



Epidemiology Division

Epidemiology & Surveillance Unit

BACKGROUND

The Epidemiology and Surveillance Unit facilitates communication and data sharing between the National and Provincial Department of Health Expanded Programme on Immunisation (EPI) and the NICD. The Unit co-ordinates the “viral-watch” respiratory virus surveillance system and operates a surveillance system for tracking respiratory consultations in the private sector. The unit is involved in many collaborative projects and provides epidemiologic input to other NICD units. Unit staff are involved in numerous teaching and training activities and represent the NICD at quarterly national EPI Task Force meetings. The Unit is also responsible for publication of the quarterly Communicable Diseases Surveillance Bulletin.

Province are tested at the NHLS Universitas Academic Laboratory at the University of the Free State (UFS). The numbers presented here represent specimens received by the NICD and UFS and may differ from those presented by the National Department of Health as they may receive information on cases where no specimens were taken.

During 2007 there were 3230 suspected cases of measles on whom blood specimens were submitted to the laboratory; Of these 1938 had a urine specimen submitted. All provinces met the criteria for sufficient number of specimens collected, i.e. more than 2 suspected measles cases per 100 000/population with an overall figure of 6.8/100 000 population. However, 12 districts did not meet the criteria, i.e. one each in the Eastern Cape, Gauteng and Northern Cape, 2 in the Free State, and 7 of the 11 districts in KwaZulu-Natal. The case detection rate in 2007 was lower than in 2006 (14.0/100 000), when a large outbreak of rubella occurred which may have contributed to increased reporting that year.

ACTIVITIES, HIGHLIGHTS AND ACHIEVEMENTS

SURVEILLANCE PROGRAMMES

SUSPECTED MEASLES CASE-BASED SURVEILLANCE

The NICD is accredited by WHO to perform measles and rubella IgM testing for national case-based surveillance. Blood and urine specimens from suspected measles cases nationally are submitted to NICD for measles and rubella testing. Approximately 60% of suspected measles cases from Free State

Measles: There were 32 cases with positive measles IgM serology results in 2007 as compared to 81 cases in 2006, 9 were from Gauteng, and 6 from the Eastern Cape (Table 1). Ages of patients with positive measles IgM results ranged from 10 months to 34 years (median 5 years). Of the 32 IgM positive cases 14 (44%) had a urine specimen available for PCR testing, and of these 6 were confirmed on PCR. Genotypic analysis was possible on 4 cases which belonged to clade B, genotype B3.1. One patient had a history of vaccination 6 days before the onset of rash and sequencing

Table 1: Number and rate of suspected measles cases with specimens submitted and measles and rubella IgM positive cases from suspected measles case-based surveillance, South Africa, 2006 and 2007

	Year	Provinces									Total
		EC	FS	GA	KZ	LP	MP	NC	NW	WC	
Number of cases	2006	579	106	1542	829	1209	841	372	754	415	6647
	2007	602	70	605	421	407	354	143	221	407	3230
Cases/100 000 population	2006	11.1	3.6	16.8	8.5	21.3	25.9	40.9	19.6	8.7	14.0
	2007	8.5	2.4	6.2	4.3	7.6	9.8	13.0	6.6	8.4	6.8
Measles IgM positive	2006	4	0	24	5	4	9	5	29	1	81
	2007	6	1	9	3	2	6	0	2	2	31
Rubella IgM positive	2006	290	62	612	460	631	282	156	367	120	2980
	2007	293	20	141	213	119	60	36	65	118	1064

confirmed that the strain identified on PCR was vaccine virus. One additional case had a history of vaccination 2 weeks prior to the onset of rash but urine was not available for PCR. Ten of the measles IgM positive cases were also positive for rubella IgM.

Of 53 cases with equivocal measles IgM serology, 28 (53%) had urine specimens available for PCR testing. Two of these were identified as PCR positive for measles on urine specimens. The genotypes for these cases were also clade B, genotype B3.1.

Two cases from Mpumalanga were epidemiologically linked. Both cases were adults who resided in the same household. Preliminary investigation suggested that all other cases were sporadic importations; however, detailed epidemiologic data were not available to the laboratory for the majority of cases.

Rubella: There were 1064 rubella IgM positive cases reported in 2007; the largest number were from the Eastern Cape. Patients' ages ranged from 11 months to 54 years with a median of 6 years. 56 (5.3%) of the rubella IgM positive results were from females aged ≥ 12 years (Table 1).

The percentage of patients testing rubella IgM positive was highest (44.3%) in the 10-14 year age group, followed by that of the 5-9 year age group (30.2%) (Figure 1).

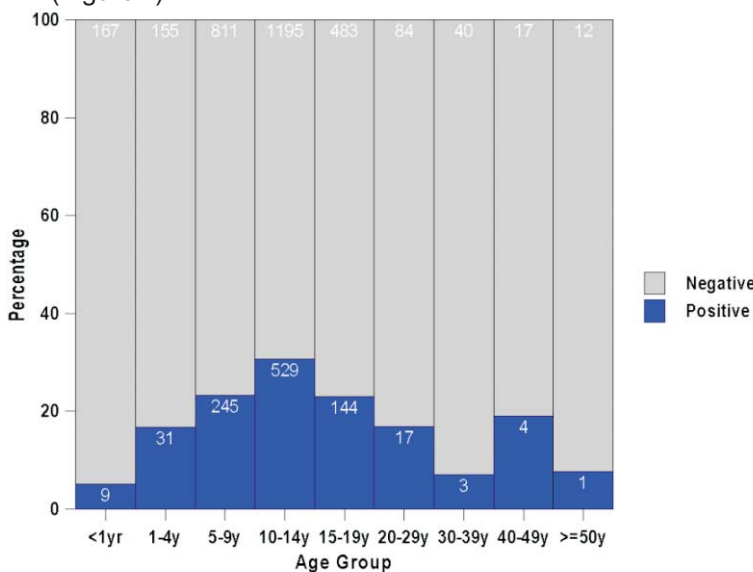


Figure 1: Percentage of specimens submitted for measles case-based surveillance testing rubella IgM positive per age group, South Africa, 2007 (inset numbers indicate the number of specimens testing positive and negative for rubella IgM respectively)

ACUTE FLACCID PARALYSIS SURVEILLANCE

Acute flaccid paralysis (AFP) surveillance, as part of the WHO worldwide campaign to eradicate poliomyelitis, has continued throughout the year. All cases of AFP including Guillain-Barré syndrome, in children less than

15 years of age, or a patient of any age diagnosed as polio by a medical doctor must be regarded as possible polio cases until proven otherwise.

The NICD serves as national isolation laboratory for South Africa as well as six other Southern African countries i.e. Angola, Botswana, Lesotho, Mozambique, Namibia, and Swaziland.

During the year 1753 stool specimens were received from patients with AFP from these seven countries. Of these 96 were from patients with onset of paralysis prior to 2007, or patients who were subsequently considered not to have AFP. Of the remainder, 550 specimens were from 266 South African cases, and 1107 from 577 cases from the six other countries served by the NICD (Figure 2).

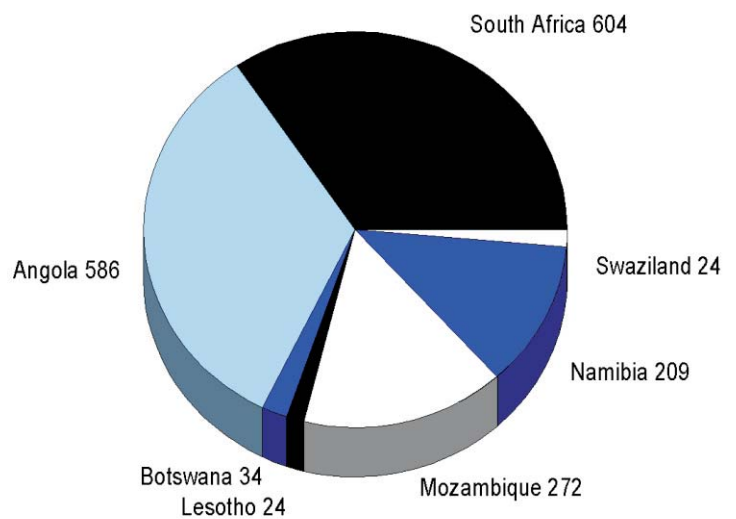


Figure 2: Number of stool specimens from AFP cases received for virus isolation by country

South Africa

A further 11 specimens were received in the first two weeks of January 2008 from patients with onset of paralysis in 2007. Case detection rate by province ranged from 1.1 to 4.0, with the overall rate being 1.8. The percentage of adequate stool specimens per province ranged from 66.8% to 91.3% with an overall rate of 78.6%. (Figure 3). Non-polio enteroviruses were isolated from 73 specimens, non-enteroviruses from a further 26 specimens and Sabin types 1, 2 and 3 from 23 specimens from 14 patients.

Other southern African countries

The majority of specimens received were from Angola i.e. 586 specimens from 293 patients. Wild type polio 1 was isolated from one or more specimen of 8 patients from Angola with onset of paralysis between 25 April and 8 July. With the exception of one patient from Benguela, all were from 4 districts in Luanda province. Non-polio enterovirus was isolated from 165 specimens, and non-enterovirus from a further 3. Poliovirus identified as Sabin virus was isolated from the specimens of 16 patients from Angola and 2 from Namibia.

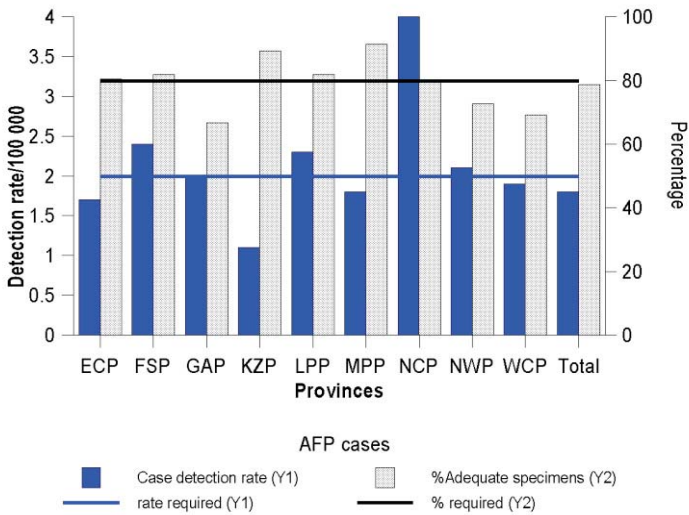


Figure 3: AFP case detection and stool adequacy rate, South Africa, 2007 (only patients from whom stool specimens were received included)

RESPIRATORY VIRUS SURVEILLANCE

“Viral watch” surveillance system

During 2007 a total of 1624 specimens were received for detection of respiratory virus. Of these 1439 (88.6%) were received from the Viral Watch programme, started in 1984 and expanded substantially in 2005. This programme was specifically designed to monitor the timing of influenza activity in the community, and detect the type of influenza strains prevalent. During 2007 sites were added in the Free State, Mpumalanga and Limpopo, bringing the total number of practitioners reporting to 141. Throat swabs are submitted from these centres throughout the year from patients with respiratory tract infections of recent onset i.e. within 48 - 72 hours, and without obvious bacterial cause, and transported to the laboratory in viral transport medium for isolation of virus. Specimens from Gauteng, Free State, Mpumalanga, Limpopo and the Eastern Cape are submitted directly to NICD,

whereas specimens from the Western Cape and KwaZulu-Natal are tested at the respective laboratories and positive specimens sent to NICD for confirmation, serotyping and sequencing.

A total of 533 influenza isolates were made, of which 511 (95.9%) were from the Viral Watch. The isolates were further identified as 390 influenza A, of which A H3N2 accounted for 215 (80.8%), and 143 influenza B, 76 (53%) of which were identified as B/Malaysia/2506/04-like (Figure 4).

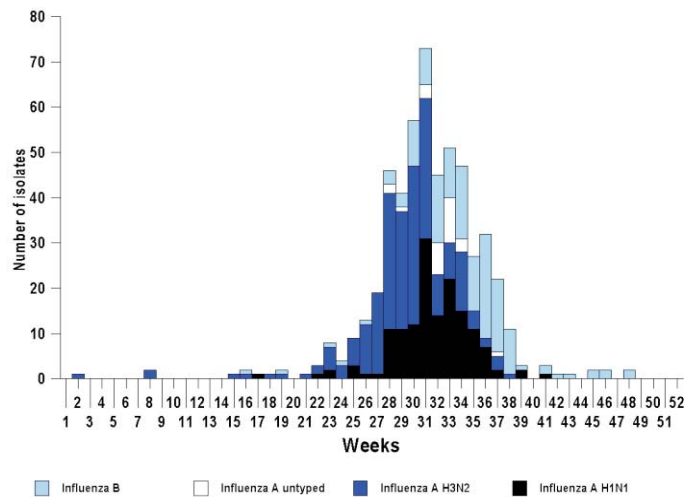


Figure 4: Number of influenza virus isolates by virus type and epidemiologic week, 2007

The 2007 season started later than the previous 2 years. After some sporadic isolates early in the year, the number of isolates started to increase substantially from the week starting 25 June, although the first isolate of the season was made from a specimen collected on 12 April. The season peaked in the week starting 30 July, and the number of isolates started decreasing from the week starting 10 September, with the last isolate of the year being made from a specimen collected on 29 November (Figure 4).

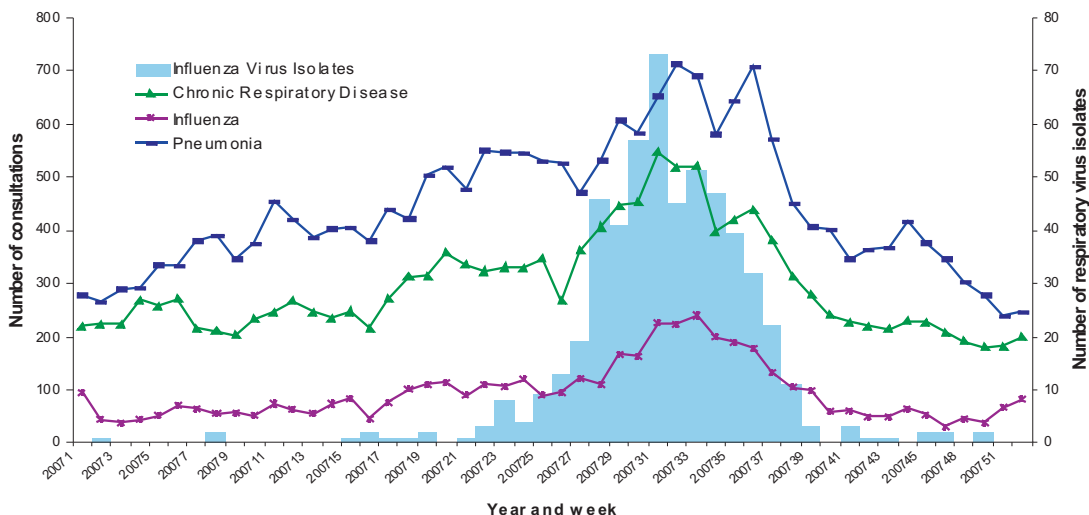


Figure 5: Number of consultations due to respiratory diagnoses of interest and influenza virus isolations by epidemiologic week, 2007

A further 60 respiratory isolates made during the year including 37 respiratory syncytial virus, 7 parainfluenza virus (4 type 1, 1 type 2, 3 type 3, 1 untyped), and 9 adenovirus.

Respiratory morbidity data mining surveillance system

During 2007 there were 1 039 256 consultations reported to the NICD through the respiratory morbidity data mining surveillance system. Of these 4635 (0.45%) were coded as due to influenza (ICD codes J10-11), 21578 (2.08%) were coded as pneumonia (ICD codes J12-18) and 14475 (1.39%) were coded as chronic respiratory disease (ICD codes J41-47). The timing of the peak in respiratory consultations was similar to the timing of the peak in influenza virus isolations (Figure 5).

DEPARTMENT OF HEALTH COLLABORATIVE ACTIVITIES

Dr Cohen is a member of the National Certification Committee for the Eradication of Polio and was involved in submission of the 2006 Annual Update Report Following Successful Presentation of the Complete Country Documentation for the Republic of South Africa to the Africa Region Certification Commission.

Sr McAnerney is a member of the secretariat of the National Polio Expert Committee and attended quarterly meetings of this committee.

Dr Cohen and Ms Cheyip attended the quarterly EPI Task Group Meetings and gave presentations on several topics related to the laboratory diagnosis of and surveillance for measles and polio as well as other EPI conditions.

Dr Cohen attended the Gauteng quarterly Communicable Diseases Meeting on 2 March and gave a presentation on "The laboratory diagnosis of measles".

Sr McAnerney was invited to give a talk on "Measles Surveillance" for the Gauteng Province Epidemic Preparedness and Response Training in Sandringham from 7-8 October 2007.

Dr Cohen participated in Provincial training to Outbreak Response Teams in Pandemic Influenza Preparedness in collaboration with the National Department of Health Communicable Diseases Directorate.

Dr Cohen and Ms Cheyip participated in the Pre-, Intra- and Post Campaign External Evaluation of the National Mass Vaccination Campaign for Measles and Polio in 2007 for Gauteng province (Figure 6).

Dr Cohen and Dr Blumberg were part of a team tasked with investigating recent malaria outbreaks in Limpopo Province and attended a meeting in Tzaneen from 24-27 July 2007.

Dr Cohen and Sr McAnerney were invited by the National Department of Health Communicable

Diseases Directorate to speak at the Epidemic-prone Infectious Diseases Symposium, Gauteng 30-31 August. Presentations made were on "Vaccine preventable Diseases" and "Seasonal Influenza Surveillance".



Figure 6: Epidemiology and Surveillance Unit staff participated in the Pre-, Intra- and Post Campaign External Evaluation of the National Mass Vaccination Campaign for measles and polio in 2007 for Gauteng Province.

RESEARCH PROJECTS

Age-specific prevalence of hepatitis B virus immunity and carriage in Eastern Cape Province 11 years after the introduction of universal infant vaccination

Dr C Cohen, Dr A Puren, Prof B Schoub, Ms B Singh, Mr M Masango. A protocol was developed to evaluate the age-specific prevalence of antibodies to hepatitis B virus surface antigen and the prevalence of surface antigen carriage in the Eastern Cape Province using residual sera from specimens submitted from suspected measles cases as part of case-based measles surveillance. Testing of specimens will begin in 2008.

Measles surveillance: Evaluation of a new laboratory testing algorithm at the National Institute for Communicable diseases, Johannesburg, South Africa

Dr Z Vundle, Dr C Cohen, Dr A Puren, Mr M Masanga, Dr S Smit, Sr J McAnerney. Dr Ziyanda Vundle, a Public Health Registrar from the University of the Witwatersrand conducted a project aiming to evaluate the value of sequential testing of blood and urine compared to serology testing for IgM alone, in the context of low measles incidence in South Africa. Dr Vundle analysed retrospective data on specimens submitted from suspected measles cases and collected additional data from all measles IgM positive and equivocal cases.

The re-emergence of rabies in Limpopo Province, South Africa: epidemiology and viral molecular characterization

Dr C Cohen^{1,2}, Mr B Sartorius^{1,2}, Dr C Sabeta³, Ms G Zulu, Dr J Paweska^{1,2}, Ms M Mogoswane⁴, Dr C Sutton⁵, Dr L Nel⁶, Prof R Swanepoel^{1,2}, Ms P Leman^{1,2}, Ms A Grobbelaar^{1,2}, Dr E Dyason⁷, Dr L Blumberg^{1,2}. ¹National Institute for Communicable Diseases of the National Health Laboratory Service, Johannesburg, ²University of the Witwatersrand, Johannesburg, ³Onderstepoort Veterinary Institute (OVI), Rabies Unit, Pretoria,

⁴Department of Health, Limpopo Province, ⁵Department of Paediatrics and Child Health, Polokwane/Mankweng Hospital Complex, University of Limpopo, ⁶Department of Microbiology and Plant Pathology, University of Pretoria, ⁷Department of Agriculture, Limpopo Province. Clinical, epidemiologic and viral molecular data from human rabies cases and epidemiologic and viral molecular data from animal rabies cases associated with the outbreak of rabies in Limpopo Province during 2006 were reviewed. Molecular genetic analysis indicated that outbreak virus strains were most closely related to recent canine strains from southern Zimbabwe. Delayed recognition of the human cases may have resulted from decreased clinical suspicion after many years of effective control of the disease and the occurrence of atypical clinical presentations in several patients.

GROUP FOR ENTERIC RESPIRATORY AND MENINGEAL PATHOGENS-SOUTH AFRICA (GERMS-SA) PROJECTS

The unit participated in the following collaborative projects with the National Microbiology Surveillance Unit (NMSU), Respiratory and Meningeal Pathogens Unit (RMPRU), Enteric Diseases Reference Unit (EDRU) and Mycology Reference Unit (MRU) as part of GERMS-SA:

Collection rates for blood culture and cerebrospinal fluid specimens and estimated burden of disease due to invasive respiratory, meningeal and enteric bacterial pathogens in South Africa. Ms M Cheyip, Dr C Cohen, Dr A von Gottberg, Dr N Govender, Dr K Keddy, Dr V Quan, Dr S Meiring. This study aimed to describe the correlation between rates of blood culture and cerebrospinal fluid specimens collected by province in 2005 and estimates of the burden of invasive disease from these specimens. A high correlation between the rate of specimen collected and the estimated incidence of reported invasive disease by province by the GERMS-SA surveillance system was found. Failure of clinicians to submit specimens for culture in certain provinces may lead to an underestimation of burden of disease.

Risk factors for trimethoprim-sulfamethoxazole resistance in *Streptococcus pneumoniae* causing invasive disease in South Africa 2003-2006. Mr P Hippner, Dr C Cohen, Dr A von Gottberg, Ms L de Gouveia. A research project was conducted by an MSc Epidemiology student from the University of the Witwatersrand, School of Public Health, Mr Piotr Hippner, to investigate risk factors for cotrimoxazole resistance in patients with invasive pneumococcal disease.

Vaccine-preventable invasive pneumococcal disease, South Africa, 2006. Dr A von Gottberg, Ms L de Gouveia, Dr V Quan, Dr S Meiring, Dr C Cohen, Dr A Whitelaw, Prof C Feldman, Dr A Karstaedt, Ms M Cheyip, Dr A Brink, Dr P Sein and Prof KP Klugman. Surveillance data were reviewed aiming to determine the potential coverage of different formulations of the

polysaccharide-protein conjugate vaccine (PCV). The 7 valent PCV (PCV-7) was licensed in South Africa in 2005. PCV-7 could potentially prevent 70% (418/593) of invasive pneumococcal disease in infants <1 years and 90% (254/281) of penicillin non-susceptible disease in this age group.

Comparison of paediatric and adult cryptococcal cases in South Africa Dr S Meiring, Dr N Govender, Dr V Quan, Dr C Cohen, Dr H Dawood, Dr A Karstaedt, Dr P Sein, Dr A Whitelaw and Dr K McCarthy - Cases of cryptococcosis in children (<13 years) and adults reported to a national laboratory-based surveillance programme between January 2005 and December 2006 were compared. Incidence rates in the general paediatric population (0.7/100000) were lower than the adult population (17/100000) in 2006. Median age at time of diagnosis was 6 years (range: 2 days-12 years) in children. More children were diagnosed by blood culture alone than adults (23/175, 13% vs. 436/9786, 4%, $p < 0.001$). *Cryptococcus gattii* was the causative pathogen in proportionately more children (9/105, 9%) than adults (227/7991, 3%) ($p = 0.003$). Where HIV status was known, a greater proportion of adults (2207/2224, 99%) than children (42/45, 93%) ($p = 0.007$) were HIV-infected.

Epidemiology of invasive pneumococcal disease in patients ≥ 65 years of age, South Africa, 2005 and 2006. Dr V Quan, Dr A von Gottberg, Dr S Meiring, Dr C Cohen, Ms L de Gouveia, Prof C Feldman, Dr A Karstaedt, Dr P Sein, Dr N Govender and Prof KP Klugman. This project aimed to describe the epidemiology of invasive pneumococcal disease (IPD) in patients ≥ 65 years old in South Africa. Although few cases had known HIV status, 63% of the elderly group with IPD were HIV-seropositive. More than a third of IPD cases were due to the PCV7 serotypes and potentially could be prevented by routine immunization of children with PCV7.

SURVEILLANCE PUBLICATIONS

The Unit is responsible for publication of the quarterly Communicable Diseases Surveillance Bulletin which aims to be a scientific publication for the regular dissemination of surveillance and outbreak data as well as relevant recent research from the NICD.

NICD TRAINING ACTIVITIES

An Epidemiology Discussion Group was established in 2007 aiming to bring NICD staff involved in epidemiology together in a forum which allows for ongoing education and discussion. Local and International invited speakers were asked to speak on relevant topics and facilitate discussions related to the use of new information for NICD activities.

TRAINING COURSES AND MEETINGS ATTENDED

Dr Cohen was awarded a fellowship to attend the 8th Advanced Vaccinology Course in Annecy France from 14-25 May 2007.

Dr Cohen was invited to attend the Asia Regional Meeting of the Multinational Seasonal Influenza Mortality Study from August 13-17 2007 in Hanoi, Vietnam.

LOCAL MEETINGS AND SYMPOSIA

Influenza Symposium: An influenza symposium was held at the PRF Training Centre at the NICD, Johannesburg, South Africa from 18-19 February 2007. The aim was to feed back results from the viral watch surveillance programme to relevant stakeholders as well as provide a forum for presentation of current topics related to influenza. Participants included doctors participating in the viral watch surveillance programme, public health practitioners and infectious diseases clinicians, and presentations were given by local and international invited speakers (Figures 7 and 8).



Figure 7: Visitors attending the laboratory demonstration during the influenza symposium



Figure 8: At the influenza symposium Dr Lucille Blumberg presented certificates to Dr Max Patz who was the longest standing member of the viral watch, now resident in Israel, and Dr Sylvia Johnson who started the viral watch programme in 1984.

Dr Cheryl Cohen spoke on 'Community immunity' at the Vaccinology Conference, Hermanus, 22-23 October.

Poster presentations at the FIDSSA Congress, Spier, Cape Town, 28-31 October 2007:-

- Dr Cheryl Cohen. Influenza-associated admissions in South Africa, 2003-2006.
- Mireille Cheyip. A surveillance system for influenza-associated admissions in South Africa.
- Sr Jo McAnerney. Epidemiology of rubella in South Africa, 1998-2006.

Jo McAnerney gave a talk on voluntary and mandatory surveillance programmes, 'Watchdocs' versus EPI at the Webster Memorial Seminar, National Institute for Occupational Health on 22nd November 2007.

CAPACITY BUILDING

Dr Cohen co-supervised Mr P Nyasulu who was awarded the degree Master of Science in Medicine (Epidemiology and Biostatistics) at the University of the Witwatersrand, Johannesburg, South Africa in November 2007 for his dissertation entitled "Risk factors for Mortality in Patients with Invasive Penumococcal Disease in South Africa".

Dr Cohen co-supervised Mr P Hippner in his research towards the degree Master of Science in Medicine (Epidemiology and Biostatistics) at the University of the Witwatersrand, Johannesburg, South Africa in 2007. His dissertation is entitled "Risk factors for trimethoprim-sulfamethoxazole resistance in *Streptococcus pneumoniae* causing invasive disease in South Africa 2003-2006".

Dr Cohen co-supervised Ms Phumzile Zondo (FELTP Resident) in her research towards the degree Master of Public Health (Epidemiology) at the University of Pretoria. Her dissertation is entitled "Factors contributing to missed opportunities for childhood immunization in health facilities in Gauteng Province".

Dr Cohen was co-ordinator for the Infectious Diseases Epidemiology and Disease Surveillance Modules for the Master of Science in Medicine (Epidemiology and Biostatistics) at the University of the Witwatersrand, Johannesburg, South Africa.

Dr Cohen and Sr J McAnerney were lecturers for the Field Epidemiology and Laboratory Training Programme.

Dr Cohen was appointed as an external examiner for the Masters in Epidemiology at the National School of Public Health University of Limpopo.