Measles, 2004

Key Points

- **There were 330 measles notifications in 2004**
- **The crude incidence rate of measles per 100,000 population in 2004 was 8.4 compared to 14.6 in 2003 and 6.2 in 2002**
- **47% of the measles notifications in 2004 were classified as confirmed, 45% were classified as possible while 7% had no case classification assigned**

Introduction

Measles is an acute viral infectious disease characterised by high fever, cough, conjunctivitis, coryza (runny nose) and rash. Complications of measles include otitis media, pneumonia, croup, diarrhoea and encephalitis. Measles results in death in approximately one to two cases per 1000 population. In Ireland, three measles deaths were reported during 2000. Two of these deaths were as a result of pneumonia complicating measles and one was due to post-measles encephalitis.

Measles is highly contagious but can be prevented by vaccination. Measles vaccine in Ireland is currently available as part of the combined measles-mumps-rubella (MMR) vaccine. More than 99% of individuals who receive two MMR doses (provided the first dose is given after their first birthday) develop immunity to measles. Two doses of MMR are required to ensure protection, as two to five percent of children fail to respond to one dose of MMR. In Ireland, vaccination with the first dose of MMR (MMR_1) is recommended at twelve to fifteen months and the second dose (MMR_2) at four to five years.

Measles is a notifiable disease in Ireland and since 2000 is notified weekly to HPSC. In 2004 there were 330 measles notifications, a decrease compared to 2003 when 572 measles cases were notified.

Materials and Methods

Measles 2004 notification data, obtained through the weekly infectious disease notification system, are presented in this report. A dataset, including identification number, date of birth, age, sex, date of onset, date of notification/week of

Table 1. Numbers of measels notifications and crude incidence rates (CIR) per 100,000 population by health board in 2003 and 2004

Health board	2003		2004	
	Number	CIR	Number	CIR
ERHA	363	25.9	223	15.9
MHB	123	54.6	10	4.4
MWHB	24	7.1	10	2.9
NEHB	15	4.3	17	4.9
NWHB	1	0.5	22	9.9
SEHB	6	1.4	9	2.1
SHB	5	0.9	26	4.5
WHB	35	9.2	13	3.4
Total	**572**	**14.6**	**330**	**8.4**

Table 2. Number of measles notifications and rate per 100,000 population by age group in 2003 and 2004

Age group (years)	2003		2004	
	Number	Rate	Number	Rate
<1	109	200.0	96	176.2
1-2	207	185.3	118	105.6
3-4	61	54.7	38	34.1
5-9	107	40.5	49	18.6
10-14	60	21.0	12	4.2
15-19	6	1.9	3	1.0
20-24	13	4.0	5	1.5
25+	0	0.0	7	0.3
Unknown	9	-	2	-
Total	**572**	**14.6**	**330**	**8.4**

notification, Community Care Area, county, health board, case classification, diagnostic specimen type and vaccination status, is collected through the weekly notification system for each case. In addition, for a number of measles cases in 2004, enhanced details, such as information on hospitalisation status, were reported.

The following case definition is used for measles in Ireland:

Clinical description
Clinical picture compatible with measles i.e. a generalised erythematous rash lasting greater than three days and a temperature greater than 38°C and one or more of the following cough, coryza (rhinitis), Koplik's spots or conjunctivitis.

Laboratory criteria for diagnosis
One of the following:
- Detection of measles IgM antibody in absence of recent vaccination
- Four-fold or higher rise in measles IgG antibody level in absence of recent vaccination
- Detection of measles virus (not vaccine strains) in a clinical specimen.

Case classification

Possible:	Clinically compatible cases
Confirmed:	A case that is laboratory confirmed or a clinically compatible case which is epidemiologically linked to a confirmed case. A laboratory-confirmed case does not need to meet the clinical case definition.

A measles case is epidemiologically linked if there was exposure to a laboratory confirmed case during the infectious period (four days before to four days after rash onset) and this exposure occurred within the expected incubation period of the case under investigation – 7 to 18 days (mean 14 days) before rash onset.

Measles data presented in this report were taken from the Computerised Infectious Disease Reporting (CIDR) system on the 7th October 2005. Analysis of measles data was carried out using Business Objects and Microsoft Excel. Incidence rates were calculated based on population data taken from the 2002 census.

Results

Incidence

A total of 330 measles cases were notified during 2004, giving a crude incidence rate of 8.4 per 100,000 population. This rate is lower than the crude incidence rate of 14.6 per 100,000 in 2003 but higher than the incidence rate of 6.2 per 100,000 in 2002. The breakdown of measles cases by health board and the crude incidence rates by health board during 2003 and 2004 are presented in table 1. In 2004, the highest number of notifications was in the ERHA (n=223, 68%) followed by the SHB (n=26, 8%). The highest crude incidence rate in 2004 was in the ERHA (15.9/100,000) followed by the NWHB (9.9/100,000).

Case classification

Case classification was provided for 93% (n=306) of measles notifications in 2004. Of the 330 notifications, 156 (47%) were classified as confirmed, 150 (45%) as possible while case

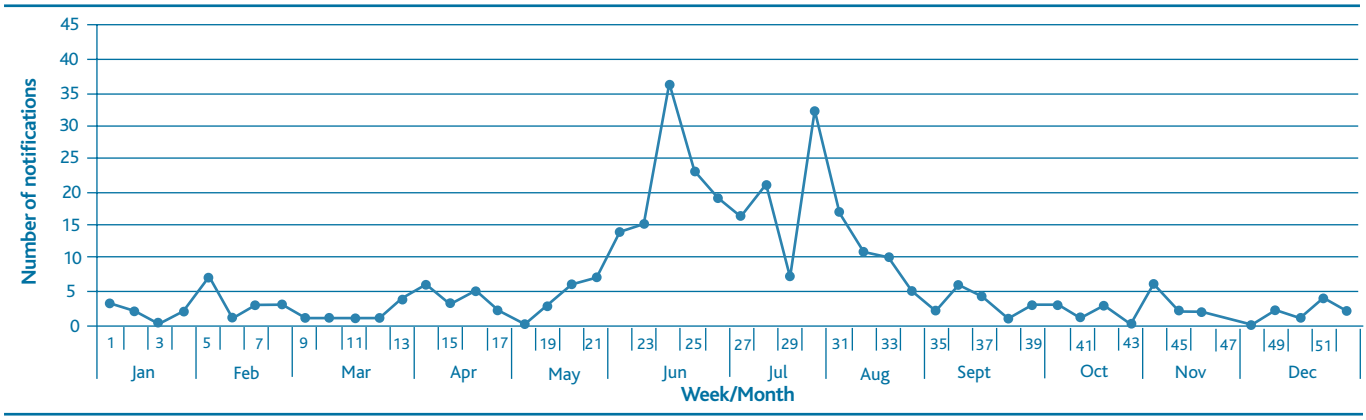

Figure 1. Number of measles cases notified by week and month, 2004.

classification was not provided for 24 notifications (7%). Of the 156 notifications classified as confirmed, 145 were laboratory confirmed while the remaining 11 were epidemiologically linked to a laboratory confirmed case.

Age and sex distribution

A breakdown of measles notifications by age group and the age specific incidence rates per 100,000 population in 2003 and 2004 are presented in table 2. Measles cases were reported in both children and adults in 2004. The highest number of notifications (n=118, 36%) in 2004 was in the age group 1-2 years followed by those aged <1 year (n=96, 29%) and those aged 5-9 years (n=49, 15%). The highest incidence rates in 2004 were in the age groups <1 year (176.2/100,000) and 1-2 years (105.6/100,000). Of the 330 measles notifications, 167 were female, 159 were male, while sex was not reported for four notifications.

Seasonality, increased activity and outbreaks

Measles notifications by week of notification are shown in figure 1. An increase in measles notifications commenced in early June 2004 (Week 22 2004) with the number of measles notifications remaining high throughout June, July and August. It was the beginning of September (Week 35 2004) before weekly measles notifications dropped to five cases or fewer for two consecutive weeks. During June, July and August (Weeks 22 -34) 226 measles cases were notified, this is 68% of the notifications for the entire year. The majority of these notifications during the period June-August were notified in the ERHA (n=162, 72%) followed by the SHB (n=18, 8%) and the NWHB (n=16, 7%). During the period June to August, twelve epidemiologically linked measles notifications were reported by the NWHB, seven by the SHB, while three linked notifications were reported by the NEHB.

Laboratory data

Laboratory confirmation of acute measles infection is recommended for all sporadic cases and to confirm the existence of outbreaks. Diagnosis can be confirmed by testing oral fluid specimens or serum specimens.

Oral fluid specimens are collected using a foam swab, which provides a non-invasive method for the confirmation of measles. Oral fluid specimens should be obtained between one and five weeks following the appearance of the rash. Specimens obtained less than one week after rash onset may lead to a false negative result. Measles can also be confirmed serologically by detecting measles specific antibodies. In 2004, laboratory results were provided to HPSC for 156 (156/330, 47%) measles notifications.

One hundred and forty-five notifications were laboratory positive for measles (table 3). Forty-six percent (67/145) of the laboratory confirmed cases were diagnosed based on tests of oral fluid specimens, 29% (42/145) were diagnosed using serum specimens, and 23% (34/145) were diagnosed on both oral fluid and serum specimens. Eleven notifications were not lab confirmed but the cases were considered to fit the clinical criteria for measles.

As measles vaccine induces a positive measles IgM response a positive IgM test cannot be used to confirm the diagnosis of

Table 3. Measles laboratory test results (n=156)

Specimen type	Laboratory result		Total
	Positive	Negative	
Oral fluid	67	10*	77
Serum	42	0	42
Oral fluid and serum	34†	1‡	35
Type not reported	2	0	2
Total	**145**	**11**	**156§**

** Specimen date in relation to onset date not reported for 2 cases, and for 3 cases the specimen was taken <7 days after rash onset*
†One case that was negative based on an oral fluid specimen (taken < 7 days after onset) but serum positive is reported here as laboratory positive
‡Specimens taken on day of rash onset
§Laboratory results were only provided for 156 of the 330 notifications

Table 4. Laboratory results and vaccination status of measles notifications in Ireland during 2004

Vaccination status	Laboratory result			Total
	Positive	Negative	Not Tested/Unknown	
MMR_1*	14 †	4	15	33 ‡
MMR_2§	0	0	6	6 §
Nil	74	5	62	141
Not Reported	57	2	91	150
Total	**145^**	**11 ||**	**174**	**330**

**24 of the 33 cases known to have at least one dose of MMR may have received two doses*
†For 13 cases date of vaccination in relation to disease onset not provided, 1 case vaccinated 6 months prior to onset
‡For 27 cases date of vaccination in relation to disease onset not provided, 2 cases were known to be vaccinated <18 days prior to onset
§MMR2 vaccination dates reported for 4 cases, 2 of these were vaccinated < 20 days prior to onset
^One case that was negative based on an oral fluid specimen (taken < 7 days after onset) but serum positive is reported here as laboratory positive
||4 possible false negative as specimens taken < 7 days following onset

measles in individuals who received measles vaccine six to 45 days before rash onset. Of the 145 laboratory positive measles notifications 14 had received at least one dose of vaccine (table 4). The date of vaccination in relation to onset of disease was not provided for 13 of these. The remaining case was vaccinated (MMR_1) six months prior to onset of illness.

Vaccination data

Vaccination status was reported for 180 (55%) of the 330 notifications. One hundred and forty-one (141/180, 78%) notifications were unvaccinated. Fifty percent (71/141) of those unvaccinated were aged greater than 15 months and therefore, were potentially eligible for vaccination with MMR_1 (assuming there were no contraindications to vaccination).

Nine cases (9/180, 5%) were vaccinated with MMR_1 only. Two of these cases were aged greater than five years; therefore, they were not age appropriately vaccinated. Of the nine cases vaccinated with MMR_1; two received the vaccine less than 18 days prior to onset suggesting the possibility they may have been incubating measles at the time of vaccination; four were vaccinated greater than two months prior to onset; the date of vaccination in relation to disease onset was not reported for three cases. An additional 24 notifications received at least one dose of MMR; however, cases may have received two doses. The MMR_1 vaccination dates were not reported for these notifications.

Six cases received MMR_2; however, it is important to note that none of these cases were reported as laboratory confirmed (table 4). The MMR_2 vaccination date was reported for four cases, two of these were vaccinated less than 20 days prior to onset of illness. Therefore, none of these six cases are known to be, or can be, classified as vaccine failures based on the data provided.

Hospitalisation data & complications of measles

Information on hospitalisation status was available for 178 notifications (178/330, 54%). Forty-one cases were hospitalised representing 23% (41/178) of all cases with known hospitalisation status (table 5). The length of hospital stay was only reported for six notifications, with the length of stay ranging from one to five days. The hospitalised cases were aged between 6 months and 53 years (mean age, 5 years; median age, 2 years). Twenty-nine of the hospitalised cases (29/41, 71%) were unvaccinated. Twenty-one (72%) of these unvaccinated cases were aged greater than 15 months and so were potentially eligible for vaccination. Six hospitalised cases had received at least one dose of MMR (dates of vaccination were not provided for any of the six cases), one of these was aged greater than five years and so was not age-appropriately vaccinated. Vaccination status was not provided for the remaining six hospitalised cases. Laboratory results were reported to HPSC for 37 of the hospitalised cases, all 37 were laboratory confirmed.

Information on measles associated complications was reported for 31 (31/330, 9%) notifications. Seizures were reported as a complication for two cases. Hypertension was reported as a complication for one older case (<50 years of age) but it is unlikely to have been related. The 28 remaining cases were reported to have no complications.

Table 5. Number of measles notifications in Ireland by age group and hospitalisation status during 2004

Age group (years)	Hospitalisation status			Total
	Hospitalised	Not hospitalised	Not reported	
<1	6	41	49	96
1-2	16	47	55	118
3-4	7	17	14	38
5-9	8	21	20	49
10-14	0	7	5	12
15-19	0	1	2	3
20-24	2	0	3	5
25+	2	2	3	7
Unknown	0	1	1	2
Total	**41**	**137**	**152**	**330**

Discussion

In Ireland, despite the dramatic reduction in measles cases following the introduction of a measles vaccine in 1985 and MMR in 1988, measles continues to be a problem with recurrent outbreaks. Measles outbreaks occurred in 1993 and 2000 with 4328 and 1603 cases notified, respectively. Following the measles outbreak in 2000 measles notifications had declined during 2001 and 2002 but measles activity increased again in 2003 with 572 notifications. In 2004, while there were fewer notifications compared to 2003, increased measles activity was observed between June and August. The majority of notifications during this time were in the ERHA (n=162). However, epidemiologically linked notifications were also reported by the NEHB (n=3), NWHB (n=12) and SHB (n=7) during this time. Since the national collation of cohort based immunisation uptake data commenced in Ireland in Quarter 1 1999, MMR_1 uptake at 24 months has never reached the WHO target of 95%.[1] While the uptake of MMR remains below the target of 95% required to prevent the spread of measles outbreaks will continue to occur.

Ireland continues to have a high incidence of measles compared to a number of other European countries. In 2004, the measles incidence was 8.4 per 100,000 in Ireland, compared with a measles incidence of less than one per 100,000 (as derived from the number of laboratory confirmed cases) in England and Wales.[2] The incidence of measles in Ireland, in 2004, ranked us second highest compared to 16 other regions reporting complete data to WHO Europe.[3]

The WHO has targeted 2010 for the elimination of measles and congenital rubella in the WHO European Region. In order to achieve measles elimination in Ireland a measles elimination committee was established during 2004 with the aim of producing a five-year elimination plan. The elimination plan will place particular emphasis on improving MMR uptake rates in Ireland. Strengthening of measles surveillance in Ireland will also be a critical component in the control and elimination of measles. Measles surveillance is required to detect cases and to understand the reasons for the occurrence of the disease so that appropriate and timely control measures can be implemented. Surveillance also detects trends and risk factors thereby guiding and monitoring the effectiveness of control and elimination efforts.

One of the limitations of measles surveillance data provided to HPSC in 2004 was the incompleteness of data. Laboratory confirmation of measles is an important aspect of surveillance but less than half of notifications had laboratory testing performed. Vaccination status was provided for just over half the notifications. In addition, for a number of cases, where vaccination status was provided, the date of vaccination in relation to disease onset was not reported making interpretation of the vaccination data difficult. Nearly a quarter of cases in 2004, where hospitalisation status was reported, were hospitalised. However, the duration of stay was not reported for the majority of these cases. Information on hospitalisation status was not provided for 46% of notifications, thus limiting interpretation of this data in relation to all measles notifications. However, it highlights the severity of measles infection and clearly indicates that measles causes substantial morbidity for the individual, with substantial implications for families and health services.

Incomplete surveillance data poses problems during analysis and interpretation. As measles surveillance and data quality are improved so to will the ability to control and prevent measles cases thereby aiding elimination.

Acknowledgements

HPSC wish to sincerely thank everyone who contributed to measles surveillance in Ireland. Special thanks to those who provided enhanced measles data.

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