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SURVEILLANCE OF RURAL DRINKING WATER QUALITY IN NSW

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INTRODUCTION

The sampling and analysis of our drinking water supplies is fundamental to safeguarding public health. In rural NSW, water supply authorities – Local or County Councils, or the Public Works Department (PWD) – are responsible for the provision of drinking water which meets agreed microbiological, chemical and physical criteria.

Compliance with National Health and Medical Research Council (NHMRC) water quality guidelines should protect the public from waterborne illness. However, it is not uncommon for these recommended criteria to be exceeded in rural NSW, and some supplies are tested irregularly.

This review has two aims:

- to evaluate the current system of water quality surveillance in NSW; and
- to gauge the public health significance of these results.

BACKGROUND

Legal situation

There is no statutory requirement for any authority to monitor drinking water quality. However, legislation allows for closure of a drinking water supply if it is suspected to be unfit for drinking (Public Health Act, 1991)[1]; creates offences relating to the discharge of prohibited matter into sewers and drains, unauthorised drainage work, wasting or misusing water, and polluting a public water supply (Local Government Act, 1993)[2]; and confers powers to classify waters, inspect and impose standards and direct action in relation to pollution of a waterway (Clean Waters Act, 1970)[3]; as well as dealing with the mechanics of water supply and commercial standards for use.

To safeguard public health, the NHMRC and the Australian Water Resources Council (AWRC) have developed guidelines[4] for the microbiological, physical, chemical and radiological characteristics of drinking water in Australia. The guideline values are not standards, but achievement of the guidelines should ensure that drinking water will not present a significant health risk to the public. The NSW Health Department, the PWD and local councils have adopted these guidelines as a basis for assessing water quality in NSW. The guidelines, adopted in 1987, are being revised[5] and propose:

- more stringent values for some parameters;
- more frequent microbiological sampling; and
- a framework for the evaluation of a supply's water quality.

The draft guidelines[5] advocate that water authorities provide event reports and annual reports of water quality to health authorities and the public. Although having no legislative status, the guidelines imply there is a duty of care on the water supply and health authorities to ensure safe drinking water is provided to the public. The draft guidelines state that they provide a "needed reference to ensure the accountability both of water authorities, as managers, and of state health authorities, as auditors of water supplies" [5].

Continued on page 36 ▶

Contents

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Rural drinking water surveillance

▶ Continued from page 35

Water supply authorities
In NSW the following government authorities are responsible for drinking water supplies:

- Water Boards (consisting of the Sydney, Hunter and Broken Hill water boards);
- NSW Public Works Department; and
- Local and County Councils which service most of the rural areas.

The PWD, through the Country Towns Water Supply and Sewerage Subsidy Program (CTWSSP), has delegated responsibility for the provision of water services to rural councils[6]. The program includes areas not covered by the Sydney and the Hunter Water Board and incorporates 128 councils and 200 water supply schemes[7].

In rural NSW towns about 82 per cent of the water supply comes from surface sources while the remainder originates from groundwater sources which include deep bores and shallow wells[6]. Almost all the supplies in rural towns use chlorination for disinfection, with chloramination being used in only two supplies where long disinfection residual times are required. A small number of councils has decided not to disinfect water supplies[6].

Costs
The 1987 water quality guidelines state that to achieve compliance with all water quality guidelines throughout Australia would cost around $2,000 million in 1984 dollars[4]. Although small towns have a limited capacity to meet these costs, the goal of the PWD is to improve the quality of all water supplies in rural towns to meet the 1987 guidelines as a minimum[6].

The Division of Analytical Laboratories (DAL) carries out microbiological, physical, chemical and pesticide analysis of drinking water samples for rural NSW supplies. The water samples are submitted by the water supply authorities and are analysed free of charge. Results are fed back to councils and the Public Health Units (PHUs).

Some councils use alternative laboratories for the analysis of water samples. Councils in the South West Region and two councils in the South East Region send samples to Wagga Wagga Base Hospital for microbiological analysis only, and a few councils in the New England Region carry out analysis in their own laboratories or send samples elsewhere.

The cost incurred by DAL for microbiological, chemical and physical analysis of both public and private drinking water samples for the period 1988-89 was $528,400 (excluding pesticide analysis)[8], and $664,630 for 1989-1990 (including pesticide analysis)[9]. These figures incorporate costs for salaries, maintenance, working expenses, laboratory equipment and equipment replacement. Councils also incur significant costs in the collection of samples.

Sampling and analysis of drinking water supplies in rural NSW
The NHMRC[1] states that local conditions and a knowledge of the water supply system will help to determine where and how frequently monitoring should be carried out. Nevertheless, the guidelines also define a minimum frequency for water sampling and state that the samples must be representative of the water supply. The guideline values relate to quality of the water which is delivered to the consumer. The guidelines stress that exceeding the standards occasionally is not necessarily a public health threat, but that authorities should consider the degree and duration when taking remedial action.

In addition to monitoring the treated drinking water supply, some authorities also test raw water sources and storages to assemble information on the quality of the water before treatment.

- *Microbiological sampling and analysis*
  It is not feasible to test for all materials or organisms which may be present in water. Instead, the coliform group of organisms, and in particular *E coli*, are used as indicator bacteria of faecal contamination. The NSW Health Department, including DAL, has adopted the sampling frequency for microbiological analysis as recommended in the guidelines. The major determinant of sampling frequency is population size[4] – for example, a minimum of one sample a month for the smallest supplies, and weekly sampling in supplies servicing areas with large seasonal increases in population such as holiday resorts.
  When faecal contamination occurs, the water and health authorities should take appropriate remedial action and where necessary issue a public warning. This action has been carried out by the Regional PHUs and Local Councils. In the event of a gastroenteritis outbreak, a full microbiological investigation is conducted, although no tests for the presence of viruses are done.
  The draft guidelines present a framework for the annual assessment and reporting of non-compliance with water quality standards. At present this is not often conducted.
- *Chemical, physical and pesticides analysis*
  The NHMRC guidelines[4] stipulate that supplies serving more than 50,000 people be sampled monthly, and those serving smaller populations be sampled twice annually. In addition, the pattern and types of pesticides used in the area should be considered.
  DAL has developed a water sampling program in which supply authorities are requested to submit two samples a year for chemical and physical analyses. Submission of water samples for pesticide analysis usually occurs at this time.

METHODS

The results of water quality surveillance were obtained from the following available DAL reports: bimonthly microbiological reports, record sheets for annual chemical and physical results by Region, annual pesticide results by Region, and the 1988-1989 and 1990 annual reports. The results presented in this review are for treated water samples only.

The PWD has been receiving water quality data from DAL for more than 20 years, and has computerised the information up to 1990. In addition, the PWD recruits councils on a voluntary basis to report annually on the performance of their water and sewerage systems. In the 1991 NSW Water Supply and Sewerage Performance Comparisons[10], water quality results have been compiled

from information collected on 86 water supply schemes (100 councils). A table from this report summarises the compliance of a sample of rural water supply authorities with current guidelines.

DAL results of water testing and compliance with current water quality guidelines are presented in terms of locations tested, supplies tested or total samples tested. A water supply scheme may serve one or more locations, and locations can be towns, villages or any other settlements.

RESULTS

Microbiological analysis

Between July 1991 and June 1992 DAL received specimens from 352 (73 per cent) of the 481 water supplies throughout NSW[11] (Table 1). Some of the 27 per cent of supplies not tested serve populations greater than 15,000 people.

In addition, many samples failed microbiological standards. In Table 2 the water samples submitted to DAL between 1988-90 and in 1992-93 are summarised by type of analysis and failure rate.

A total of 753 samples (10 per cent) from 313 locations failed during 1992-1993[12]. Of these locations, 195 failed at least once throughout the year; 65 failed twice and 53 failed three or more times. Similar information is not available for 1988-90, due to incompletion of record cards by the submitting water authorities.

Chemical and physical analysis

The proportion of locations tested for chemical and physical analysis has increased from 58 per cent in 1988-89 to 89 per cent in 1992[8,9,13]. During 1992, 39 per cent of samples submitted for chemical/physical analysis failed on at least one parameter[13]. The most common parameters for which samples failed were colour, turbidity, iron, manganese, pH and conductivity. During 1989-90 and 1988-89, the failure rates for chemical and physical analysis were 38 per cent and 51 per cent respectively (Table 2).

Pesticides analysis

The number of locations sampled for pesticide residues and the detection rates are shown in Table 3[14]. In addition to the routine pesticide samples submitted, some PHUs and councils have carried out specific surveys. These survey results are not included in this table.

PWD surveillance

The results obtained from the NSW Water Supply and Sewerage Performance Comparisons[10] from the PWD are presented in Table 4.

DISCUSSION

Microbiology

The results of this review clearly illustrate that a significant number of water supply authorities in rural NSW do not regularly submit samples for water analysis, and that a number of locations fail existing health criteria on a continual basis.

TABLE 1

LOCATIONS FROM WHICH NO SAMPLES WERE SUBMITTED FOR MICROBIOLOGICAL ANALYSIS, JULY 1991-JUNE 1992

Areas or Regions	Total Number of Locations[a]	Number of Locations not tested (%)
Central Coast Region	32	6 (19%)
Hunter Area	11	4 (36%)
Illawarra Area	34	4 (12%)
Central West Region	70	20 (29%)
South East Region[b]	100	12 (12%)
North Coast Region	80	21 (26%)
New England Region[c]	68	13 (19%)
Orana and Far West Region	86	49 (57%)
Total	481	129 (27%)

Source: DAL, microbiology results.
a. Locations known to DAL.
b. Two councils from the South East Region send water samples to Wagga Wagga Base Hospital for microbiological analysis.
c. Several councils in the New England Region have alternative arrangements for analysis of water samples.

Continued on page 38 ▶

TABLE 2

FAILURE RATE OF SAMPLES SUBMITTED TO DAL 1988-1989 AND 1989-1990[a]

Type of sample		1988-89[b]		1989-90[b]		1992-1993[c]	
		No. of samples tested	Failure rate	No. of samples tested	Failure rate	No. of samples tested	Failure rate
Microbiological (coliforms, faecal coliforms and E. coli)	Public supplies	5,476	31% of samples	5,780	12% of samples	7,440	10% of samples
	Private supplies	324	41% of samples	421	43% of samples	502	44% of samples
	Food processing (TPC, coliforms and E. coli)	374	47%	296	52%	74	41%
Chemical analysis	Public supplies	2,499	51%	2,231	38%		
	Private	453	67%	388	48%		

Sources: Annual reports: 1988-1989; 1990. DAL
a. Failure is defined by DAL as: > 10 coliforms/100 ml of water or any faecal coliforms/100 ml of water.
b. Results obtained from DAL annual reports.
c. Results obtained from bimonthly microbiological reports.

TABLE 3

PESTICIDE MONITORING IN NSW 1990-1992

	1990	1991	1992
Total number of locations[1]	538	542	533
Locations for which samples were not submitted according to the Pesticides Program	40% (215)	28.4% (154)	34.7% (185)
Locations tested twice during the 12-month period	2.8.% (15)	2.8% (15)	8.1% (43)
Locations in which pesticides were detected	1 location Found in trace amounts	1.1% (6) All below guidelines	2.2% (12) Below guidelines or found in trace amounts

Source: DAL Pesticides laboratory
1. Locations may vary due to water supplies becoming operational/non-operational.

Rural drinking water surveillance

► *Continued from page 37*

The PWD and DAL use different reporting periods and criteria and so the information is not directly comparable. The PWD program relies on self-reporting of supplies by local councils which may introduce bias. For instance, the PWD compiled data on 55 schemes from the 200 in NSW for 1988.

Failure to comply with microbiological standards for drinking water may have important implications for public health. In the US more waterborne disease outbreaks were reported for the period 1971-1985 than in any 15-year period since 1920, although the incidence of waterborne disease has declined from eight cases per 100,000 during 1920-40 to four cases per 100,000 during 1971-85[15]. The US Centers for Disease Control and Prevention estimates that in the US 900,000 people become sick each year from drinking contaminated water[16].

Despite improvements in epidemiological and microbiological methods, an aetiological agent has not been identified in about half the recent US outbreaks[17]. Since 1971, outbreaks in surface water systems occurred primarily because of inadequate disinfection (13 per cent) or interrupted disinfection (14 per cent), especially in systems that provide disinfection as the only treatment[15]. However, a recent Canadian study showed that even with drinking water which met current guidelines, the rates of gastrointestinal symptoms in people drinking the unfiltered compared with filtered tap water were significantly higher[18]. The supply of water was sourced from sewage-contaminated surface waters. The authors concluded that there is a "non-trivial endemic level of unreported gastrointestinal disease due to the consumption of tap water"[18]. This may be due to the presence of viruses and cysts of pathogenic protozoa such as *Cryptosporidium* and *Giardia* which can survive conventional water treatment. Although protozoan organisms or viruses have been advanced as alternative or additional indicators[19], they are either not available or are too costly to be a practical alternative to the measurement of faecal coliforms.

Despite these problems it is reasonable to assume that the health risk of gastro-intestinal disease is related to how often and by how much the microbiological guidelines are exceeded. Knowledge of the quality of the water source and the treatment methods used may modify these concerns.

TABLE 4

NSW PERFORMANCE INDICATORS FOR 82 WATER SUPPLY SCHEMES

Water quality and treatment % of supplies complying	1988*	1989	1990	1991
Microbiological water quality	85%	85%	90%	90%
Physical water quality	70%	75%	80%	90%
Chemical water quality	70%	80%	80%	85%

* 1988 figures include information from 55 rural water supply schemes[6]
Source: 1991 NSW Water Supply and Sewerage Performance Comparisons

Chemical and physical agents

For chemical analysis, excesses of iron and manganese, and for physical criteria, excesses of colour, turbidity, pH and conductivity, were the most common reasons for failure. These characteristics are generally not a public health risk but do affect the aesthetic quality of water and may cause people to seek drinking water from alternative sources, which may not be as safe.

Manganese and iron contamination stain clothes, and low pH causes corrosion and encrustation to pipework and plumbing fixtures[4,5]. Turbidity, due to particulate matter in the water, can protect microorganisms from disinfection and promote bacterial growth.

Pesticides

The almost complete absence of pesticide residues in tested water should be viewed with some caution. The monitoring program, which tests only once or twice a year, is not specifically tailored to the timing or the type of pesticide used in each area[20].

Furthermore, this evidence stands in contrast to a NSW Water Resources study which found pesticide contamination at all sites tested in the Barwon, Gwydir, Namoi and Macquarie valleys, albeit at extremely low levels[21]. The DAL pesticides laboratory does not have the technology or the resources to screen for all pesticides in use in NSW, but efforts are being made to widen this range.

RECOMMENDATIONS

The following recommendations are proposed in response to the issues presented in this review:

- The establishment of a formal avenue for annual reporting of water quality in NSW by the Health

Department. This is not intended to replace annual reporting conducted by the water authorities. It is recommended that summarised results be published in the *Public Health Bulletin* each year, in a method agreed to by DAL, the Epidemiology Branch and the Public Health Units.

- That computerisation of data by DAL be given high priority.
- A Health Department circular be distributed to water supply authorities, outlining their responsibility to conduct periodic water sampling as a basic public health preventive measure. Emphasis be placed on proper completion of the water sample record cards to ensure all relevant data are collected.
- Water supply authorities be required to assess the long-term performance of their water supplies. This should be conducted on an annual basis in accordance with the guidelines, and the information should be provided to the PHUs.
- Non-compliance of water supplies either on a short-term or long-term basis, requires follow-up investigation by the PHUs.
- Consideration be given by the Public Health Network to the need for gastrointestinal symptom surveys in areas with supplies which regularly fail current microbiological criteria for water quality.
- Enhance communication between DAL, the PHUs and the Public Health Section of the NSW Health Department. PHUs, local councils, PWD and the Department of Agriculture should be requested to provide DAL with an annually updated list of:
  - supplies in each Region, and the number of locations requiring sampling. This will aid DAL in the programming of samples;
  - pesticides used in each Area/Region, giving priority to those most widely used and of greatest toxicity; and
  - annual patterns of pesticide use.
- The pesticide monitoring program be structured to suit patterns of Statewide pesticide use. Another suggestion is to concentrate on Regions supporting the most intense agriculture and to sample these areas more frequently.
- That Environmental Health Officers and/or Food Surveyors investigate the high degree of microbiological non-compliance of water used by food processing manufacturers.
- Review of the water monitoring program take place when the new guidelines are adopted.

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RESPONDING TO CHEMICAL INCIDENTS – A RURAL PERSPECTIVE

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South West Public Health Unit)
Tony Kolbe, Director
South West Centre for Public Health

INTRODUCTION

The involvement of Public Health Unit (PHU) staff in the response to chemical spills, including those caused by motor vehicle accidents, has been under discussion for some time. It is particularly relevant to rural PHUs because motor vehicle accidents are not uncommon on the network of highways throughout NSW. Although PHUs operate on an on-call basis, they are not a 24-hour "combat agency". Attending an incident may involve considerable travelling time and leave an officer isolated at the site with limited access to data and less than adequate communication facilities. Attempts at arranging the notification of incidents by police and ambulance control networks have generally been unsuccessful. The question arises as to the role of PHU staff both at the site of the incident and otherwise and how a PHU might best carry out its responsibilities.

A recent incident has highlighted the value of PHU involvement. It has also provided a practical example to trial a methodology for response to a chemical incident.

THE INCIDENT

About 0300 hours on Wednesday, July 7, 1993 a 30,000 litre tanker was involved in a motor vehicle accident on the Hume Highway 10 kilometres north of Gundagai. As a result of the rupture of one compartment, about 2,000 litres of the liquid formaldehyde (37% solution) was discharged from the tanker. Emergency services on site attempted to contain the spill, but heavy rainfall at the time meant this was unsuccessful and the liquid entered a creek which discharged into the Murrumbidgee River.

Formaldehyde solution (other names: formalin, formol, methanol solution 37%) is a general chemical used in resin manufacture and as a preservative. The material is a clear, colourless liquid with a pungent, irritating odour. It is miscible in water. The material is a powerful reducing agent which reacts with acids, bases and metal salts. If swallowed it can cause nausea, vomiting, diarrhoea, abdominal pains and loss of consciousness. The material can irritate the eye, skin and mucous membranes. Long-term animal test data suggest a carcinogenic potential. The Draft Revised Drinking Water Standards recommends that the formaldehyde concentration in drinking water should not exceed 0.5 mg/L while the World Health Organisation guideline value is 0.9 mg/L.

Rainfall in the area for the day of the incident and those either side of it was 16-31mm. All watercourses were flowing well and "good" dilution was expected.

Wagga Wagga and Gundagai Fire Brigades and an Environment Protection Agency (EPA) officer attended the site. The PHU learned of the incident only from media reports at 0900 hours.

ACTION TAKEN

- Initial contact was made to the site NSW Fire Brigades Zone Commander's mobile telephone and a verbal assessment of the situation was obtained.
- Contact was made with Epidemiology Branch and toxicological information requested. This was received by facsimile.
- Contact was made with the local council's Shire Clerk and it was suggested that precautionary steps be considered to protect the water supply.
- Contact was also made with the NSW Police Patrol Commanders, Wagga Wagga and Gundagai. Links were established through the District Emergency Management Committee by the Divisional Controller of the State Emergency Services (SES). It was decided that the SES would handle media liaison.
- Based on this advice, the unknown health effects, dilution rates and mixing within the river, it was decided to act conservatively and take the following action:
  - fill the town reservoirs in the time available; and
  - shut down the water supply system before the expected arrival of any chemical and not restart the plant until residuals would have passed.
- Contact was received from the Emergency Response Unit of the manufacturing chemical company. Advice on action taken by both organisations was exchanged. Safety data sheets were supplied to the PHU by facsimile.
- Contact was made with the SES Divisional Controller and a briefing minute was provided to help prepare a media release. The public health risks were considered to be low to moderate, but until water sample results were received it was decided to act conservatively and advise that water below the accident site should not be used for drinking, domestic or stock purposes until further notice and that any water pumped from the time of the accident be discarded.
- Contact was made with the Southern Riverina County Council, the water supply authority for Wagga Wagga and environs. In consultation with engineering staff, it was decided that the supply should be protected, again primarily as a precautionary measure. The authority decided to shut down the river component of the supply system and rely totally on the bore system to accommodate the passage of any residuals.
- Subsequent testing indicated 1.1 mg/L of formaldehyde at entry to Muttama Creek and "none detected" at Gundagai with a testing detection limit of 0.2 mg/L. An adjacent farm dam contaminated by the spill contained 250 mg/L.

DISCUSSION

A response procedure model had been under development for some time for the area covered by the South West Centre for Public Health. Contacts had been made with the Zone Commander, NSW Fire Brigades, Zone 4 for a co-operative approach between the organisations for such incidents. The procedural and action steps would include:

- The PHU out-of-hours contact system would be included in the operational protocol for chemical incidents at the Albury and Wagga Wagga Fire Stations.
- On receipt of an alert, the duty public health officer would contact the appropriate control room at Albury or Wagga Wagga Fire Station (which between them cover the South West District) by telephone to obtain further data on the incident.

- If appropriate, the officer would go to the control room to provide public health advice and receive data through the Fire Brigades' communication system. The decision to go to the control room would depend on an assessment of each incident.
- Once the nature of the situation is clear and adequate toxicological data are available, a decision could be made about sending an officer to the scene of the incident.

The perceived advantages of the system are that:

- scarce resources are conserved;
- the trained staff are kept close to developed communications resources; and
- the staff can better gather toxicological data if they have access to telephones, fax machines, the resources of Epidemiology Branch and the chemical company concerned.

The incident involving formaldehyde has indicated the model may have potential for further development.

EDITORIAL COMMENT

This report highlights the need for a rapid response and timely access to health information, as well as the need for early notification of chemical incidents to local public health authorities.

A protocol for public health response to chemical incidents was developed and approved by the NSW Health Department in 1992 to provide a systematic approach to the investigation of incidents by PHUs. However, the remote locations of some incidents may require modifications of the protocol, and so feedback from the PHUs is necessary to improve its practicability. Nevertheless, this report underlines the importance of the use of a standardised method for responding to incidents.

The protocol presents a framework for:

- deciding the type of incidents which should be investigated by PHUs;
- conducting a rapid health impact assessment of an incident. The checklist provides a structured method of collecting information and is based on an adaptation of a WHO checklist. When finalised, the computerised standard format should be used for reporting;
- liaising with other combat agencies such as fire brigade, the police, and the Environment Protection Authority to obtain relevant health information;
- collecting and having access to key information at the time of the incident, to enable the assessment of the chronic, as well as the acute, health effects of an incident. This may include information on the nature of the chemical, its concentration in the environment, prevailing weather conditions, the likely spread of the chemical and the population at risk of exposure to the chemical; and
- determining the need for long-term follow-up of people affected in a chemical incident.

Faster notifications and better access to appropriate toxicological data would improve the existing system. The reporting by each Public Health Unit of chemical incidents in a standardised manner will also help paint a State-wide picture of the health impact of chemical incidents in NSW.

NEWS AND COMMENT

HIV DATA QUALITY

The editor has received a letter from Professor David Cooper, Director, St Vincent's Hospital (SVH) Centre for Immunology HIV reference laboratory, concerning the editorial comment to the article, "Improving the quality of HIV Data" (*Public Health Bulletin*, January 1994; 5:10-11). The letter expresses concern that the editorial comment contained unwarranted criticism of the data quality from SVH laboratory.

Editor's comment

Any perceived criticism of the data quality from SVH laboratory was not intended. Data analysis carried out by the Epidemiology Branch shows that data from both Prince of Wales and SVH HIV laboratories are of an equally high standard. We would like to stress that the callback procedure was implemented in all HIV reference laboratories in 1992 resulting in a substantial improvement in data quality. The point of the editorial comment was that, in response to the recent suspected case of patient-to-patient HIV transmission, the Department: (a) has restated the need for high quality data on risk exposure, and (b) will carry out follow-up surveillance where appropriate.

UNLEADED PETROL DISCUSSION CONTINUES

Dr Donald Scott-Orr has written to say he is at Comboyne, north of Taree, NSW, and not in London as we published in the February *Public Health Bulletin*.

His letter continues: "The response from the authors, to my comments on their November 1993 article on the virtues of unleaded petrol, was useful. However, they do not address the issue of need for a catalytic converter.

In Australia, since those cars required to use unleaded petrol should also have converters, 'the low levels of benzene found in ambient air in Australian cities may depend partly on this and the low conversion rate to unleaded petrol in those earlier cars which can use leaded and unleaded.

If the converters were thought to be necessary here and earlier car users are now encouraged to make use of unleaded petrol (without converters), ever though its octane rating is lower than in Europe, is there not a greater potential carcinogenic hazard than the authors suggest?

Perhaps the authors, and the Lead in Petrol Working Group, would also comment on the current availability of (higher priced) higher octane rated unleaded petrol and the concomitant encouragement of its use.

When Neville Wran was premier some people may have believed his promise that unleaded petrol would become and remain cheaper than leaded – to encourage the use of unleaded. Now the proposal is to increase the price of leaded for the same purpose. Let us hope that some of the revenue will enhance research into alternatives."

ERRATUM

Public Health Bulletin, January 1994; 5:5 –
Boom in demand for genetics services in NSW

It should be noted that Statewide cytogenetics services are provided from laboratories located at Prince of Wales Hospital, Royal Alexandra Hospital for Children, Royal North Shore Hospital, Westmead Hospital and John Hunter Hospital. Statewide molecular genetics services are provided from three laboratory groups: Prince of Wales Hospital/ Concord Hospital, Royal Prince Alfred Hospital/Royal North Shore Hospital and John Hunter Hospital.

TABLE 5

INFECTIOUS DISEASE NOTIFICATIONS FOR 1994
FOR NOTIFICATIONS RECEIVED BY MARCH 30, 1994
BY MONTH OF ONSET

Condition	Month			
	Jan	Feb	Mar	Total
Adverse event after immunisation	2	4	–	6
AIDS	27	16	15	58
Arboviral infection	22	61	34	117
Foodborne illness (NOS)	13	3	1	17
Gastroenteritis (instit.)	1	11	3	15
Gonorrhoea	33	25	8	66
H influenzae epiglottitis	2	1	4	7
H influenzae meningitis	1	–	1	2
H influenzae septicaemia	1	1	–	2
H influenzae infection (NOS)	2	1	–	3
Hepatitis A – acute viral	48	44	21	113
Hepatitis B – acute viral	7	6	1	14
Hepatitis B – unspecified	302	276	111	689
Hepatitis C – acute viral	1	–	–	1
Hepatitis C – unspecified	553	645	223	1,421
Hepatitis D – unspecified	1	2	–	3
Hepatitis – acute viral (NOS)	1	1	–	2
HIV infection	25	43	27	95
Hydatid disease	–	1	1	2
Legionnaires' disease	3	4	1	8
Leptospirosis	1	2	–	3
Listeriosis	2	2	–	4
Malaria	5	8	4	17
Measles	147	63	21	231
Meningococcal meningitis	5	3	4	12
Meningococcal septicaemia	1	1	2	4
Meningococcal infection (NOS)	1	–	–	1
Mumps	1	–	–	1
Mycobacterial atypical	13	3	–	16
Mycobacterial tuberculosis	24	9	7	40
Mycobacterial infection (NOS)	12	10	3	25
Pertussis	165	116	40	321
Q fever	20	12	4	36
Rubella	8	6	–	14
Rubella – congenital	–	1	–	1
Salmonella bovis morbificans	1	3	–	4
Salmonella typhimurium	47	48	9	104
Salmonella (NOS)	58	69	40	167
Syphilis	82	71	33	186
Typhoid and paratyphoid	1	3	–	4
Total	1,639	1,575	618	3,832

TABLE 6

SUMMARY OF NSW INFECTIOUS DISEASE NOTIFICATIONS
MARCH 1994

Condition	Number of cases notified			
	Period		Cumulative	
	March 1993	March 1994	March 1993	March 1994
Adverse reaction	2	–	5	6
AIDS	40	15	113	58
Arboviral infection	163	34	469	117
Brucellosis	–	–	–	–
Cholera	–	–	–	–
Diphtheria	–	–	–	–
Foodborne illness (NOS)	20	1	32	17
Gastroenteritis (instit.)	3	3	39	15
Gonorrhoea	44	8	104	66
H influenzae epiglottitis	4	4	9	7
H influenzae B – meningitis	7	1	17	2
H influenzae B – septicaemia	4	–	8	2
H influenzae infection (NOS)	3	–	6	3
Hepatitis A	49	21	177	113
Hepatitis B	359	112	937	702
Hepatitis C	513	223	1,319	1,422
Hepatitis D	1	–	1	3
Hepatitis, acute viral (NOS)	–	–	1	2
HIV infection	66	27	156	95
Hydatid disease	–	1	–	2
Legionnaires' disease	7	1	19	8
Leprosy	–	–	–	–
Leptospirosis	3	–	7	3
Listeriosis	–	–	4	4
Malaria	20	4	58	17
Measles	37	21	184	231
Meningococcal meningitis	1	4	6	12
Meningococcal septicaemia	1	2	5	4
Meningococcal infection (NOS)	1	–	3	1
Mumps	–	–	–	1
Mycobacterial tuberculosis	29	7	105	40
Mycobacterial – atypical	57	–	110	16
Mycobacterial infection (NOS)	3	3	12	25
Pertussis	39	40	127	321
Plague	–	–	–	–
Poliomyelitis	–	–	–	–
Q fever	33	4	92	36
Rubella	28	–	120	14
Salmonella infection (NOS)	117	49	341	275
Syphilis	69	33	184	186
Tetanus	–	–	2	–
Typhoid and paratyphoid	5	–	14	4
Typhus	–	–	–	–
Viral haemorrhagic fevers	–	–	–	–
Yellow fever	–	–	–	–

TABLE 7

FOODBORNE INFECTIOUS DISEASE NOTIFICATIONS
FOR NOTIFICATIONS RECEIVED BY MARCH 30, 1994
BY PUBLIC HEALTH UNIT

Condition	CSA	SSA	ESA	SWS	WSA	WEN	NSA	CCA	ILL	HUN	NCR	NER	OFR	CWR	SWR	SER	U/K	Total
Foodborne illness (NOS)	1	1	4	7	2	–	–	–	–	–	–	–	2	–	–	–	–	17
Gastroenteritis (instit.)	11	–	–	–	2	–	–	1	–	1	–	–	–	–	–	–	–	15
Listeriosis	–	–	1	–	–	–	–	–	1	1	–	–	1	–	–	–	–	4
Salmonella bovis morbificans	–	1	1	–	1	–	–	–	–	1	–	–	–	–	–	–	–	4
Salmonella typhimurium	10	8	8	1	26	3	14	3	7	10	–	1	2	7	3	1	–	104
Salmonella (NOS)	9	16	10	6	14	3	20	9	5	10	27	6	16	5	10	1	–	167
Typhoid and paratyphoid	–	1	2	–	–	1	–	–	–	–	–	–	–	–	–	–	–	4

TABLE 8

INFECTIOUS DISEASE NOTIFICATIONS FOR 1994
FOR NOTIFICATIONS RECEIVED BY MARCH 30, 1994
BY PUBLIC HEALTH UNIT

Condition	CSA	SSA	ESA	SWS	WSA	WEN	NSA	CCA	ILL	HUN	NCR	NER	OFR	CWR	SWR	SER	U/K	Total
Adverse event after immunisation	–	–	–	–	2	2	–	1	–	–	1	–	–	–	–	–	–	6
AIDS	7	2	23	2	8	3	7	1	2	–	3	–	–	–	–	–	–	58
Arboviral infection	–	2	–	–	–	–	3	1	2	7	85	2	8	–	7	–	–	117
Gonorrhoea	4	5	24	3	4	1	4	2	–	3	1	3	9	1	2	–	–	66
H. influenzae epiglottitis	1	1	–	–	1	1	1	1	1	–	–	–	–	–	–	–	–	7
H. influenzae meningitis	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	2
H. influenzae septicaemia	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	2
H. influenzae infection (NOS)	–	–	–	–	–	–	–	2	–	–	1	–	–	–	–	–	–	3
Hepatitis A – acute viral	8	3	12	8	11	1	10	2	1	6	16	10	3	3	19	–	–	113
Hepatitis B – acute viral	3	–	4	–	1	–	–	–	–	1	1	–	2	1	–	1	–	14
Hepatitis B – unspecified	80	75	65	169	121	4	94	12	15	24	16	1	3	3	7	–	–	689
Hepatitis C – acute viral	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1
Hepatitis C – unspecified	161	70	236	132	121	31	154	47	55	96	203	10	11	34	39	21	–	1,421
Hepatitis D – unspecified	–	–	–	–	–	–	1	–	–	–	2	–	–	–	–	–	–	3
Hepatitis, acute viral (NOS)	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	2
HIV infection	13	4	40	4	1	1	–	1	–	–	2	–	–	–	–	–	29	95
Hydatid disease	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Legionnaires' disease	–	1	1	–	2	–	3	–	–	–	–	–	–	1	–	–	–	8
Leptospirosis	–	–	–	–	–	–	–	–	–	1	1	–	–	–	1	–	–	3
Malaria	3	–	4	2	1	–	2	–	–	1	1	–	–	–	3	–	–	17
Measles	22	5	6	12	17	16	18	3	6	18	66	9	21	9	–	3	–	231
Meningococcal meningitis	–	2	–	2	2	1	–	2	–	2	1	–	–	–	–	–	–	12
Meningococcal septicaemia	–	–	–	1	–	–	–	1	–	1	1	–	–	–	–	–	–	4
Meningococcal infection (NOS)	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Mumps	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Mycobacterial atypical	3	–	5	–	–	–	5	–	–	–	1	–	–	1	1	–	–	16
Mycobacterial tuberculosis	1	8	1	8	10	2	3	1	3	2	–	–	–	–	1	–	–	40
Mycobacterial infection (NOS)	13	–	1	–	3	1	3	–	–	2	2	–	–	–	–	–	–	25
Pertussis	4	22	17	14	28	7	24	6	17	25	129	–	11	10	2	5	–	321
Q fever	–	–	–	–	–	–	–	–	–	5	7	5	17	–	2	–	–	36
Rubella	–	–	1	–	5	1	2	–	–	–	1	2	–	–	2	–	–	14
Rubella – congenital	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1
Syphilis	31	14	49	23	13	–	15	2	–	–	14	–	21	1	3	–	–	186
Total	354	214	492	381	352	72	351	85	102	194	556	43	106	65	86	35	29	3,517

TABLE 9

SURVEILLANCE OF NON-NOTIFIABLE SEXUALLY TRANSMITTED DISEASES
JANUARY-FEBRUARY 1994
(Diagnoses from sexual health centres unless otherwise stated in footnote)

* First diagnosis; 1. No data yet received for 1994; 2. 01/01/94-31/01/94; 3. 01/01/94-28/02/94; 4. 01/01/94-31/03/94; 5. No SHC in Region; 6. Laboratory and SHC data 01/01/94-31/03/94.

AHS Infection		CSA[1]	SSA[2]	ESA[3]	SWS[2]	WSA[1] + WEN	NSA[4]	CCA[4]	ILL[1]	HUN[1]	NCR[3]	NER[4]	OFR[1]	CWR[5]	SWR[6]	SER[1]
Chlamydia trachomatis	Male	–	–	10	1	–	–	–	–	–	–	3	–	–	–	
	Female	–	–	12	1	–	1	1	–	–	–	10	–	–	3	
	Total	–	–	**22**	**2**	–	**1**	**1**	–	–	–	**13**	–	–	**3**	–
Donovanosis	Male	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Female	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Total	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
*Genital herpes	Male	–	1	57	–	–	6	4	–	–	1	1	–	–	–	
	Female	–	3	16	–	–	3	2	–	–	1	6	–	–	–	
	Total	–	**4**	**73**	–	–	**9**	**6**	–	–	**2**	**7**	–	–	–	–
*Genital warts	Male	–	6	161	19	–	11	15	–	–	6	3	–	–	1	
	Female	–	6	69	9	–	4	5	–	–	2	11	–	–	1	
	Total	–	**12**	**230**	**28**	–	**15**	**20**	–	–	**8**	**14**	–	–	**2**	–
Nongonococcal urethritis	Male	–	1	127	12	–	4	11	–	–	6	5	–	–	1	
	Female	–	–	–	–	–	2	–	–	–	–	–	–	–	2	
	Total	–	**1**	**127**	**12**	–	**6**	**11**	–	–	**6**	**5**	–	–	**3**	–
Lymphogranuloma venereum	Male	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Female	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Total	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Abbreviations used in this Bulletin:
CSA Central Sydney Health Area, SSA Southern Sydney Health Area, ESA Eastern Sydney Health Area, SWS South Western Sydney Health Area, WSA Western Sydney Health Area, WEN Wentworth Health Area, NSA Northern Sydney Health Area, CCA Central Coast Health Area, ILL Illawarra Health Area, HUN Hunter Health Area, NCR North Coast Health Region, NER New England Health Region, OFR Orana and Far West Health Region, CWR Central West Health Region, SWR South West Health Region, SER South East Health Region, OTH Interstate/Overseas, U/K Unknown, NOS Not Otherwise Stated.

Please note that the data contained in this Bulletin are provisional and subject to change because of late reports or changes in case classification. Data are tabulated where possible by area of residence and by the disease onset date and not simply the date of notification or receipt of such notification.

NOTIFICATIONS

HAEMOPHILUS INFLUENZAE TYPE B (Hib)

Only one notification for Hib in a child under one year of age has been made in NSW this year. The average age for Hib notifications was 13.7 years for the first quarter of 1994. This compares with 6.3 years for all of 1993 and 3.1 years for the first quarter of 1993. Only 14 notifications were received for the first quarter of 1994, for a rate of 0.95/100,000 population. This compares with a notification rate of 2.7/100,000 population for the same period in 1993.

MEASLES

Notifications for measles peaked in epiweek 1. The notification rate for the first quarter of 1994 is 15.7/100,000 population. This compares with a rate of 12.5 for the same period in 1993. The North Coast PHU has received 66 notifications at a rate of 69.4/100,000 population. The mean age for notifications was 8.0 years (range four months to 36 years). Fifteen per cent of notifications were for neonates and infants (≤ one year of age). Fifty-nine per cent were for children over the age of five years, while 25 per cent were for people 12 years and older. From September 1, 1994, the schoolgirl rubella program is expected to be replaced by a universal schoolchild measles-mumps-rubella program.

PERTUSSIS (WHOOPING COUGH)

Notifications for pertussis peaked in epiweek 7. Seventy-eight per cent of notifications for 1994 were for the period before epiweek 8. The notification rate for pertussis for the first quarter of 1994 is 22.3/100,000 population. This compares with a rate of 8.6 for the same period in 1993.

Twenty per cent of notifications were for children aged less than five years. A further 36 per cent were for school-aged children. The mean age for notifications was 21.7 years. Sixty-six per cent of pertussis notifications were received from laboratories and 24 per cent were received from medical practitioners. North Coast Public Health Unit (PHU) has received 119 notifications at a rate of 125.2/100,000 population. The PHU has investigated all cases and advised contacts of measures to minimise risk of further spread in infection. Media releases have been made in community newspapers, and liaison between the PHU and the local Divisions of General Practice will promote the use of triple antigen.

SALMONELLA TYPHIMURIUM PHAGE TYPE 9

The National Salmonella Surveillance Scheme notified of 33 cases of Salmonella typhimurium phage type 9 in NSW between January 17 and February 10, 1994 from 11 Health Areas. Investigation by PHUs found a relationship between seven of the cases, who had bought food from a takeaway outlet in the Central Sydney Area.

Investigation by Food Surveillance Officers from Central Sydney PHU revealed unsatisfactory handling procedures, including unclean food processing equipment and perishable foods stored at unsatisfactory temperatures for long periods. Food samples were positive for Salmonella brandenburg. Measures have been implemented to improve hygiene at this outlet and further sampling will be undertaken to ensure satisfactory standards are maintained.

SENTINEL REPORTING ON INFLUENZA IN THE ILLAWARRA

Desolie Lovegrove, Public Health Nurse,
Illawarra Public Health Unit

Sentinel surveillance networks provide "listening posts" for timely reporting of conditions not normally notifiable. Sentinel surveillance does not provide complete prevalence data but can give an indication of changing patterns of disease and does provide a valuable early warning system for health professionals.

The Illawarra Sentinel Surveillance Network for influenza consists of general practice (GP) surveillance and school surveillance.

The sentinel GP surveillance has been monitoring influenza and other specified conditions on a weekly basis since June 1990. In 1992 and 1993 influenza immunisation was included in the conditions for surveillance. The network consists of 14 doctors between Helensburgh in the north to Gerringong in the south.

The sentinel school surveillance has been monitoring weekly absentee rates in schools in four geographical (northern, central, western and southern) areas of the Illawarra. It has monitored absentee rates during the winter months of 1992 and 1993.

The National Health and Medical Research Council recommend annual influenza vaccination for individuals in the following categories:

- adults and children with chronic debilitating disease, especially those with chronic cardiac, pulmonary, renal and metabolic disorders;
- persons over 65 years of age;
- residents and staff of nursing homes and other chronic care facilities;
- persons receiving immunosuppressive therapy; and
- medical and health personnel in regular contact with the above groups.

The Illawarra PHU was interested in monitoring those receiving influenza immunisations in the community to ascertain whether it was the targeted "at risk" or the "worried well" who were being immunised. Immunisation of the fit and well may be inadvisable since naturally-acquired influenza immunity provides protection against the virus for many years, compared with the short-term effects of the immunisation.

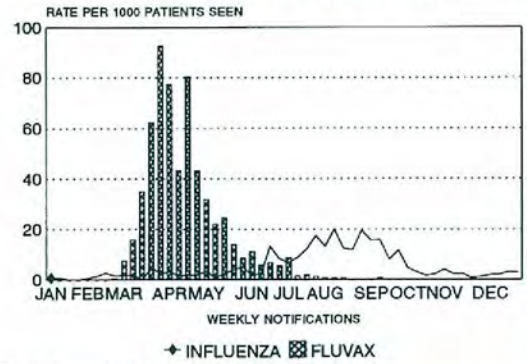
During the first week in April, as part of Influenza Awareness Week, the PHU targeted "at risk" groups in the community for influenza immunisation. An article was placed in the local GP newsletter and letters were sent to directors of all nursing homes in the Illawarra area recommending immunisation of residents in the at risk groups. Community health nurses were advised to recommend immunisation to their clients. This was followed with coverage in local newspapers and radio stations.

Influenza, school absentee rates and influenza immunisation uptake were monitored through the weekly sentinel GP and school surveillance networks.

Figure 1 shows the number, calculated as rate per 1,000 patients seen, of influenza presentations and influenza immunisation reported by the Illawarra Sentinel GP Surveillance Network in 1993. The graph shows GPs were beginning to offer influenza immunisation in March, with the demand peaking in the first week in April which was

FIGURE 1

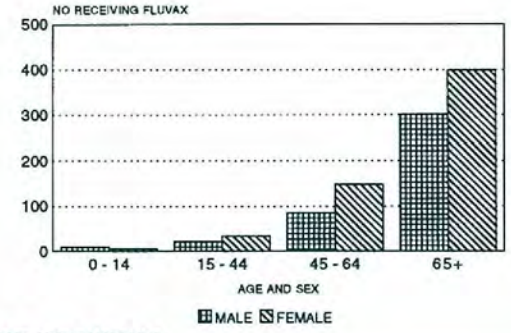
ILLAWARRA SENTINEL GP SURVEILLANCE INFLUENZA AND FLUVAX NOTIFICATIONS 1993



SOURCE SENTINEL GP DATA

FIGURE 2

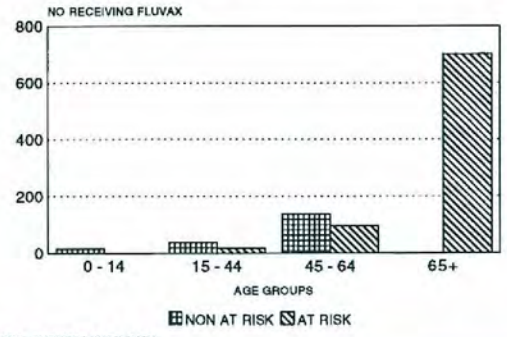
ILLAWARRA SENTINEL GP SURVEILLANCE INFLUENZA IMMUNISATION 1993 BY AGE AND SEX



SENTINEL SURVEILLANCE DATA

FIGURE 3

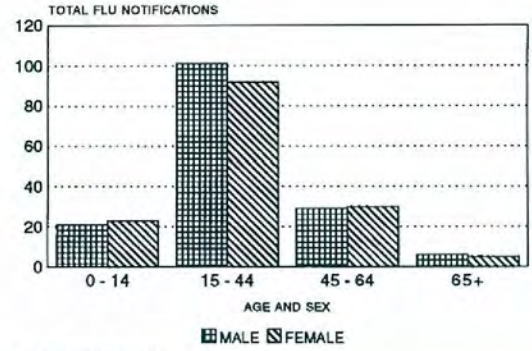
ILLAWARRA SENTINEL GP SURVEILLANCE INFLUENZA IMMUNISATION 1993 BY AGE AND RISK GROUP



SENTINEL SURVEILLANCE DATA

FIGURE 4

ILLAWARRA SENTINEL GP SURVEILLANCE INFLUENZA NOTIFICATIONS 1993 BY AGE AND SEX



SENTINEL SURVEILLANCE DATA

Influenza Awareness Week. There was a gradual decrease in immunisations over May, June, July and August.

Figure 2 shows the influenza immunisation by age groups and sex. The graph shows that most patients receiving the influenza immunisation were in the 65+ age group, which was the group targeted for immunisation. It also shows that more females than males in all age groups (except 0-14 years) were being immunised.

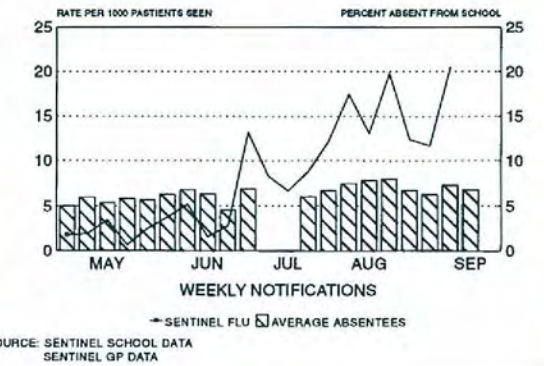
As it was possible for patients under the age of 65 years to belong to an at risk group (e.g. with chronic debilitating disease), doctors were asked to indicate if the patient receiving the influenza vaccination belonged to an at risk category. Figure 3 shows influenza immunisation by age group and risk group.

Figure 4 shows that most sentinel influenza notifications were in the 15-44 age group. Fewer than 4 per cent of influenza cases were reported in the 65+ age group, which was the "at risk" group targeted for influenza immunisation.

Continued on page 46 ►

FIGURE 5

ILLAWARRA SENTINEL INFLUENZA SURVEILLANCE SENTINEL GP FLU & SENTINEL SCHOOL ABSENTEE RATES



SOURCE: SENTINEL SCHOOL DATA
SENTINEL GP DATA

Sentinel reporting on influenza

► *Continued from page 45*

During May, June, July, August and September absentee rates were being collected from sentinel schools in the Illawarra. Figure 5 shows the average school absentee rates and the sentinel GP influenza notifications. It is difficult to see a relationship between the two, although there was an interesting decrease in GP influenza notifications which corresponded with the school holidays.

The sentinel surveillance of influenza and influenza immunisation has provided the PHU and the community with useful data on the pattern of influenza, peak time for the administration of influenza immunisations, the age, sex and at risk category of the patients receiving the vaccinations. It would appear that in the Illawarra 80 per cent of influenza immunisations were given to those most likely to benefit – the elderly and others at risk – and that fewer than 4 per cent of influenza infections occurred in this group.

INFLUENZA SURVEILLANCE IN THREE CENTRAL WESTERN NSW BOARDING SCHOOLS

Peter Tissen, Kelly Demattia and Peter Christopher, Central Western Public Health Unit

Recurrent epidemics of influenza occur on average once every 1-10 years and can be traced back hundreds of years[1]. The pandemic of 1918-1919 demonstrated the potential devastation caused by influenza when, worldwide, an estimated 500 million people were infected and 20 million people died. Thus influenza caused the most deadly epidemic of disease in recorded history[2].

Although frequently a mild disease, influenza can cause death. It has a low case-fatality ratio – about 1 or 2 deaths per 1,000 cases – but in some groups such as the chronically ill and the elderly, the case fatality can be as high as 30 per cent.

The aims of sentinel surveillance programs are to provide a reliable, rapid and inexpensive means of disease surveillance. The purpose of this project was to monitor the incidence of influenza in the Evans and Lachlan Health Districts, as part of a Statewide program involving schools. Incidence of infection is often highest in school-age children, so the 1993 influenza surveillance program focused primarily on children aged 6-18 years.

The results obtained from the surveillance program conducted the previous year (1992 autumn/winter) showed a high incidence of influenza among children aged 13-18 years. This is commonly the case as the young are most frequently affected with new influenza virus strains, with adults often already immune to the strain from a past infection.

To achieve an exact diagnosis a blood test is required and the influenza strain is identified by means of a throat gargle. These methods of detection are not used throughout this surveillance as the technology required is too costly.

Surveillance was to be conducted for five months during the autumn/winter period, from May 1 to October 1, 1993.

Cases of influenza were determined by referring to the Royal Australian College of General Practitioners (RACGP) influenza criteria, which set out symptoms and signs indicative of influenza.

Initially, school principals were approached by the Director of the Public Health Unit and made aware of the objectives of the program and their involvement in it. Three schools, in different geographical areas, were involved in this project. These were school A at Forbes, with 760 students, and two schools 150km away at Bathurst – school B with 290 students and C with 280 students.

All the schools involved cater for boarders and day students. The study had been designed to include both boarders and day students but this notion was abandoned because of the inaccuracy in diagnosis and the poor presentation of sick notes by day students. Therefore the surveillance dealt only with boarders, who are assessed when ill by a resident registered nurse. The nurses were to make a diagnosis by referring to the RACGP criteria. The work involved the sister in charge of the sickbay reporting once a week by phone to the Department to notify the number of boarders who had contracted influenza.

Information on the number of pupils enrolled at each school was obtained from the nurses. Most students at school A had been immunised with the 1993 Commonwealth Serum Laboratory influenza vaccine about one week before the surveillance began. This was school policy.

During the five-month surveillance period, it was found that of a total of 1,330 boarder students, 42 (3 per cent) had been diagnosed with influenza. Cases occurred only at school A and school B. There were no cases reported at school C.

Schools A and B experienced two distinct outbreaks, at different times of the surveillance period. School A recorded a number of cases in late May/early June, while school B did not record any cases until the latter part of the surveillance period in August. The outbreaks occurred about eight weeks apart. No known hospitalisations or serious complications resulted from the illnesses.

From the results obtained it is evident that 1993 was not an epidemic influenza year, with only 42 cases among 1,330 students. In an epidemic year, with a new strain of influenza, an attack rate of 20 per cent or more would be expected.

Although most students at school A were vaccinated and presumed immune against influenza, this school still experienced an outbreak. This suggests the vaccine used did not contain the strain of the virus that caused the outbreak or did not have a high degree of protective value.

Compared with school A, school B experienced an outbreak during the latter part of the surveillance period because the influenza virus, via an infectious student, was introduced into the closed community later during the winter. School C experienced no cases of influenza. This suggests that when students had contact with the outside community, none contracted influenza, thus preventing the introduction of the infection to the other students.

This surveillance project was of value when combined with other similar studies undertaken by PHUs in the State, as it contributed to the provision of a profile of influenza occurrence in 1993 in NSW.

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1. Benenson AS. Control of Communicable Diseases in Man, 1990, 15th Edition, American Public Health Association, Washington, USA.
2. Last JM and Wallace RB. Public Health and Preventive Medicine, 13th Edition, 1992, Appleton and Lange, Connecticut, USA.