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A CLEVER COUNTRY – THE HEALTH BENEFITS OF REMOVING LEAD FROM PETROL

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On June 2, 1993 the National Health and Medical Research Council (NHMRC) proclaimed a goal of achieving

"... for all Australians a blood lead level below 10μg/dL. There is a particular urgency in reaching this level in children aged 1-4 years because of the adverse effects on intellectual development".

The NHMRC statement also indicates that to achieve this goal a strategy should be developed which specifically addresses:

- the accelerated reduction of lead in petrol; and
- the increased use of unleaded petrol.

While no date has been set for the achievement of this goal it is unlikely that it can be met in the short term unless steps are taken to accelerate the phasing out of leaded fuel[1]. In this article we review briefly the rationale for the removal of lead additives from fuel, present some data on the relative effectiveness of certain measures and foreshadow policy options to achieve this end.

WHY IS LEAD ADDED TO PETROL?

Lead is added to petrol to increase octane rating and for valve lubrication. Octane rating is a measure of the compression of the petrol-air mixture in a car engine without experiencing "knocking". A higher octane rating ensures higher compression and greater engine efficiency[2].

In Australia unleaded petrol is refined to an octane rating of 92 Research Octane Number (RON), while leaded petrol is refined to 97 RON. Almost all petrol in Australia originates as 92 octane unleaded fuel. The amount of lead added to the petrol depends on the desired octane rating: the more lead added, the higher the octane rating. Consequently, reducing the amount of lead added to petrol reduces the octane rating unless additional octane-enhancing compounds are added.

There is debate as to whether a lower octane fuel can be used in vehicles designed for a 98 or 97 octane fuel specification. It has been suggested that the inappropriate use of lower octane fuel may cause slight engine damage, although the evidence for this is weak.

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Removing lead from petrol

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Some industry experts believe the only likely problem will be a small rise in driver dissatisfaction because of an increase in engine knocking. However, most drivers are unlikely to detect this phenomenon[2].

The amount of lead permitted to be added to petrol in Australia (0.4-0.8 g/L)[3] is high compared with other OECD countries. In the US, Canada and Austria leaded petrol is not permitted. In most EEC countries the level of lead in petrol is 0.15 g/L[3].

In Australia unleaded petrol was introduced in 1986 and since then about 5 per cent of the NSW car fleet a year changes over from using leaded to unleaded fuel as vehicles become redundant. Fifty per cent of the NSW car fleet uses leaded petrol. The NSW Lead Issues Paper predicts leaded petrol will continue to be available until 2005-2010[3].

It is estimated that about one-third of pre-1986 vehicles can fully switch over to using unleaded petrol. Another third of pre-1986 vehicles will be able to run on a mixture of leaded fuel (one tank) to unleaded fuel (three tanks), while the remainder will most likely not be able to use unleaded petrol[4].

WHAT IS THE HAZARD?

There is scientific consensus that levels of blood lead as low as 10-25 µg/dL can cause neurological impairment in preschool-aged children[5,6,7]. The magnitude of this impairment has been estimated as an average loss of 2-3 IQ points for every 10 µg/dL increase in lifetime average blood lead[5]. There is no evidence of a threshold to the effects of lead[5,6,7].

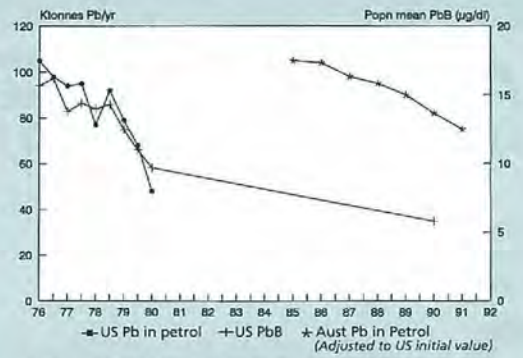
Children absorb lead by ingestion and inhalation through contact with lead particles in soil, dust and air. There is general agreement that for children, the relative contribution to blood lead from ingestion is greater than that from inhalation.

The Australian Bureau of Statistics has estimated that 90 per cent of the lead content in air in urban areas is attributable to leaded petrol emissions[8]. Compounding the problem of environmental lead pollution is the fact that once lead in air has been deposited in soil it becomes cumulative in the environment. It is also difficult and expensive to remove.

Other main sources of lead in urban areas include leaded paint used in older housing and lead from industrial processes. Although there is still uncertainty about the exact contribution of the major sources of lead to environmental levels, it is commonly accepted that removing lead from fuel is an effective means of lowering population mean blood lead levels.

FIGURE 1

COMPARATIVE RATES OF DECLINE OF LEAD IN PETROL IN US AND AUSTRALIA*, AND MEAN BLOOD LEAD IN THE US POPULATION (US PbB)



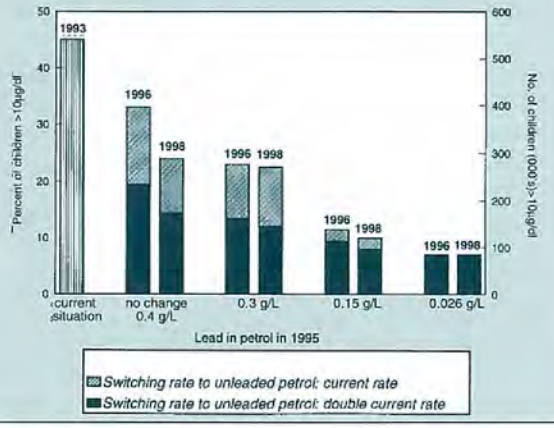
** The number of kilotonnes of lead additives used in Australia per annum were weighted to equate US tonnages at the time of unleaded petrol policy introduction.*

In the US the phasing out of leaded petrol from 1973 was associated with a significant reduction in the mean population blood lead level from 15.9 µg/dL in 1976 to about 6 µg/dL in 1990[9,10]. Figure 1 illustrates the comparative decline in the amount of lead added to petrol in the US[9] and in Australia, coupled with the parallel decrease in blood lead levels of the US population. In Australia the amount of lead added to petrol has decreased by only 20-25 per cent since 1985 when unleaded petrol was introduced, compared with the US where a 40 per cent reduction was achieved between 1976 and 1980[3].

In addition, a UK study found there was a significant decrease in blood lead concentrations in children and mothers living in both urban and rural settings, with urban children showing a 17 per cent drop in mean blood lead over four years. The only consistent changes in blood lead concentrations for all ages studied occurred in 1985 and 1986 when lead in petrol was reduced by 63 per cent. The authors concluded that the decrease in blood lead levels was due to declining air concentrations after the phasedown of lead in petrol[11].

FIGURE 2

NUMBER OF AUSTRALIAN CHILDREN (0-4 YEARS) EXCEEDING THE NH&MRC BLOOD LEAD GOAL



SCENARIOS

On the basis of data collected from Australian surveys conducted between 1975 and 1990, it has been estimated that 45 per cent of preschool-aged children have blood lead levels above 10 µg/dL[12]. However, the prevalence of high blood lead levels is likely to be lower due to declining levels of lead in air since 1985.

If current levels of lead in petrol are maintained, and only 5 per cent of cars a year switch to using unleaded fuel, it is predicted that in 1996 there will still be up to 400,000 children in Australia with blood lead levels exceeding 10 µg/dL[12]. In Figure 2[12], a number of the policy options for the reduction of lead in petrol is illustrated. Clearly, the switchover rate to unleaded petrol will have the greatest effect on the decline in the number of children with blood lead levels above 10µg/dL. However, overseas experience would suggest that even a doubling of the switchover rate would be difficult unless a large price differential were introduced.

IS IT WORTH IT?

As a society we place a high value on children achieving their intellectual potential. Although applying a dollar cost on this value has limitations, there is no doubt that cost and benefit analyses are an integral part of decision making in complex policy issues.

The NSW Environment Protection Authority (EPA) has conducted such an analysis[4], and this will soon be presented to the NSW Government. The analysis considered the costs involved in remedial education and costs of forgone income due to a loss of IQ because of chronic low-level lead poisoning. The benefits of avoiding these outcomes have been weighed against the following factors:

- reducing the lead content of fuel below 0.3 g/L may incur increased refining costs if there is a continuing demand for fuel with an octane rating of 96 RON; and
- the cost associated with increased engine wear in cars which may require a high-octane fuel.

However, there are also savings to industry such as the reduced requirement for buying lead additives as a result of the change to unleaded fuel.

The EPA concluded there is a large net benefit in decreasing lead in petrol. Two main conclusions drawn from the cost-benefit analysis are:

- reducing lead in petrol sooner rather than later will produce the greatest benefits; and
- lead levels should be reduced by as much as is technically possible without incurring significant capital expenditure.

In addition, a recent report to the NHMRC estimated that the likely cost of reducing the amount of lead added to petrol to a level of 0.15 g/L, would be about 2 cents a litre[1].

CURRENT SITUATION

A Lead in Petrol Working Group reporting to the NSW Lead Taskforce is considering the following proposals:

- lead in petrol should be reduced immediately from 0.4 to 0.3 g/L;
- endorsement of the decision made at the national level, that NSW refineries supply leaded petrol with a lead content of 0.2 g/L by the end of 1994 provided that octane demand can be reduced;
- NSW sales data of leaded and unleaded fuel, figures for total tonnage of lead added to petrol, and ambient air data be used to ascertain the short-term impact of the lead in petrol reduction strategy. A blood lead survey will be used to evaluate the effectiveness of the lead in petrol reduction strategy in the long term;
- an education campaign be instituted to encourage owners of pre-1986 cars to switch to using unleaded petrol (for those models which can do so); and
- that further research is required to investigate the effect of using lower octane fuels in pre-1986 vehicle engines and that research is required into the use of alternative octane enhancers.

The NSW Health Department considers reducing lead in petrol is likely to be the most effective means of reducing blood lead of all people living in an urban setting. Furthermore, controlling the hazard at source is the optimal method to guarantee the desired reduction in children's blood lead levels.

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DISPLAY OF TOBACCO SALES WARNING SIGNS

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In NSW in 1991 the permissible minimum age for buying cigarettes and other tobacco products was raised from 16 to 18 years, with the introduction of the NSW Public Health Act 1991. As part of the information campaign to implement this legislation, a Public Health Act Regulation requires all tobacco vendors to display an official sign warning that tobacco sales to children are illegal. Failure to display the sign carries a penalty of up to $1,000, since the display of these signs is considered to be an important means of reducing the availability of cigarettes to children. To assist with implementation of the legislation, on November 21, 1991 the NSW Office of State Revenue issued 20,000 warning signs to licensed tobacco retailers throughout the State. Any unlicensed tobacco retailer would not have received the warning sign. In response to complaints from the public that children were buying and smoking tobacco products, a survey of premises selling cigarettes and tobacco products was conducted in Central and Southern Sydney Health Service Areas to assess whether premises were displaying the warning sign required by the legislation, and if not, why not. The survey was accompanied by education of retailers about the signs.

METHODS

Tobacco retailers were chosen from shopping centres, railway station kiosks, shops near schools and shops in beachfront malls in Central and Southern Sydney Health Service Areas. Within each Local Government Area, retailers were chosen from one shopping centre, one railway station and from the vicinity of three schools. In shopping centres at least every second tobacco retailer was selected. All tobacco retailers near schools were selected. This process resulted in the selection of 388 retailers.

Each premise was visited between February and September 1992 by an Environmental Health Officer to determine whether the sign was displayed. If a premise did not have the sign displayed, the manager was informed of the legal requirements, and a follow-up warning letter and a copy of the sign were sent.

All premises not displaying the sign at the initial visit were revisited between January and April 1993 to determine whether the sign had been displayed after the initial visit and warning letter. At the second visit, the managers in charge were asked to produce for inspection their licence to sell tobacco. This inspection was confined to premises not displaying the sign because the Office of State Revenue uses the tobacco licence register to mail out warning signs. We therefore assumed that virtually all premises displaying the sign would be licensed.

All data were entered and analysed using Microsoft Excel spreadsheets.

RESULTS

Of the retailers visited, 120 (31 per cent) did not have the sign displayed at the point of sale. The compliance rates were lowest among the most numerous tobacco retailers: take-aways, mixed businesses and newsagents (Table 1). Compliance was also low among the small number of railway kiosks surveyed. Hairdressers, supermarkets and tobacconists generally had high compliance rates. The rate varied widely across Local Government Areas, from 9 out of 10 in Drummoyne to less than half in South Sydney.

During the survey the interest expressed by retailers was low and their cooperation was poor. Some retailers who did not display the sign seemed unconcerned by the warning issued to them. In some cases, comments were made to the effect that the Health Department must have nothing better to do, and in one case the retailer became offensive when told of the penalty for not displaying the sign. In other cases, the claim made was they did not to have time to cooperate.

Non-complying retailers gave various reasons for not displaying the sign (Table 2). The most common was that the sign had been destroyed or lost during cleaning or had fallen off because of accumulation of grease from cooking. This was particularly a problem in take-away businesses, because of cleaning to remove grease from surfaces.

Changes to promotional and advertising material around tobacco stands and refurbishment of stands by tobacco companies were a common reason given for not displaying the sign. Apparently the signs were not being replaced after these alterations. On one visit, a sales representative from a tobacco company had just finished erecting promotional material for a new brand of cigarettes, which had covered the sign. When approached and questioned, he advised that he would obtain a new sign and display it. In other outlets, the same company did not redisplay or replace the sign after completing the same type of work.

Nearly one-quarter of retailers reported they had not received a sign, while others said they were waiting for the tobacco company representative to deliver the sign. Being unable to explain why the sign was not displayed was normally associated with the recent acquisition of a business that did not have the sign.

Following issuing of the warning letters to non-complying retailers, complaints were received by the managers of two newsagencies, who claimed the sign was displayed. On receipt of these complaints the premises were revisited and both managers interviewed. At one premise, the son of the manager, who was in charge of the business at the time, was unable to locate the sign, although he said he remembered having seen it. The sign had been camouflaged by a lottery stand. In the other premise, the assistant was not certain if she had seen the sign in that shop. The sign in this shop was hidden from view by a pile of newspapers.

Most tobacco retailers surveyed said they were aware it is an offence to sell tobacco to children and denied ever doing so.

Among premises which did not have the sign displayed at the initial visit, 86 per cent had the sign displayed at the time of the revisit (Table 3). Take-away and mixed businesses were least likely to have the sign displayed after the initial visit/warning letter, although even among these businesses, more than three-quarters were displaying the sign at the time of the revisit.

More than three-quarters of premises revisited were able to produce a current licence to sell tobacco. Take-away and mixed businesses were least likely to be able to produce a licence to sell tobacco. The most common reasons reported for not having a licence were the belief that a licence was not required or not knowing how to obtain one. Based on the absence of tobacco sales licences in 23 per cent of the 120 premises revisited, we estimate that at least 7 per cent of all premises visited were not licensed to sell tobacco.

Discussion

While more than two-thirds of tobacco retailers were complying with the law and displaying the official sign warning against sales of tobacco to children, a significant number of retailers were not. If the non-compliance rate observed in this study is representative of the rate throughout NSW, there would be many thousands of tobacco retailers in breach of this law.

Various steps need to be taken to rectify this problem. Tobacco retailers should be reminded of the requirement to display the sign (possibly at the time of payment of the annual tobacco licence fee) and how signs can be obtained. Tobacco retailers such as take-aways could be advised to keep a supply of signs so they can be replaced when destroyed. We found that visiting premises and issuing warning letters was an effective method of increasing compliance, but may be less cost-effective than other methods.

There is also a need for the register of tobacco retailers to be kept up to date and for signs to be given to tobacco retailers not previously sent signs. This study suggests at least 7 per cent of tobacco retailers may be unlicensed.

Follow-up surveys of the type reported here should be undertaken to monitor compliance with the legislation, detect unlicensed retailers, encourage the display of warning signs and educate retailers about not selling tobacco to people under 18 years of age.

TABLE 1

LEVEL OF COMPLIANCE IN DISPLAYING WARNING SIGN

BUSINESS	PREMISES VISITED	PREMISES NOT DISPLAYING THE SIGN	
		NUMBER	PER CENT
Take-away	97	41	42
Mixed business	61	20	33
Newsagent	59	20	34
Supermarket	53	7	13
Service station	38	9	24
Tobacconist	29	5	17
Liquor shop	19	6	32
Railway kiosk	10	7	70
Cafe	8	2	25
Fruit shop	8	3	38
Hairdresser	6	0	0
Total	388	120	31

TABLE 2

REPORTED REASON FOR NOT DISPLAYING THE WARNING SIGN AMONG 120 PREMISES FOUND TO BE NOT DISPLAYING THE SIGN

REASON	NUMBER	PER CENT
Sign destroyed or removed as a result of cleaning	44	37
Sign never received	26	22
Sign destroyed during tobacco stand refurbishment	20	17
Unable to explain why sign not displayed	15	13
Thought sign was displayed but unable to locate	10	8
Did not know sign was required to be displayed	5	4
Total	120	100

TABLE 3

LEVEL OF COMPLIANCE IN DISPLAYING WARNING SIGN AND BEING ABLE TO PRODUCE A LICENCE TO SELL TOBACCO AMONG PREMISES REVISITED DUE TO LACK OF THE SIGN AT INITIAL VISIT

BUSINESS	PREMISES REVISITED	PREMISES NOT DISPLAYING THE SIGN		UNABLE TO PRODUCE LICENCE	
		NUMBER	PER CENT	NUMBER	PER CENT
Take-away	41	10	24	12	29
Mixed business	20	4	20	12	60
Newsagent	20	2	10	2	10
Supermarket	7	1	14	1	14
Service station	9	0	0	0	0
Tobacconist	5	0	0	0	0
Liquor shop	6	0	0	0	0
Railway kiosk	7	0	0	0	0
Cafe	2	0	0	0	0
Fruit shop	3	0	0	1	33
Hairdresser	0	0	0	0	0
Total	120	17	14	28	23

INFECTIOUS DISEASES

NOTIFICATIONS

WHOOPING COUGH

All Area Health Services and Rural Public Health Units have received notifications for whooping cough in 1993.

The notification rate for the State from January to October is 12.4/100,000 population. This compares with a rate of 10.3 for the first nine months of the year. Central West PHU has received notifications at a rate of 27.8/100,000 population. Orana and Far West PHU has received notifications at a rate of 18.8/100,000 population.

A total of 610 notifications for pertussis has been received this year. This is more than four times the number of notifications received for the same period in 1992. Fifty-five per cent of notifications have been for females, which is consistent with historical experience of pertussis notifications, both in Australia and overseas.

The mean age for notifications was 17.3 years (range one month to 89 years). Ten per cent of cases have been for infants and neonates (i.e. ≤ one year of age); 75 per cent of notifications have been for people aged ≤ five years.

The peak in notifications which began in epiweek 24 has continued unabated.

The Communicable Diseases Standing Committee of the National Health and Medical Research Council has been asked to review immunisation recommendations. Immunisation providers are requested to consider the consequences of not offering whooping cough vaccine to infants and children when there is documented evidence of high levels of *Bordatella pertussis* throughout the State.

TUBERCULOSIS

Two hundred and seventeen notifications have been received for 1993, for a rate of 4.4/100,000 population.

Site of infection, for 1993 notifications, is as follows:

TABLE 4

SITE	NUMBER	PERCENTAGE
Respiratory	124	57
Miliary	4	2
Primary	8	4
Genitourinary	6	3
Meningitis	5	2
Bone	3	1
Gastrointestinal	4	2
Other/unspecified	63	29

MEASLES

All Health Area Services and Regions have received notifications for measles in 1993.

The annual notification rate for the State is 22.6/100,000 population. Western Sydney has received notifications at a rate of 86.7/100,000 population.

Measles notifications peaked in epiweeks six to 10 and again in epiweeks 17 and 18. The rise in notifications that began in week 23 peaked in week 37 but continues at high levels. Most measles notifications have been for the Blacktown Local Government Area. Other clusters have been notified from Albion Park in the Illawarra Area, and Temora in South West NSW.

The mean age for notifications was 8.3 years (range one month to 99 years), and 11.5 per cent were for neonates and infants. Sixty-eight per cent of notifications were for children over the age of five years; only 24 per cent of cases were over the age of 12 years.

MENINGOCOCCAL SURVEILLANCE

For some years a national surveillance scheme to monitor the changing sensitivity of *Neisseria gonorrhoeae* to antimicrobial agents has been coordinated from the Microbiology Department of The Prince of Wales Hospital.

It has been suggested that a similar scheme be started for *Neisseria meningitidis*. A number of reports of meningococci with decreased penicillin, rifampicin and quinolone sensitivity has appeared and sulphonamide resistance is a well-recognised phenomenon. We will therefore be monitoring the antibiotic susceptibility of meningococci to those agents used for therapeutic and prophylactic purposes and would be grateful to receive your isolates. The number of strains of meningococci isolated in any one laboratory is usually very low, but, as with the gonococci, consolidation of data from a wide variety of sources should provide a more complete picture.

Additionally, and again as for gonococci, subtyping of strains of meningocci will be undertaken to assist in the distinction between sporadic and clustered cases of meningococcal disease. Associate Professor Rosemary Munro of Liverpool Hospital will coordinate this aspect of the program.

Strains may be sent to The Prince of Wales or Liverpool Hospital Microbiology Departments in the first instance. If you have any problems or questions, we may be contacted on (02) 399 4084.

J.W. Tapsall, Microbiology Department, Prince of Wales Hospital

ANTIBIOTIC SENSITIVITY OF GONOCOCCI IN SYDNEY AND NSW

The antibiotic sensitivity of 127 strains of *Neisseria gonorrhoeae* was examined by the Gonococcal Reference Laboratory in the third quarter of 1993. There was a marked reduction in the number of isolates examined when compared with the corresponding period in 1992, when 180 strains were received from the same sources. (No reduction in numbers of isolates received was observed in the preceding two quarters).

The predominance of gonococcal infections in males remains (M:F - 8.8:1) but is less than in recent reports.

The patterns of antibiotic resistance are little changed from previous quarters, except that no TRNG were found in this period. All strains were again sensitive to Ceftriaxone and Spectinomycin. Resistance to the penicillins (PPNG + CMRNG) is about the same at 17 per cent of isolates. Data on acquisition of PPNG are still being obtained but locally acquired infections with PPNG were again noted. Three per cent of strains showed decreased sensitivity to Ciprofloxacin. These patients were infected in the Philippines or were direct contacts of returning travellers.

J.W. Tapsall

NON-NOTIFIABLE STD SURVEILLANCE

Donovanosis is manifested by characteristic slow-growing granulomatous ulcers, caused by infection with *Calymmatobacterium granulomatis*. It is regarded as mildly infectious and readily responds to treatment. The roles of different modes of transmission have not been completely

TABLE 5

INFECTIOUS DISEASE NOTIFICATIONS BY SELECTED MONTH OF ONSET FOR 1993

Condition	Month				
	Jul	Aug	Sep	Oct	Total
Adverse event after immunisation	–	2	4	1	7
AIDS	29	27	10	7	73
Arboviral infection	10	8	6	2	26
Brucellosis	–	1	1	–	2
Foodborne illness (NOS)	3	2	14	–	19
Gastroenteritis (instit.)	14	9	19	1	43
Gonorrhoea	24	32	10	7	73
H influenzae epiglottitis	2	4	–	–	6
H influenzae meningitis	6	6	3	–	15
H influenzae septicaemia	2	3	1	–	6
H influenzae infection (NOS)	2	–	3	–	5
Hepatitis A – acute viral	46	37	35	14	132
Hepatitis B – acute viral	10	4	6	1	21
Hepatitis B – unspecified	328	337	289	58	1,012
Hepatitis C – acute viral	3	2	2	2	9
Hepatitis C – unspecified	552	577	442	106	1,677
Hepatitis D – unspecified	2	1	1	1	5
Hepatitis, acute viral (NOS)	1	1	1	–	3
HIV infection	79	73	45	34	231
Legionnaires' disease	2	3	3	1	9
Leprosy	–	1	–	–	1
Leptospirosis	1	1	1	–	3
Listeriosis	1	–	–	5	6
Malaria	4	20	14	–	38
Measles	83	173	352	208	816
Meningococcal meningitis	4	13	15	6	38
Meningococcal septicaemia	4	8	2	4	18
Meningococcal infection (NOS)	2	1	1	–	4
Mumps	–	1	4	–	5
Mycobacterial – atypical	21	7	2	–	30
Mycobacterial tuberculosis	29	24	8	2	63
Mycobacterial infection (NOS)	3	5	10	4	22
Pertussis	92	114	121	47	374
Q fever	39	39	25	8	111
Rubella	18	36	65	30	149
Salmonella (NOS)	38	37	19	14	108
Salmonella bovis morbificans	2	3	1	–	6
Salmonella typhimurium	15	7	12	2	36
Syphilis	68	73	35	9	185
Tetanus	–	1	–	–	1
Tuberculosis – non active	3	3	7	2	15
Typhoid and paratyphoid	–	–	2	3	5
Total	1,542	1,696	1,591	579	5,408

defined, however, cases in adults are generally associated with sexual exposure and cases in young children have been attributed to person-to-person contact.

Donovanosis is very uncommon in North America and Europe, but common in many tropical and sub-tropical countries. It has been reported as endemic among Aboriginals in the Northern Territory.

SCHOOL ABSENTEE RATE SURVEILLANCE

GP sentinel surveillance is continuing through the year in Public Health Units (PHUs), but outside the influenza season it will not be reported in the *Public Health Bulletin*. Surveillance of school absentee rates will be presented instead. These are being monitored in five PHUs, in a total of 12 schools covering urban and rural areas of NSW. Data presented in Figure 3 are for the period to the beginning of the September/October school holidays. The graph shows that the State average of the school population absent each day reached a high of 8.5 per cent in August and had fallen to 5.5 per cent by the end of September.

TABLE 6

SUMMARY OF NSW INFECTIOUS DISEASE NOTIFICATIONS OCTOBER 1993

Condition	Number of cases notified			
	Period		Cumulative	
	Oct 1992	Oct 1993	Oct 1992	Oct 1993
Adverse reaction	–	1	30	23
AIDS	29	7	278	227
Arboviral infection	9	2	328	598
Brucellosis	–	–	2	4
Cholera	–	–	–	–
Diphtheria	–	–	–	–
Foodborne illness (NOS)	6	–	171	99
Gastroenteritis (instit.)	25	1	405	229
Gonorrhoea	42	7	319	262
H influenzae epiglottitis	5	–	42	30
H influenzae B – meningitis	10	–	92	47
H influenzae B – septicaemia	1	–	24	20
H influenzae infection (NOS)	3	–	27	13
Hepatitis A	79	14	474	463
Hepatitis B	293	59	2,798	2,734
Hepatitis C	442	108	3,615	4,269
Hepatitis D	1	1	6	10
Hepatitis, acute viral (NOS)	2	–	15	7
HIV infection	50	34	601	439
Hydatid disease	–	–	5	1
Legionnaires' disease	2	1	87	49
Leprosy	–	–	5	1
Leptospirosis	–	–	19	12
Listeriosis	2	5	15	11
Malaria*	12	–	132	77
Measles	111	208	439	1,124
Meningococcal meningitis	14	6	74	62
Meningococcal septicaemia	1	4	13	32
Meningococcal infection (NOS)	1	–	10	9
Mumps	–	–	20	6
Mycobacterial tuberculosis	26	2	359	217
Mycobacterial – atypical	16	–	438	214
Mycobacterial infection (NOS)	3	4	27	53
Pertussis	29	47	149	623
Plague	–	–	–	–
Poliomyelitis	–	–	–	–
Q fever	22	8	184	297
Rubella	76	30	166	308
Salmonella infection (NOS)	61	16	741	686
Syphilis	74	9	834	524
Tetanus	–	–	2	5
Typhoid and paratyphoid	–	3	27	19
Typhus	–	–	–	–
Viral haemorrhagic fevers	–	–	–	–
Yellow fever	–	–	–	–

* from Malaria Register

FIGURE 3

SCHOOLS SURVEILLANCE INFLUENZA 1993

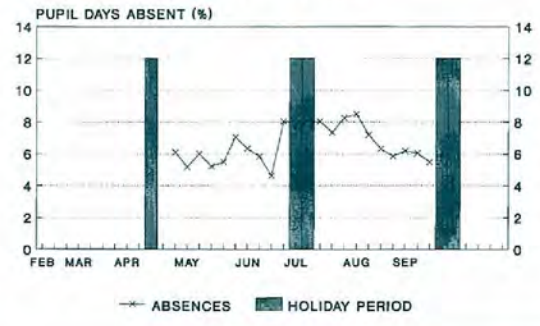


TABLE 7

INFECTIOUS DISEASE NOTIFICATIONS BY PUBLIC HEALTH UNIT CUMULATIVE 1993

Condition	CSA	SSA	ESA	SWS	WSA	WEN	NSA	CCA	ILL	HUN	NCR	NER	OFR	CWR	SWR	SER	U/K	Total
Adverse event after immunisation	1	3	1	–	6	–	1	–	–	2	–	2	–	5	2	–	–	23
AIDS	38	7	79	12	12	7	27	2	2	2	25	1	2	4	7	–	–	227
Arboviral Infection	1	1	2	1	1	3	3	1	1	28	54	27	104	13	354	4	–	598
Brucellosis	1	1	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	4
Foodborne Illness (NOS)	6	3	–	17	23	10	–	2	6	–	–	2	11	14	5	–	–	99
Gastroenteritis (Instit)	64	6	–	9	13	4	–	21	–	39	–	17	4	20	32	–	–	229
Gonorrhea	43	16	98	12	15	4	20	5	3	6	11	7	12	6	1	3	–	262
H. influenzae epiglottitis	1	7	1	–	–	2	4	1	2	2	2	2	1	–	2	3	–	30
H. influenzae meningitis	3	4	–	7	3	3	5	2	7	1	3	3	1	3	1	1	–	47
H. influenzae septicaemia	1	3	1	8	1	–	1	–	1	2	–	2	–	–	–	–	–	20
H. influenzae infection (NOS)	–	–	2	–	2	1	3	2	–	2	–	–	1	–	–	–	–	13
Hepatitis A – acute viral	42	19	37	42	107	19	42	10	15	12	42	50	6	5	11	4	–	463
Hepatitis B – acute viral	6	5	18	1	8	1	–	–	–	–	27	4	–	–	2	2	–	74
Hepatitis B – unspecified	424	342	–	764	430	34	392	34	37	64	50	34	16	12	18	9	–	2,660
Hepatitis C – acute viral	1	–	–	–	3	–	–	2	1	–	2	5	1	1	–	3	–	19
Hepatitis C – unspecified	596	316	527	427	459	99	458	194	235	340	277	74	24	62	100	62	–	4,250
Hepatitis D – unspecified	2	1	3	–	1	–	–	–	1	1	–	1	–	–	–	–	–	10
Hepatitis, acute viral (NOS)	–	–	2	–	–	–	–	–	–	1	–	1	1	2	–	–	–	7
HIV infection	60	12	171	16	11	9	31	8	3	12	10	1	1	–	2	1	91	439
Hydatid disease	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Legionnaires' disease	9	1	–	13	13	–	3	1	3	2	1	–	1	–	1	1	–	49
Leprosy	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1
Leptospirosis	–	–	–	–	–	–	–	–	–	2	4	2	1	–	3	–	–	12
Listeriosis	2	–	–	2	2	–	1	–	–	4	–	–	–	–	–	–	–	11
Malaria	4	3	9	1	10	1	20	2	3	10	1	7	2	–	3	1	–	77
Measles	88	77	21	107	442	123	37	25	52	40	21	8	52	5	18	8	–	1,124
Meningococcal meningitis	2	4	4	8	10	1	3	3	2	3	6	3	3	2	1	7	–	62
Meningococcal septicaemia	4	6	1	1	2	3	4	–	2	2	2	3	1	–	–	1	–	32
Meningococcal infection (NOS)	–	–	1	–	–	–	1	2	1	1	–	–	2	1	–	–	–	9
Mumps	1	1	–	2	–	–	–	–	1	1	–	–	–	–	–	–	–	6
Mycobacterial – atypical	47	14	15	9	25	4	24	3	8	29	21	8	1	1	4	1	–	214
Mycobacterial tubercolosis	31	33	12	34	37	6	28	5	5	13	2	2	3	5	–	1	–	217
Mycobacterial infection (NOS)	11	1	1	1	3	–	15	4	8	2	3	1	1	–	2	–	–	53
Pertussis	26	45	62	75	77	37	109	9	31	23	35	14	30	39	5	6	–	623
Q fever	–	1	1	1	4	–	1	–	1	21	59	93	83	12	4	16	–	297
Rubella	7	15	12	21	53	28	24	5	10	18	27	68	–	4	6	10	–	308
Salmonella (NOS)	21	44	48	36	21	6	55	26	11	64	48	37	25	5	11	9	–	467
Salmonella bovis morbificans	1	3	2	–	2	–	3	–	–	10	–	–	–	1	1	–	–	23
Salmonella typhimurium	18	25	18	17	15	10	18	2	1	22	7	8	15	3	11	6	–	196
Syphilis	73	32	68	130	21	7	27	5	6	7	38	33	63	4	7	3	–	524
Tetanus	–	1	–	–	–	–	–	–	–	–	2	–	1	–	–	1	–	5
Typhoid and paratyphoid	1	2	4	1	1	2	2	–	–	1	2	–	–	3	–	–	–	19

TABLE 8

NOTIFICATIONS OF NON-NOTIFIABLE SEXUALLY TRANSMITTED DISEASES JANUARY-OCTOBER 1993
(Diagnoses from sexual health centres unless otherwise stated in footnote)

AHS Infection		CSA[1]	SSA[1]	ESA[1]	SWS[1]	WSA[2] + WEN	NSA[3]	CCA[3]	ILL[4]	HUN[1]	NCR[1]	NER[3]	OFR[1]	CWR[5]	SWR[6]	SER[7]
Chlamydia trachomatis	Male	1	2	64	3	23	2	–	8	11	2	4	13	–	10	
	Female	1	4	52	6	16	1	1	4	32	2	10	13	–	24	
	Total	**2**	**6**	**116**	**9**	**39**	**3**	**1**	**12**	**43**	**4**	**14**	**26**	**–**	**34**	**4**
Donovanosis	Male	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Female	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Total	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**
*Genital herpes	Male	8	12	222	3	35	12	6	7	21	3	2	3	–	2	
	Female	8	6	143	2	18	3	6	8	24	4	5	5	–	13	
	Total	**16**	**18**	**365**	**5**	**53**	**15**	**12**	**15**	**45**	**7**	**7**	**8**	**–**	**15**	**3**
*Genital warts	Male	27	61	490	57	155	27	22	62	93	34	16	20	–	–	
	Female	19	49	214	24	65	16	14	25	37	20	15	15	–	–	
	Total	**46**	**110**	**704**	**81**	**220**	**43**	**36**	**87**	**130**	**54**	**31**	**35**	**–**	**–**	**15**
Nongonococcal urethritis	Male	9	9	525	11	279	11	11	52	69	16	4	13	–	1	
	Female	1	–	–	3	3	4	5	–	–	4	–	1	–	–	
	Total	**10**	**9**	**525**	**14**	**282**	**15**	**16**	**52**	**69**	**20**	**4**	**14**	**–**	**1**	**–**
Lymphogranuloma venereum	Male	–	–	–	–	–	–	–	–	–	–	–	–	–		
	Female	–	–	–	–	–	–	–	–	–	–	–	–	–		
	Total	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	

* First diagnosis; 1. 01/01/93-31/08/93; 2. 01/01/93-31/07/93; 3. 01/01/93-30/09/93; 4. 01/01/93-30/06/93; 5. No SHC in Region;
6. No SHC in Region. Laboratory data 01/01/93-30/09/93; 7. No SHC in Region. Data from GP network 01/01/93-24/10/93.

INVESTIGATION OF HEPATITIS A CASES IN A SINGLE STREET

Louise McDonnell and Anthony Capon
Western Sector Public Health Unit

Between February and April 1993 the Western Sector Public Health Unit was notified of eight cases of hepatitis A. All cases were resident in the same street in a western suburb of Sydney. The first case was notified in February and the other seven cases were notified during the first week in April. All had clinical disease and were positive for hepatitis A IgM antibody.

INVESTIGATION AND PUBLIC HEALTH ACTION

On Friday, April 2, 1993 a member of the public telephoned the Public Health Unit and expressed concern about a possible "outbreak of hepatitis" in a street in western Sydney. Our surveillance records showed one case of hepatitis A in a resident of the street, notified in February. The case was a five-year-old female. The PHU had followed up the case at the time. All family members and close contacts had been advised to have normal (human) immunoglobulin (IG).

The same afternoon a general practitioner in the area notified the PHU of a case of hepatitis A. The case was the father of the five-year-old notified in February. He had not received normal (human) immunoglobulin (IG) at the time of his daughter's illness. The reason for the omission of IG is unclear.

The GP reported one other possible case of hepatitis A, a resident of the same street, awaiting serological confirmation. The street was a cul-de-sac in a new housing estate. Both adults and children in the street socialised extensively with each other. The area is known to be socioeconomically disadvantaged.

Our immediate response was to inform other GPs in the area. We asked them to report any further cases and to review their IG supplies. We recommended IG for all household members and any other close contacts[1].

Over the following five days a further six cases were confirmed (Table 9):

- a 24-year-old woman and her 27-year-old de-facto husband who frequently socialised with the father of the index case;
- a 24-year-old female whose children played with the index case; and
- three children aged 5, 7 and 10 years from one family who regularly played with other children in the street, including the index case.

The homes of all the cases were in close proximity (Figure 4).

On Tuesday, April 6 we visited all homes in the street. We advised residents to receive IG from their GP. We left letters at homes which were unattended.

We interviewed cases to determine possible sources of infection. In December 1992 the house where the first two cases lived had reported sewage problems to the Housing Commission. A blocked drain had caused effluent to discharge into the house and soak the carpets. This occurred regularly until the Housing Commission repaired the plumbing several weeks later. No plumbing problems have occurred since.

DISCUSSION

Although foodborne and waterborne outbreaks of hepatitis A do occur in Australia, person-to-person transmission is probably the most common of mode spread[2]. This is usually

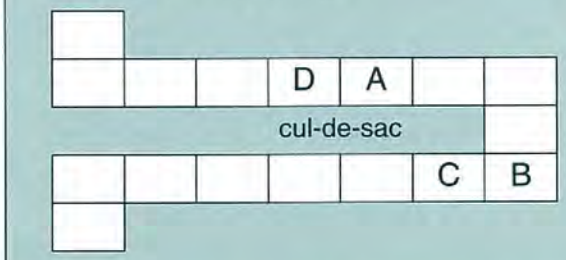
TABLE 9

NOTIFIED HEPATITIS A CASES IN ONE STREET, JANUARY-APRIL 1993

CASE NUMBER	AGE (YEARS)	SEX	DATE OF ONSET	HOUSE
1	5	Female	21/1/93	A
2	30	Male	13/3/93	A
3	27	Male	17/3/93	B
4	24	Female	29/3/93	B
5	24	Female	1/4/93	C
6	10	Female	4/4/93	D
7	7	Female	6/4/93	D
8	5	Female	6/4/93	D

FIGURE 4

STREET PLAN OF THE NEIGHBOURHOOD WHERE THE CLUSTER OF CASES OF HEPATITIS A OCCURRED



through poor hygiene practices, such as inadequate hand washing. The hepatitis A virus can be transferred from hands to environment, where it can persist for several days[3].

Hepatitis A has an incubation period of 15-50 days with a mean of 28 days[4]. The distribution of cases in this cluster is suggestive of person-to-person transmission, rather than a point source of infection. All cases had contact with either another case of hepatitis A or a child of a case. It is likely some transmission occurred through asymptomatically infected children. Fewer than 5 per cent of children below three years and 10 per cent of children between four and six years of age with hepatitis A will develop symptoms[5]. Cases of hepatitis A in parents of asymptomatic children are often the first indication of outbreaks in child care centres.

It is uncertain how the first case acquired hepatitis A. The child attended a local primary school but there were no other cases of hepatitis reported from the school. There was no known contact with day care centres. There is a possibility she became infected through contact with sewage infected with hepatitis A when the household had sewerage problems. Hepatitis A virus can be found at low levels in primary effluent, particularly in spring and summer.

There were no further cases of hepatitis A notified from the area.

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1. Infectious Diseases Manual, Infectious Diseases Section, Epidemiology and Health Services Evaluation Branch, NSW Health Department, second edition, 1993.
2. Hanna J. Hepatitis A outbreak in a rural town, Atherton Tablelands Queensland. *Communicable Disease Intelligence* 1993; 17(4):70-71.
3. Mbithi JN, Springthorpe VS, Boulet JR and Slatar SA. Survival of Hepatitis A virus on human hands and its transfer on contact with animate and inanimate surfaces. *J Clin Microbiol* 1992; 30:757-763.
4. Benenson AS (ed). *Control of Communicable Diseases in Man*; 15th edition. American Public Health Association. Washington DC 1990.
5. Hanna J. Hepatitis A in a Child Day-Care Centre. *Communicable Disease Intelligence* 1993; 17(4):73-75.
6. Personal communication, G. Grohmann, Water Board.

IMMUNISATION CENSUS OF THE 1992 SCHOOL INTAKE IN CENTRAL AND SOUTHERN SYDNEY

Kerrie Goldston, Mark Bek and Clare Nixon,
Central and Southern Sydney Public Health Units.

This report presents results of an immunisation survey ('census') of all children starting infant school (Kindergarten, Year 1, Year 2) in the Central and Southern Sydney Health Areas. The census was conducted by the Public Health Unit for Central and Southern Sydney in collaboration with the community health services of each Area, after a request from the NSW Health Department.

An aim of the census was to provide baseline information for use in evaluation of the Public Health (Amendment) Act, 1992. This Act seeks to increase childhood immunisation rates by requiring parents to provide documented evidence of a child's immunisation status on enrolment to all child-care centres, pre-schools and schools from 1994.

An important limitation of the data presented in this report, however, is that they are based only on parental recall. The accuracy of this information is unknown. Parents from non-English speaking backgrounds, in particular, have often been found by the PHU to be unsure of their children's vaccination history.

METHODS

Data collection for the census was undertaken by child health nurses (CHNs), who traditionally collect information on immunisation together with other health information on children when they start school.

Southern Sydney (Canterbury, St George and Sutherland districts)

The PHU provided a survey form to CHNs in the Southern Sydney Area for entering summary data for each school in their area. This was returned to the PHU for collation.

Information on follow-up action for those children with inadequate immunisation histories was also provided by the CHNs working in the Sutherland and Canterbury districts.

The St George district employed a different system which did not provide information on non-kindergarten children or follow-up activities.

Central Sydney

CHNs also collected data using the form provided by the PHU. The community health service employed a computer system at RPAH to collate and analyse the data collected by CHNs, and has forwarded some results to the PHU. Unfortunately, due to technical difficulties with the system, many of the data were in error or missing and could not be interpreted.

RESULTS

Southern Sydney

Table 10 shows the proportion of children starting school in 1992 who were fully immunised (i.e. 4 x DTP, 4 x OPV, 1 x MMR or MM, 1 x CDT) in each of the three districts of Southern Sydney. Follow-up action by the CHNs resulted in another 3-5 per cent becoming fully immunised in the Sutherland and Canterbury districts.

Table 11 shows the same results for only those children starting kindergarten.

Central Sydney

Unfortunately there is much missing data from the Central Sydney Area. Table 12 shows what information is available for both kindergarten starters and all school starters.

TABLE 10

1992 CENSUS RESULTS FOR INFANT SCHOOL STARTERS IN THE SOUTHERN SYDNEY AREA

District	No. schools surveyed	No. children fully immunised	No. children surveyed	Proportion fully immunised (%)
Canterbury	24	2,925	3,484	84.0
St George*	52	1,580	1,862	84.9
Sutherland	51	3,066	3,231	94.8
Total	127	7,571	8,577	88.3

* Kindergarten starters only. This survey, however, did assess rates for individual immunisations as follows: all of DTP and OPV (98.8%); MMR or MM (95.3%); pre-school CDT (90.9%).

TABLE 11

1992 CENSUS RESULTS FOR KINDERGARTEN STARTERS IN THE SOUTHERN SYDNEY AREA

District	No. schools surveyed	No. children fully immunised	No. children surveyed	Proportion fully immunised (%)
Canterbury	–	1,203	1,448	83.1
St George	51	1,580	1,862	84.9
Sutherland	–	2,439	2,581	94.8
Total	–	5,222	5,991	87.2

TABLE 12

1992 CENSUS RESULTS FOR INFANT SCHOOL STARTERS IN THE CENTRAL SYDNEY AREA

Variable	Kindergarten starters	All school starters
No. of schools surveyed	–	50*
No. children fully immunised	626	1,028
No. children not fully immunised	161	293
No. children with missing information	116	738
No. children surveyed	903	2,059
Proportion of children with missing information	12.8%	35.8%
Minimum proportion fully immunised	69.3%	49.9%
Maximum proportion fully immunised	82.2%	85.8%
Estimated proportion fully immunised#	79.5%	77.8%

* Data from 12 schools excluded due to missing information.
\# Proportions among known groups extrapolated to those with missing data.

DISCUSSION

The high immunisation rates in the Sutherland district of Southern Sydney accord with the low rates of childhood infectious diseases reported from this district to the PHU. Higher rates of these diseases were reported to the PHU from the St George and Canterbury districts of Southern, as would be expected by their lower immunisation rates. The CHNs who collected data from Canterbury asked that these data be regarded with caution as the high number of parents from non-English speaking backgrounds made much of the data unreliable. They believed immunisation

NEWS AND COMMENT

NSW HEALTH OUTCOMES PROGRAM FUNDED PROJECTS

The NSW Health Department invites proposals for funding for projects which show how an outcome-oriented approach to the planning, implementation and evaluation of public health and clinical services can produce measurable improvements in health outcomes.

In 1992-93 the Department funded health outcomes projects in cardiovascular disease, diabetes, critical care, injury, tuberculosis, immunisation, Aboriginal health, information system development and pregnancy outcomes. While these priorities remain, the Department seeks proposals in other areas, especially mental health, aged care and community health.

Proposals which bring clinicians, managers, consumers and public health professionals together to identify priority indicators and plan the use of appropriate indicator information are particularly sought. Proposals for workshops to identify minimum datasets and action plans to implement outcome-oriented approaches are encouraged.

Projects to be funded in 1993-94 should cover one or more of the following:

- development of clinical data systems with the potential to produce standardised outcome information throughout NSW by 1995;
- application of outcome and/or cost-effectiveness information to improve health service provision; and
- development and application of methods for outcome evaluation of health technologies, procedures or services.

Preference will be given to projects which:

- build on existing work in the development of outcome indicators;
- provide information to health outcomes councils in Area or District Health Services;
- promote collaboration among different sectors of the health system; e.g. public health and clinical services;
- involve consumers in the evaluation of health outcomes and the use of outcome data in decision making;
- show evidence of consultation and collaboration among clinicians, health service administrators, public health specialists and consumers; and
- include the development and/or implementation of standardised information systems, procedures and practices suitable for ready adoption in multiple sites in NSW.

Projects must be completed by January 1995. To obtain a copy of an application kit, telephone (02) 391 9219, or send a request by facsimile to (02) 391 9232. Closing date for applications is December 20, 1993.

Inquiries may be directed to Dr George Rubin, Director, Epidemiology and Health Services Evaluation Branch, telephone (02) 391 9191.

BEE STING WARNING

The NSW Apiarists' Association has issued advice about bee stings. Secretary Fred Benecke has warned that using insect repellants when going near bees will usually ensure a severe stinging, because repellants can make bees aggressive. He also said the way to remove a bee sting is to scrape it off, usually with a fingernail. The nail slips in under the venom sack and removes it without allowing any more venom into the puncture made by the barbed sting. The affected area should be washed, as venom on the skin may attract other bees.

REHABILITATION AND PAIN MANAGEMENT CONGRESS

The International Federation of Physical Medicine and Rehabilitation will hold its 12th world congress from March 27 to 31 in Sydney, in conjunction with the annual scientific meetings of the Australasian Faculty of Rehabilitation Medicine (RCAP), the Australian Pain Society and the New Zealand Pain Society. For information about the congress contact the IFPMR Secretariat, PO Box 629, Willoughby NSW 2068. Telephone (02) 417 8525; Facsimile (02) 417 8513.

Immunisation census

► *Continued from page 130*

rates may be much lower in children of these families. The PHU's experience supports this view after a large outbreak of measles occurred in this district in November-December 1992, during which most children seen did not have records of immunisation against measles.

While much information obtained from Central Sydney is missing, useful statistics were able to be derived: the maximum and estimated proportions of children who were fully immunised. The maximum rates are much lower than the results obtained for Southern Sydney and low by Australian standards. The estimated rates are even lower and, if close to the true values, reveal a situation which is clearly inadequate. The PHU experience with measles outbreaks in the Area (February-March 1991, April 1992, December-January 1993) and the high number of measles cases reported in the Area for 1992 (54) also suggest that immunisation rates are low.

Introduction of compulsory documentation of immunisation in 1994 will not only facilitate accurate assessment of immunisation rates but will also encourage parents to regard childhood immunisations as an important issue.

Conclusion

Based on parental recall, rates of children fully immunised at school entry in 1992 were found by this census to be 88.3 per cent in the Southern Sydney Area and were estimated at 77.8 per cent in the Central Sydney Area. The central Sydney rates had to be estimated due to substantial amounts of missing data (the estimate is not highly reliable). In addition, there was concern about the accuracy of data based on parental recall.

Acknowledgement

We thank the child health nurses of Central and Southern Sydney Areas for providing the data for this census.

YELLOW FEVER IMMUNISATION CLINICS

AREA	DOCTORS	ADDRESS
CENTRAL SYDNEY	R Marr J Gambrill F Robinson L Brennan	687 Darling St, Rozelle 2039
	D Chambers L Mann J Blazel J Fletcher	93 Balmain Rd, Leichhardt 2040
	P Kirby F Ross S Knowlden M Stewart	19 Edgeware Rd, Enmore 2042
SOUTHERN SYDNEY	HL Thompson M McGarrity J Rifi	53 Railway Pde, Lakemba 2195
	L Edwards B Pearson M Hidi M Eisenberg A Rose	80 Penshurst St, Penshurst 2222
	P Malouf L Phillips E Harrison	258 Box Rd, Sylvania 2224
EASTERN SYDNEY	J Cottrell-Dormer	Qantas Travel Medical Centre, Cnr George and Jamison Sts, Sydney 2000
	I Morrison	Qantas Travel Medical Centre, 203 Coward St, Mascot 2020
	M Hu	Travellers Medical & Vaccination Centre, 428 George Street, Sydney 2000
	B Tan	Overseas Travel Vaccination Centre, 669-673 Anzac Parade, Maroubra Junction 2035
AUSTRALIAN GOVERNMENT HEALTH SERVICE		120 Sussex Street Sydney 2000
SOUTH WESTERN SYDNEY	SN Un D Tang J Chen	23 Chamberlain Street, Campbelltown 2560
	NC Patel KK Amin SN Patel	693 The Horsley Drive, Smithfield 2164
WESTERN SYDNEY	P Hay G Hayunga	269-271 Old Northern Rd, Castle Hill 2154
	M Johnston P Sternhill V Leonov	161 Hawkesbury Rd, Westmead 2145
	J Miller D Lee I Motala J Barber J Whyte M Nelson-Marshall RS Elliot R Jay GR Morgans B McDonald	269-271 Old Northern Rd, Castle Hill 2154
	P Cavanagh S Farina D Flanigan J Skalle	33 Rembrandt Street, Carlingford 2118
AUSTRALIAN GOVERNMENT HEALTH SERVICE		Level 3, 2-12 Macquarie Street Parramatta 2150
NORTHERN SYDNEY	DC Dawkins CM Schnitzler R Gordon H Lunzer	3/303 Pacific Hwy, Lindfield 2070
	DA Roper OE Scaramuzzi L Williams	Thornleigh Medical Centre, 92 The Esplanade, Thornleigh 2120
	ME Armstrong DC Wynter D Machin CM Turner	30 Oaks Ave, Dee Why 2099
	J Fisher M Ling Ho J Gordon	Crows Nest Medical Practice 134 Willoughby Road, Crows Nest 2065
	C Turner J Marlay P Middleton M Goyen	
CENTRAL COAST	D Knox P Hogbin S Kenny R Feather	22 Brougham Street, East Gosford 2250
	H Oxley N Smith G McCarthy J Ambrose	Wyong Medical Centre, Margaret Street Wyong 2259
	J Adams L Randsom J Schulze	29 Hills Street, Gosford 2250
	R Lee J Harris M Stone C Ford	Central Coast Fair Medical Centre, Erina 2250
ILLAWARRA	DM Hillyar BM Knott GN Fisher G Smith	Fitzwilliam Street, Port Kembla 2505
HUNTER	J Kochanski C Grace	14 Watt St, Newcastle 2300
	B Hardie L Marsh S Manners S Wood	52 Ridley St, Charlestown 2290
	V Duffy G Hayes H Willoughby	Shop 26, Elermore Vale Shopping Centre, Elermore Vale 2287
	P Hopkins D Leeder C Marley P Hodgins	133 King St, Newcastle 2300
NORTH COAST	J Kempler	Lismore Area Pathology Service, 76 Uralba St, Lismore 2480
NEW ENGLAND	S Howle P May L Trichard D Rutherford	131 Marius Street, Tamworth 2340
	N Pain P Bookalil E Baker J Waters	161 Rusden Street, Armidale 2350
	K Sheils P Fowler D Keegan C Larkin	54 Wynter Street, Taree 2430
CENTRAL WEST	W Muggridge M Adamski P Davidson L Baker B Wright A Watt J McLaren J Watt W McLaren	165 Kendal Street, Cowra 2794
	K Hazelton J Gilchrist J Ross	92 Dalton Street, Orange 2800
	J Blackwood R Medbury A McCreery	123 Howich Street, Bathurst 2795
SOUTH WEST	P Love	Albury Base Hospital, Wodonga Place, Albury 2640
	F Reed J McAlpine	61 Fitzroy Street, Tumut 2720
SOUTH EAST	A Egan G Wallace V Carroll C Corr A Fenwick	62 Bombala Street, Cooma 2630