

Measles control in Australia

Report of the Measles Control in Australia Workshop, 5 November 1997.

Convened by the National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases, Royal Alexandra Hospital for Children, PO Box 3515, Parramatta NSW 2124

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Abstract

The proceedings of the Measles Control in Australia Workshop held on 5 November 1998 are presented in this report. Prompted by the possibility of a global elimination campaign in the near future the Workshop considered the factors involved in elimination of measles from Australia. Epidemiology, surveillance, laboratory diagnosis methods, mathematical modelling, and the cost and logistics were all addressed. Mass vaccination for all 2-18 year olds, and a routine 2-dose regimen with scheduled doses at 12 months and school entry were recommended. Intensified surveillance, based on a sensitive case definition and laboratory confirmation (measles specific IgM) of suspected cases was identified as a crucial component of the campaign. The continuation of high vaccination coverage for each of the two doses would be essential to maintain elimination once established. *Comm Dis Intell* 1998;22:33-36

Introduction

Recent successes in interrupting the transmission of measles virus in the Americas and the United Kingdom have prompted serious consideration of the feasibility of global measles eradication. It is likely that the World Health Organization will make this a priority once polio eradication has been achieved. Early in 1997, the Minister for Health and Family Services

announced, as part of the 'Immunise Australia' program, plans for the Enhanced Measles Control Campaign. The aim is to eliminate measles from Australia. On 5 November 1997, representatives from all States and Territories and from the Commonwealth gathered at the Royal Alexandra Hospital for Children in Sydney, to discuss logistics, funding and surveillance issues, in the light of experience in other parts of

the world. The workshop was sponsored by the National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases (NCIRS) and the National Centre for Disease Control (NCDC). Two speakers who have conducted measles campaigns, Dr Ciro de Quadros, Director of the Pan American Health Organization (PAHO)'s Special Programs for Vaccines and Immunizations, and Dr Osman Mansoor, from the New

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Zealand Ministry of Health, gave valuable insights.

Measles elimination strategies

Until recently, measles ranked eighth in the global population as a cause of death and disability adjusted life years (DALYs). Although indigenous measles has been virtually eliminated from the Americas, measles is still responsible for the deaths of at least 10% of children under the age of 5 years in the world today, and for 10% of childhood blindness in Africa. An effective vaccine has been available since 1963. Elimination of measles could make it the third infectious disease to be conquered world wide, after smallpox and polio.

Dr de Quadros presented a global overview. The three-part strategy needed to banish measles was described:

1. 'Catch-up', a once-only mass vaccination of all children aged 1-14 years with an additional dose of measles vaccine regardless of previous vaccination or illness;
2. 'Keep-up', the routine vaccination of all children in the second year of life to maintain interruption of transmission; and
3. 'Follow-up' campaigns conducted every four years, targeting all children 1-4 years of age regardless of previous vaccination status. This is considered necessary because, until all the world is free of the virus, there is always the possibility of cases being imported from other countries (1 million people travel each day).

As vaccine efficacy is not 100%, even very high coverage rates do not prevent accumulation of susceptibles due to vaccine failure or missed vaccination. Once the pool of susceptibles reaches one birth cohort in size, outbreaks may recur if follow-up campaigns are not carried out. This explains in part the resurgence of measles in Brazil in 1997. A catch-up campaign was conducted in 1992, but the follow-up campaign due in 1996 was not implemented in the State of Sao Paulo. Measles virus was imported, probably from Europe, into Sao Paulo. Cases spread to other states in Brazil, to the United States of America and to five other Latin American countries. The

only effective eradication in the long term must be global.

In New Zealand, where a 2-dose schedule (15 months and 11 years) has been in place since 1992, modelling predicted an epidemic in 1997. A mass campaign, aiming to give an additional dose of vaccine to all children aged 2-10 years old, was planned for July 1997. Measles started to appear in April 1997, prompting an earlier start to the campaign. Preschool children were vaccinated by general practitioners (GPs) after media promotion of the need for the additional dose; older children were vaccinated in schools. The campaign limited the size of the epidemic and prevented 95% of predicted cases. Dr Mansoor noted that, during this campaign, immunisation coverage of all vaccine preventable diseases increased.

In the United Kingdom, data from intensive surveillance were used to predict a 1995 epidemic of 150,000 cases with 50 deaths. Dr Tim Heath described the pre-emptive school-based campaign carried out in 1994, in which 92% of children aged 5-16 years of age were given one additional dose of measles-rubella vaccine. The epidemic was averted, but transmission of the virus was not entirely interrupted. This is thought to be because the under 5 year olds were not included in the campaign. In the subsequent 18 months there were 148 confirmed cases of measles (12 imported), with many more in 1997, and rubella remains endemic. A feature of this campaign was the intensive education of doctors and parents which preceded it.

Measles in Australia

Epidemiology

Dr Robert Hall gave a historical overview of measles in Australia since vaccination commenced in 1970. Despite a 2-dose regime (given at 12 months and 10-16 years) since 1992, and coverage of greater than 90% at 2 years of age, major epidemics occurred in a number of States in 1993-1994. Serosurveys in South Australia in 1997 suggested that another is likely in 1998; these surveys are helping to identify the upper age limit of susceptibility.

Surveillance

The important issue of surveillance was outlined by Dr Bronwen Harvey.

Currently there is passive surveillance of measles and its consequences, through laboratories, doctors and hospital statistics, and of national vaccination coverage (Australian Bureau of Statistics and Australian Childhood Immunisation Register). However, there are significant differences between States, with under-reporting, inconsistency and lack of laboratory confirmation. If we are to mount an effective control program we must have good surveillance systems in place before we start, so we can evaluate vaccination coverage and disease control. We must be able to identify populations at high risk, to detect and interrupt circulation of the virus, and to identify the origin of imported strains. A uniform and sensitive case definition, with early reporting and rapid laboratory confirmation (measles-specific IgM), is essential. A suitable case definition for reporting to public health authorities could be 'any case considered by a medical practitioner to be measles'. We must also be able to monitor safety and know the vaccination status of reported cases.

Laboratory diagnosis

Laboratory issues were elaborated by Professor Lyn Gilbert, with a description of serosurveys and quality control procedures, both existing and imminent. The various laboratory methods of diagnosing measles were discussed: the culture, polymerase chain reaction (PCR), and the detection of measles-specific IgM in serum and saliva. Standardisation and validation of test methods and the molecular epidemiology of sporadic isolates were also discussed. The Australian Public Health Laboratory Network will be important in ensuring both high quality local diagnostic services and appropriate referral mechanisms.

Mathematical modelling

Professor Niels Becker shared his expertise in dynamic modelling (spread of disease over time) as he described the different options for programs to control measles in Australia. The greatest long-term impact on control is achieved by immunising the largest possible fraction of children as early as possible, on a continuing basis. Achieving uniform immunity (so there are no clusters of non-immune people) with a coverage of at least 90% is likely to lead to eventual elimination. To

Recommendations for measles elimination in Australia

1. Mass vaccination of 2-18 year olds

- preschoolers: general practitioners
- school pupils: vaccination teams

2. Intensified surveillance

- a sensitive case definition
- laboratory confirmation (measles specific IgM)

3. Two-dose routine vaccination schedule

- 12 months of age
- school entry (4-5 years)
- greater than 90% coverage for each dose

4. Monitoring to determine necessity for follow-up campaigns

prevent epidemics sooner, we need to boost immunity in older age groups.

Costs and logistics of measles elimination in Australia

Health economist Professor Jane Hall detailed the way in which, in collaboration with Ms Sue Caleo (Centre for Health Economics, University of Sydney), the components, activities and resources involved in a national school-based catch-up program were defined and costed. They concluded that a national program was feasible, though challenging. The immunising teams, their travel and accommodation, consumables, the vaccine itself with the cold chain maintained, national promotion and coordination, and follow up and evaluation, were all included in the cost analysis. It was estimated that to immunise approximately 3 million primary and secondary school children in all States the cost would be \$24 million (this figure included follow-up, adverse event monitoring and advertising, but not the cost of the vaccine itself, which was separately costed¹).

The logistics and evaluation of a mass campaign in Australia were presented by Ms Sue Campbell-Lloyd, Commonwealth coordinator for the campaign. It is considered viable to vaccinate all 2-18 year olds (including 3 million primary and secondary school children) with measles-mumps-rubella (MMR) vaccine, aiming at 100% coverage. Prompt State and Commonwealth data collection would ensure that results of the campaign were immediately available, so that detailed evaluation could be undertaken.

Representatives from each State and the Royal Australian College of General Practitioners (RACGP) described their approaches for the

campaign, noting the special problems of distance, school absenteeism and the fact that Queensland is already seeing a significant cluster of cases, which may herald an epidemic. Overall, all States and Territories were supportive of an appropriate and well planned campaign. Early planning with Departments of Education and other stakeholders will be crucial. Problems of obtaining consent will need to be explored (an opt-out approach was preferred, but was considered unlikely to be acceptable in Australia), as will effective mop-up procedures in high-risk groups with ongoing transmission, such as Pacific Islanders and Aboriginal and Torres Strait Islanders.

Conclusions

A wide-ranging discussion, chaired by Dr Cathy Mead, stressed the importance of a sensitive case definition, the level of coverage needed for a successful campaign (greater than 90%, except perhaps in isolated remote areas), and the lessons to be learnt from the United Kingdom's decision not to target children under 5 years old. The speakers and participants agreed that, in Australia, everyone aged 2-18 years should be included in the campaign and that the second scheduled dose should be at school entry (age 4-5 years) rather than at 10-16 years of age.

Summing up, Dr de Quadros stated that we must aim at elimination, not control. National political and technical commitment is needed, because every child must be reached. Children aged 2-4 years are a weak link in the proposed Australian campaign because of the difficulty in targeting this age group. Surveillance is the key to eradication. Laboratories must be ready to test suspected cases, and

GPs should be encouraged to advocate laboratory confirmation to parents and patients. Once we have eliminated measles from Australia, we must keep it out with continued high vaccination coverage, using a 2-dose regime (12 months and 4-5 years), until global elimination is a reality. He concluded: 'If Australia fails, the whole world will fail'.

Further Reading

1. de Quadros CA, Olivé JM, Hersh BS, et al. Measles elimination in the Americas: evolving strategies. *JAMA* 1996; 275:224-229.
2. Tobias M, Christie S, Mansoor O. Predicting the next measles epidemic. *NZ Public Health Report* 1997;4:1-3.
3. Mansoor O, Durham G, Tobias M. Can New Zealand eliminate measles? *NZ Med J* 1997; 110:387-388.
4. Cutts FT. Revaccination against measles and rubella (editorial). *BMJ* 1996; 312:589-590.
5. Gay N, Ramsay M, Cohen B, et al. The epidemiology of measles in England and Wales since the 1994 vaccination campaign. *CDR Review* 1997;7:R17-R21.

Workshop speakers and panel members

Professor Niels Becker, School of Statistical Science, La Trobe University

Associate Professor Margaret Burgess, NCIRS, Sydney

Ms Sue Campbell Lloyd, NCDC, Sydney

Dr John Carnie, Department of Human Services, Victoria

Dr Ciro de Quadros, Pan American Health Organization

Ms Yvonne Epping, Australian Capital Territory Health

Professor Lyn Gilbert, Centre for Infectious Diseases and Microbiology, ICPMR, Westmead Hospital, NSW

1. Cost estimated to be \$20 million

Professor Jane Hall, Centre for Health Economics, Research and Evaluation, University of Sydney

Dr Robert Hall, South Australian Health Commission

Dr Jeffrey Hanna, Queensland Health Department

Dr Bronwen Harvey, NCDC, Canberra

Dr Tim Heath, NCIRS, Sydney

Dr Brian Kable, Royal Australian College of General Practitioners

Ms Ann Kemp, South Australian Health Commission

Dr Rosemary Lester, Department of Human Services, Victoria

Dr Osman Mansoor, Prevention Policy, New Zealand Ministry of Health

Dr Cathy Mead, NCDC, Canberra

Dr Angela Merianos, Northern Territory Department of Health and Community Services

Dr Avner Misrachi, Department of Community Health Services, Tasmania

Ms Karen Peterson, Queensland Health Department

Dr Aileen Plant, Department of Public Health, University of Western Australia

Dr Tony Watson, Western Australian Health Department

Addendum

Since the Workshop, the Minister for Health and Family Services has confirmed that the first stage of the Enhanced Measles Control Program

will take place in 1998-99. An additional dose of measles-mumps-rubella vaccine (MMR) will be offered to all primary school children in Australia in a school-based program between July and October 1998; the second scheduled dose of MMR vaccine will be brought forward and given to children at the age of 4-5 years and the parents of preschool-aged children will be urged to be certain that their children have received at least one dose of MMR vaccine. There will also be an educational program aimed at ensuring that all high school aged children and young people have received two doses of MMR vaccine.

Methodology for measuring Australia's childhood immunisation coverage

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The Australian Childhood Immunisation Register (ACIR) commenced operation on 1 January 1996. It is administered by the Health Insurance Commission for the Commonwealth Department of Health and Family Services. The ACIR holds identification and immunisation details for each child under the age of 7 years who is registered for Medicare, and any child who is not yet registered for Medicare but for whom an immunisation has been notified to the ACIR. By the age of 12 months, 98.4% of Australian children have Medicare registration (personal communication, Kathi Williams, HIC). Medicare registration includes the postcode of residence of each child, allowing reports to be prepared for Australia, for each State and Territory and for smaller units such as Local Government Areas and Statistical Divisions defined by the Australian Bureau of Statistics.¹

Immunisation information may be sent to the ACIR by immunisation providers, including general practitioners, public immunisation clinics and others. The ACIR is still relatively new and not all immunisation providers are yet

supplying complete details of the immunisations they carry out. In addition, some data flow problems were identified early in the ACIR's operation. Thus, the ACIR data currently underestimate the true proportion of children who are fully immunised, particularly in Western Australia and the Northern Territory.

To be considered fully immunised a child should have completed the number and type of vaccinations listed in the National Health and Medical Research Council (NHMRC) standard childhood vaccination schedule.² Thus, at 1 year of age, a child should have completed the primary series with three vaccinations against diphtheria, tetanus and pertussis (DTP or CDT plus monovalent pertussis), three poliomyelitis (OPV or IPV) and either two or three Hib vaccinations (if the vaccine used was PedvaxHIB or HibTITER respectively). At 2 years of age a child should have completed the primary series as well as MMR (due at 12 months), Hib (PedvaxHIB at 12 months or HibTITER at 18 months) and DTP (due at 18 months).

The calculation of the proportions of children who are fully immunised was based upon birth cohorts of three months in width. The first cohort comprised children who were born in the first quarter of 1996 (date of birth between 1 January 1996 and 31 March 1996). At the assessment date of 31 March 1997, the range of ages for the cohort was 12 months to less than 15 months. The second cohort of children (date of birth between 1 April 1996 and 30 June 1996) were examined using 30 June 1997 as the assessment date.

Only immunisations given on or before a child's first birthday were considered. If a child's records indicated that the child had received the last vaccine due in each sequence then it was assumed that earlier vaccinations in the sequence had been given (thus, for example, a record of a child having had DTP3 was interpreted to mean that the child had received DTP1, DTP2 and DTP3). Only children who were registered for Medicare were included in the calculations. The proportion of children designated as fully immunised was calculated using the count of those Medicare-registered children who had