unpublished data extracted from MADO registry).

Laboratory participation has long been considered necessary to improve surveillance of infectious diseases.<sup>18-21</sup> Underreporting of reportable diseases has long been problematic<sup>22</sup> and even reporting of severe infections such as bacterial meningitis rarely exceeds 50% when clinicians are the only ones required to report, such as in Ireland, Scotland, Wales, France, and some American state.<sup>18,23-26</sup> In Montreal, if we had relied only on physicians for reports, we would have received 38 (65.5%) case reports respectively out of the 58 estimated cases. By requiring both groups to report, completeness of reporting increases to 55/58 (94.8%).

Hospital discharge databases have been proposed as a surveillance tool to complement other surveillance systems,<sup>1</sup> but when a surveillance system based on reporting by physicians and laboratories works well, it is unlikely that the quality of surveillance of diseases such as IMD can greatly improve with the use of hospital databases.

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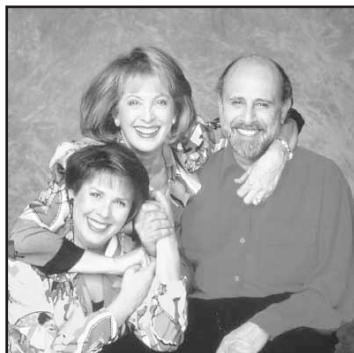
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