NICD

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GERMS-SA activities: surveillance officer meeting November 2004, Pietermaritzburg training visit 2005, Principal Investigator meeting November 2005, Dr Nelesh Govender (NMSU).

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Provisional listing: number of laboratory-confirmed cases in South Africa of diseases under surveillance reported to the NICD, corresponding periods 1 January-31 March 2005/2006

	Disease/ Organism	Case Definition	Subgroup	Cumulative to 31 March, year	EC	FS	GA	KZ	LP	MP	NC	NW	WC	South Africa
VIRAL DISEASES	Acute Flaccid Paralysis	Cases < 15 years of age from whom specimens have been received as part of the Polio Eradication Programme		2005	4	6	9	17	5	2	1	5	3	52
				2006	12	3	10	13	9	8	3	2	3	63
	Measles	Measles IgM positive cases from suspected measles cases, all ages		2005	134	0	29	36	1	0	0	1	11	212
				2006	1	0	5	0	0	1	1	2	0	10
	Rubella	Rubella IgM positive cases from suspected measles cases , all ages		2005	20	0	10	12	3	7	0	6	4	62
				2006	34	2	33	12	1	14	9	4	13	122
	VHF	Laboratory-confirmed cases of CCHF (unless otherwise stated), all ages		2005	0	0	0	0	0	0	0	0	0	0
				2006	0	1	0	0	0	0	1	0	0	2
	Rabies	Laboratory-confirmed human cases, all ages		2005	1	0	0	0	0	0	0	0	0	1
				2006	0	0	0	1	6	0	0	0	0	7
BACTERIAL AND FUNGAL DISEASES	*Haemophilus influenzae*	Invasive disease, all ages	All serotypes	2005	3	2	18	5	1	4	0	0	7	40
				2006	3	5	20	12	0	0	0	0	13	53
		Invasive disease, < 5 years	Serotype b	2005	1	0	3	0	0	0	0	0	0	4
				2006	1	0	3	2	0	0	0	0	3	9
			Serotypes a,c,d,e,f	2005	0	0	5	1	0	1	0	0	1	8
				2006	1	1	1	0	0	0	0	0	0	3
			Non-typeable (unencapsulated)	2005	1	0	2	0	0	0	0	0	0	3
				2006	1	1	2	0	0	0	0	0	0	4
			No isolate available for serotyping	2005	0	1	0	2	0	0	0	0	1	4
				2006	0	2	6	3	0	0	0	0	3	14
	Neisseria meningitidis	Invasive disease, all ages		2005	4	4	26	1	2	2	0	0	9	48
				2006	7	2	34	5	0	1	1	1	14	65
	Streptococcus pneumoniae	Invasive disease, all ages	Total cases	2005	48	32	341	78	9	34	5	14	97	658
				2006	51	42	356	83	14	40	3	15	105	709
			Penicillin non-susceptible isolates	2005	14	12	124	31	2	9	1	6	27	226
				2006	16	11	109	24	3	12	2	4	27	208
			No isolate available for susceptibility testing	2005	5	1	39	10	2	3	0	1	11	72
				2006	4	2	44	13	3	7	1	3	5	82
		Invasive disease, < 5 years		2005	18	11	110	32	3	10	1	5	47	237
				2006	18	13	107	29	5	12	1	6	39	230
	Salmonella spp. (not typhi)	Invasive disease, all ages		2005	15	7	153	18	3	11	0	0	22	229
				2006	9	9	163	31	1	6	0	5	23	247
		Confirmed cases, isolate from a non-sterile site, all ages		2005	60	4	82	50	1	18	1	11	58	285
				2006	23	7	29	44	5	10	8	17	43	186
	Salmonella typhi	Confirmed cases, isolate from any specimen, all ages		2005	7	0	6	4	0	11	0	0	6	34
				2006	7	0	5	9	4	3	0	0	6	34
	Shigella dysenteriae 1	Confirmed cases, isolate from any specimen, all ages		2005	0	0	0	0	0	0	0	0	1	1
				2006	0	0	0	1	0	0	0	0	1	2
	Shigella spp. (Non Sd1)	Confirmed cases, isolate from any specimen, all ages		2005	66	18	86	55	5	8	3	0	106	347
				2006	31	7	53	58	3	11	10	3	100	276
	Vibrio cholerae O1	Confirmed cases, isolate from any specimen, all ages	All serotypes	2005	0	0	0	0	0	0	0	0	0	0
				2006	0	0	0	0	0	0	0	0	0	0
	Cryptococcosis (*Cryptococcus* spp.)	Invasive disease, all ages, laboratory confirmed by culture, india ink or latex agglutination test	Total cases (incl. *C. neoformans*)	2005	163	71	402	219	21	95	2	43	55	1071
				2006	90	59	421	322	44	126	18	53	97	1230
			C. gattii	2005	0	0	10	3	3	5	0	5	3	29
				2006	1	2	4	1	5	6	1	2	2	24

Abbreviations: VHF – Viral Haemorrhagic Fever, CCHF – Crimean Congo Haemorrhagic Fever

Provinces of South Africa: EC – Eastern Cape, FS – Free State, GA – Gauteng, KZ – KwaZulu-Natal, LP – Limpopo, MP – Mpumalanga, NC – Northern Cape, NW – North West, WC – Western Cape

U = unavailable, 0 = no cases reported

RABIES IN SOUTH AFRICA AND RECENT DEVELOPMENTS

Robert Swanepoel[1], Lucille Blumberg[1,2], Cheryl Cohen[2], Janusz Paweska[1]
[1]Special Pathogens Unit and [2]Epidemiology Unit, NICD

BACKGROUND

Rabies is a highly fatal disease of warm-blooded vertebrates caused by a virus which is present in saliva late in infection, and is transmitted by the bite of diseased animals, most commonly dogs and other carnivores. From the bite wound virus enters peripheral nerves, and during an incubation period of weeks to months, spreads to the spinal cord and brain to produce severe nervous disease that lasts for a few days to weeks. Only five humans have reportedly survived rabies, and two of them were severely handicapped.

Strains of rabies virus (Lyssavirus 1) tend to undergo genetic adaptation to particular animal hosts, so that within specific areas of the world the disease is manifested predominantly by a single host species, and this same host appears to be responsible for maintenance and spread of the virus (= vector species). Disease in other animals represents spill-over of infection resulting from sporadic contact with the major host species. Human infection most commonly results from dog bites, and the victims are usually young children.

In South Africa the so-called classical canid (= canine) biotype of rabies virus (Lyssavirus 1), which spread into the country from the north in 1950, is transmitted by dogs and jackals in Limpopo Province, dogs in Mpumalanga, KwaZulu-Natal and Eastern Cape Provinces, and bat-eared foxes in the Northern Cape. This biotype of rabies virus causes epidemics in dogs, particularly in unrestrained ('stray') populations and is responsible for most cases of human rabies, the majority of which have occurred in children <10 years of age in the informal settlements of KwaZuluNatal and Eastern Cape Provinces. For many years, about 30 cases of rabies were confirmed each year, but improved vaccination coverage of dogs over the past decade reduced the number of human cases of the disease. Nevertheless, anecdotal evidence suggests that the human disease is under-reported.

In addition to the canid virus, there is an indigenous vivverid biotype of rabies virus (Lyssavirus 1) which is transmitted by genets and mongooses (= vivverids), mainly the yellow mongoose (*Afrikaans:* rooimeerkat*)* (*Cynictis penicillata*), on the interior plateau of the country; i.e. elsewhere in the country other than Kwazulu-Natal and Eastern Cape. The vivverid biotype of virus does not spread readily in dogs, but causes occasional cases of rabies in dogs and cats which can transmit the disease to humans. Mongooses and genets can also transmit infection to humans directly, and they cause many cases of rabies in cattle and sheep each year.

Rabies virus proper (Lyssavirus 1) has never been isolated from bats outside of North and South America, but so-called rabies-related viruses have been encountered in bats in Europe, Africa, and recently Australia and Asia. One of the three rabies-related viruses of Africa, Mokola virus, is apparently associated with shrews and rodents, not bats.

In South Africa, the rabies-related Lagos bat virus (Lyssavirus 2) has been found in fruit bats in KwaZulu-Natal (Pinetown-Durban), but has never been associated with human disease anywhere.

Mokola virus (Lyssavirus 3) has been isolated from shrews, rodents, cats and a dog elsewhere in Africa, and has caused rabies-like disease in cats in KwaZulu-Natal and the Eastern Cape. It is believed to have caused rabies-like disease in two humans in Nigeria in 1969 and 1971, shortly after its initial discovery in shrews in Nigeria in 1968, but no cases of human infection have subsequently been recognized.

Duvenhage virus (Lyssavirus 4) was discovered in 1970 when it caused fatal rabies-like disease in a human bitten by an unidentified insectivorous bat near Leeupoort about 200 km north-west of Johannesburg. In 1981, the virus was isolated from a *Miniopterus schreibersi* insectivorous bat caught in daylight by a cat in Makhado town (formerly Louis Trichardt) in Limpopo Province, and in 1986 the virus was obtained from an insectivorous bat, *Nycteris thebaica*, caught in a survey across the border from Limpopo Province in Zimbabwe.

RECENT CASE OF DUVENHAGE VIRUS INFECTION

Duvenhage virus infection was confirmed in a 77-year-old man who was scratched on the face by what appears to have been an insectivorous bat in February 2006 in North West Province, South Africa. The incident occurred about 80 km from the location where the first Duvenhage virus infection occurred 36 years previously. The bat flew into a room at night, landed on the man's face while he was attempting to chase it out, and scratched his cheek as he brushed it off. The bat did not appear to have bitten him, and it escaped after the incident. The man did not seek medical care, and thus no post-exposure treatment was given. He became sick at home in Cape Town one month later, and died on day 14 of illness. This was only the second recorded human infection with the virus, and the fourth isolation of the virus altogether. Surveys are to be conducted on bat populations.

It can be concluded that the rabies-related viruses have seldom been encountered, and that the chances of acquiring infection from contact with a bat or rodent

appear to remain small, but cannot be discounted entirely. There are no specific vaccines available for the rabies-related viruses, but rabies vaccine confers partial cross-immunity and patients should be given post-exposure treatment exactly as for rabies (i.e. with rabies vaccine).

RECENT HUMAN RABIES IN NORTH-EASTERN LIMPOPO PROVINCE

Rabies was confirmed as the cause of fatal encephalitis in a cluster of patients in the Vhembe district. Rabies is endemic in Limpopo Province where jackals are the main reservoir. Spread of the disease to dogs poses a risk to humans as dogs are in close contact with the human population. The increase in human cases followed an apparent increase in canid rabies in the area, possibly as a result of a decline in vaccine coverage in dogs. Free roaming dogs may also have played a role.

Since August 2005, there have been 23 human cases clinically compatible with rabies reported, thirteen of which have been laboratory confirmed. Prior to this outbreak, the last laboratory confirmed human rabies cases in Limpopo were reported in 1988. A number of additional cases may have gone undiagnosed. All patients, with the exception of one adult, were under the age of 12 years. Factors identified as possibly contributing to the occurrence of human cases include failure to present to health care facilities following exposure to rabid animals, as well as health facilities not offering appropriate post-exposure treatment.

A comprehensive programme to address the problem is being developed, including an intensified vaccination programme for dogs, increasing community awareness, school education programme, health-care worker education and improving access to post exposure treatment, particularly the use of rabies immune globulin for category 3 bites.

SURVEILLANCE OF MALARIA IN GAUTENG PROVINCE

Ingrid Weber, Lucille Blumberg, Epidemiology Unit, NICD

The South African Malaria Control Programme is active within the three provinces of the country in which malaria transmission occurs, namely Limpopo Province, Mpumalanga and KwaZulu-Natal and the epidemiology of the disease is well documented in these regions. The burden of disease of imported malaria in non-endemic provinces such as Gauteng is uncertain.

The National Institute for Communicable Diseases (NICD) in association with the Gauteng Department of Health and the Amayeza Information Centre have established a surveillance system for malaria cases diagnosed and treated in Gauteng Province between 1 December 2005 and 30 November 2006. Infection control personnel and clinicians from public and private sector hospitals submit questionnaires containing demographic and clinical data on patients infected with malaria to the NICD on an ongoing basis. Data on laboratory diagnoses of malaria from public and private laboratories are submitted electronically to the NICD and these are cross-checked with the questionnaire notifications. Totals and disaggregated data are compared with routine notifications to the Gauteng Provincial Department of Health. This report includes preliminary data from clinical questionnaires submitted.

From the beginning of December 2005 until 15 May 2006, 1 390 cases of malaria diagnosed and treated in Gauteng Province were reported to the NICD (Figure 1). The majority of cases (1288 cases) were reported from public hospitals and 102 cases were reported from private hospitals. This total is lower than the number of routine notifications to the Department of Health because of failure to capture a number of cases reported from private practices and certain healthcare facilities. Preliminary analysis of laboratory data compiled by the National Health Laboratory Service (NHLS) shows markedly higher totals of malaria cases than those reported by public health care facilities. Malaria diagnoses recorded by private sector laboratories exceed the number of questionnaires submitted to the NICD by private health care providers which is consistent with the fact that it is mainly private hospitals participating in the surveillance and many cases treated on an outpatient basis by general practitioners are not captured.

Sixty seven percent of reported cases were male and the median age of the cases was 29 years (range 3 months – 89 years) which is consistent with the assumption that many of the infections are contracted in members of a work force traveling between South Africa and neighbouring countries, particularly Mozambique. Of the 1 084 questionnaires that indicated where the patient was born, 48% were born in South Africa and 47% were born in Mozambique.

Pregnant women and children less than five years of age are known to be at higher risk of severe malaria. Seventeen percent of cases (215/1303 with recorded age) were children less than 5 years of age of whom 20% (42/215) were reported as having severe and complicated malaria and one of whom died. Seven percent of the female patients (31/ 453) were recorded as pregnant and within this subgroup 45% (13/31) were reported to have severe and complicated malaria but there were no deaths. In total 30 deaths due to malaria were reported to the NICD between December 2005 and April 2006, 29 had no identifiable risk factor for mortality. Data on co-morbid disease and

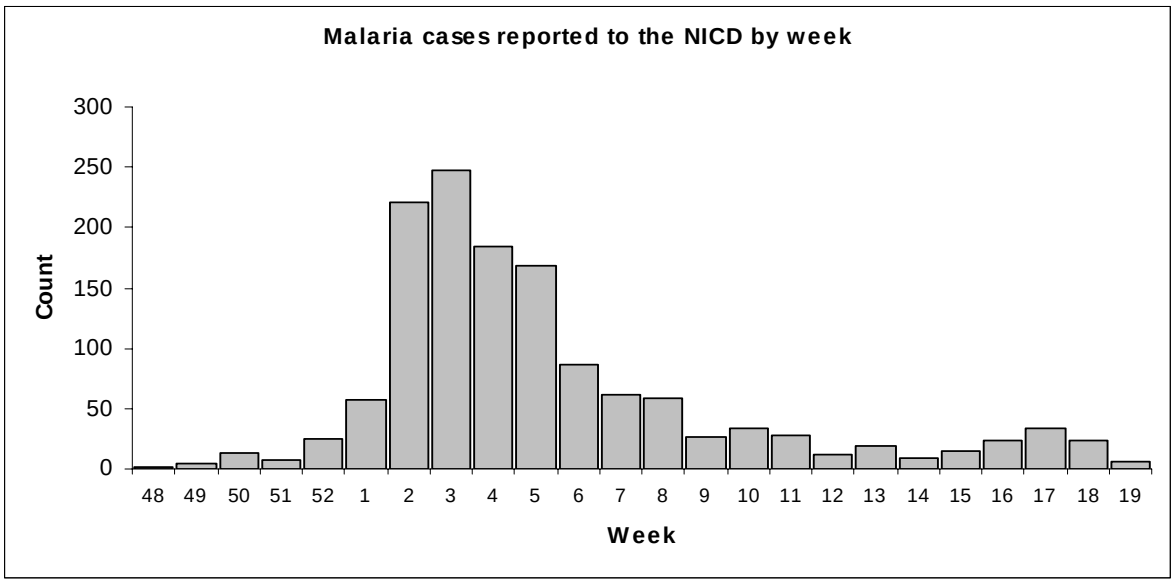

Figure 1: Number of malaria cases reported to the NICD per week

underlying immunocompromise were, however, not collected.

Over 90% of questionnaires indicated a travel history suggesting the geographic location where malaria transmission had taken place and of these 87% cited Mozambique, 6% South Africa and 2% each Zimbabwe and Malawi respectively. Only three cases stipulated no travel history outside of Gauteng – two of these indicated a visit by someone from a transmission region and one occurred through a documented needle-stick injury in a hospital setting.

The choice of drugs administered for treatment was appropriate (quinine plus doxycycline or artemether and lumefantrine) in the majority of reported cases. However, only 10% of cases with severe and complicated malaria were reported to have received the recommended loading dose of intravenous quinine. Twenty percent of the malaria cases seen at private facilities were treated with the combination of artemether and lumefantrine – this combination drug is not available for use in public hospitals in Gauteng Province.

GERMS-SA: A NATIONAL SOUTH AFRICAN SURVEILLANCE NETWORK FOR BACTERIAL AND FUNGAL DISEASES

Nelesh Govender, Vanessa Quan, Elizabeth Prentice (NMSU), Anne von Gottberg (RMPRU), Karen Keddy (EDRU) and Kerrigan McCarthy (MRU), NICD for GERMS-SA

The National Microbiology Surveillance Unit (NMSU) was created within the Microbiology Division of the NICD in January 2006 to coordinate the expanding GERMS-SA (Group for Enteric, Respiratory and Meningeal disease Surveillance in South Africa) laboratory-based surveillance programme for bacterial and fungal diseases.[1]

EVOLUTION OF NATIONAL LABORATORY-BASED SURVEILLANCE FOR SELECTED BACTERIAL AND FUNGAL DISEASES

National laboratory-based surveillance for invasive bacterial infections caused by *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Neisseria meningitidis* was initiated in mid-1999 by the Respiratory and Meningeal Pathogens Reference Unit (RMPRU), coinciding temporally with the introduction of the *H. influenzae* type b conjugate vaccine into the South African Expanded Programme of Immunisation (EPI).[2] Additional national laboratory-based surveillance, coordinated by the Enteric Diseases Reference Unit (EDRU), for infections caused by enteric bacterial pathogens (*Salmonella* species, *Shigella* species, *Vibrio* species, diarrhoeagenic *Escherichia coli*, etc) was initiated in late 1999. The Mycology Reference Unit (MRU) had initiated surveillance in Gauteng in 2002 for disease caused by *Cryptococcus* species.[3] Surveillance for cryptococcal disease was expanded nationally by utilising existing GERMS-SA infrastructure in 2003. Surveillance for laboratory-confirmed *Pneumocystis jiroveci* infection has been initiated in May 2006 at selected sites, in collaboration with the Parasitology Reference Unit (PRU).

GERMS-SA SURVEILLANCE

GERMS-SA surveillance is a collaborative effort between the NICD, participating South African universities and clinical microbiology laboratories and external funding agencies. One hundred and fifteen public and private sector laboratories nationwide, submit clinical isolates according to specified case definitions to NICD reference laboratories for further

characterisation (*Tables 1, 2*). Twelve sites in 8 provinces (*Figure 1*) currently participate in an active enhanced surveillance programme, which was initiated in 2003. Expansion of the enhanced surveillance programme is planned to include 14 sites in all 9 provinces by the end of 2006. At these sites, additional clinical data are collected from selected cases according to a standardised case report form by nurse surveillance officers. These are submitted to the NICD where data are checked, entered and analysed using Epi Info Version 6.04d computer software. National, provincial and health district incidence rates are calculated using population denominators from the South African Health Information Systems Programme, derived from 2001 Census data. Analysed data are disseminated nationally and internationally in various forms (*Table 3*). Systems are in place to monitor data quality at each step of the surveillance process. The focus and future direction of GERMS-SA surveillance is evaluated annually by coordinators of the programme (*Figure 2*).

OBJECTIVES OF THE GERMS-SA PROGRAMME

1. To provide accurate quality-controlled strategic information to patient management and public health policy-makers to influence health practice planning, implementation and evaluation for the infections under surveillance. Such strategic information includes:

- Estimates of disease burden of specific bacterial and fungal infections.
- Epidemiological and antimicrobial susceptibility trends of the pathogens under surveillance.
- Impact of the Operational Plan for Comprehensive Prevention, Treatment and Care of HIV and AIDS in SA on opportunistic infections (OI), e.g. invasive non-typhoidal *Salmonella* infections, invasive pneumococcal infections, cryptococcal infections and *Pneumocystis* infections.
    - Incidence of OI in relation to provision of antiretroviral treatment.
    - Estimated burden of selected immune reconstitution inflammatory syndrome (IRIS)-related OI, e.g. IRIS-related cryptococcosis.
- Impact of vaccines on the pathogens under surveillance.
    - Incidence of disease in targeted populations for vaccines currently included in the EPI (e.g. conjugate *H. influenzae* type b vaccine).
    - Estimates of disease burden and potential benefits of new vaccines to motivate for introduction of such vaccines into the EPI.

2. To identify areas of interest for further investigation from analysed surveillance data and to initiate and coordinate carefully designed studies to address important and relevant research questions.

FUTURE PLANS PROPOSED FOR THE GERMS-SA PROGRAMME

1. Expansion of enhanced surveillance site network to include health care facilities in all nine South African provinces.
2. Expansion of enhanced surveillance site teams to include research medical officers.
3. Expansion of the recently initiated *Pneumocystis jiroveci* surveillance programme.
4. Improving analysis and interpretation of data from the laboratory-based surveillance network, e.g. by considering and investigating the impact of pre-analytic variables on the measured burden of bacterial and fungal diseases.
5. Tailoring the format of analysed and interpreted data from the laboratory-based surveillance network to improve ability to inform and influence health practice policy, e.g. by analysing data by health district and province.
6. Contribution to and facilitation of epidemic-prone communicable disease outbreak investigation and management, e.g. by provision of timeous and relevant data to the concerned parties.

Acknowledgements

We would like to thank all clinical and laboratory staff throughout the country for submitting case reports and isolates for GERMS-SA surveillance. The many technical, scientific, and clerical staff members of the NICD involved in the surveillance programme are also gratefully acknowledged.

GERMS-SA collaborators: Sandeep Vasaikar (Eastern Cape); Nolan Janse van Rensberg, Peter Smith, André Möller (Free State); Khatija Ahmed, Mike Dove, Pyu-Pyu Sein, Ruth Lekalakala, Donald Ngwira, Anwar Hoosen, Heather Crewe-Brown, Olga Perovic, Charles Feldman, Alan Karstaedt, Jeannette Wadula (Gauteng); Wim Sturm, Trusha Vanmali, Sharona Seetharam (KwaZulu Natal); Keith Bauer, Greta Hoyland, Jacob Lebudi (Mpumalanga); John Simpson, Lynne Liebowitz, Rena Hoffmann, Elizabeth Wasserman, Denise Roditi, Andrew Whitelaw (Western Cape); Ken Hamese (Limpopo); Claire Heney (Lancet laboratories), Adrian Brink (Ampath laboratories), Marthinus Senekal (PathCare laboratories); Anne Schuchat, Stephanie Schrag (Centers for Disease Control and Prevention); Keith Klugman, Anne von Gottberg, Karen Keddy, Kerrigan McCarthy, John Frean, Nelesh Govender, Vanessa Quan, Elizabeth Prentice, Koshika Soma, Cheryl Cohen (NICD)

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Contact details for National Microbiology Surveillance Unit: Tel: +27 11 555 0353 or 386 6234, fax: +27 11 555 0437, email: neleshg@nicd.ac.za, website: www.nicd.ac.za

Table 1: Case definitions (CRAG: cryptococcal antigen test, IFA: indirect fluorescent antibody test for *Pneumocystis jiroveci*)

Organism	Case definitions	Case definitions for selected cases at enhanced surveillance sites
Streptococcus pneumoniae, *Haemophilus influenzae* and *Neisseria meningitidis*	Laboratory-confirmed cases (+culture or +latex agglutination test with additional confirmatory test, from any normally sterile body site) presenting to South African health care facilities. Recurrent disease: any case meeting the above criteria that yields a positive laboratory test 21 days after a previous positive test.	Laboratory-confirmed cases (+culture or +latex agglutination test with additional confirmatory test, from any normally sterile body site) presenting to selected South African health care facilities. Recurrent disease: any case meeting the above criteria that yields a positive laboratory test 21 days after a previous positive test.
Salmonella spp. (includes *Salmonella* Typhi) and *Shigella* spp.	Laboratory-confirmed cases (+culture from any body site, whether or not patient is symptomatic) presenting to South African health care facilities.	Laboratory-confirmed cases (+culture from any normally sterile body site) presenting to selected South African health care facilities.
Vibrio spp., *Aeromonas* spp., *Yersinia enterocolitica* and diarrhoeagenic *Escherichia coli**	Laboratory-confirmed cases (+culture from any body site or stool only*, whether or not patient is symptomatic) presenting to South African health care facilities.	Laboratory-confirmed cases (+culture from any body site or stool only*, whether or not patient is symptomatic) presenting to South African health care facilities.
Cryptococcus spp.	Laboratory-confirmed cryptococcal cases (+India ink, +CRAG or +culture, from any body site) presenting to South African health care facilities. Recurrent disease: any case meeting the above criteria that yields a positive laboratory test 30 days after a previous positive test.	Laboratory-confirmed cryptococcal cases (+India ink, +CRAG or +culture, from any body site) presenting to selected South African health care facilities. Recurrent disease: any case meeting the above criteria that has been discharged and readmitted, regardless of the time interval between discharge and readmission.
Pneumocystis jiroveci	Not applicable at present to non-enhanced surveillance sites	Laboratory-confirmed cases (IFA+) presenting to selected South African health care facilities.

Table 2: NICD reference unit characterisation of submitted isolates (*CLSI: Clinical and Laboratory Standards Institute, PFGE: Pulsed Field Gel Electrophoresis, MLST: Multi Locus Sequence Typing, PCR: Polymerase chain reaction)

Organism	Phenotypic characterisation	Genotypic characterisation (selected isolates only)
Streptococcus pneumoniae, *Haemophilus influenzae* and *Neisseria meningitidis*	Antimicrobial susceptibility testing*, serotyping (or serogrouping)	Molecular typing (PCR, PFGE, MLST), molecular antimicrobial resistance determination
Salmonella spp. and *Shigella* spp., *Vibrio cholerae*, diarrhoeagenic *Escherichia coli*	Antimicrobial susceptibility testing*, serotyping	Molecular typing (PFGE), virulence gene determination (PCR)
Cryptococcus spp.	Confirmation of genus/ species identification, antimicrobial susceptibility testing* (selected cases)	Molecular typing
Pneumocystis jiroveci	Semi-quantitative estimation of organism load (on submitted specimens)	Molecular antimicrobial resistance determination

Table 3: Dissemination of GERMS-SA programme data

Communication within the GERMS-SA network
- Quarterly newsletter (Link)
- Quarterly provincial statistics (analysed data)
- Annual pathologist report (analysed and interpreted data)
- Feedback of surveillance data at surveillance site visits and surveillance officer/programme coordinator meetings

NICD publications
- Monthly Communique
- Quarterly Communicable Diseases Surveillance Bulletin
- www.nicd.ac.za (GERMS-SA webpage in evolution)

External dissemination of data
- Peer-reviewed scientific journals
- Presentations at scientific meetings and conferences
- NHLS microbiology discussion group
- WHO Global Salm-Surv discussion group

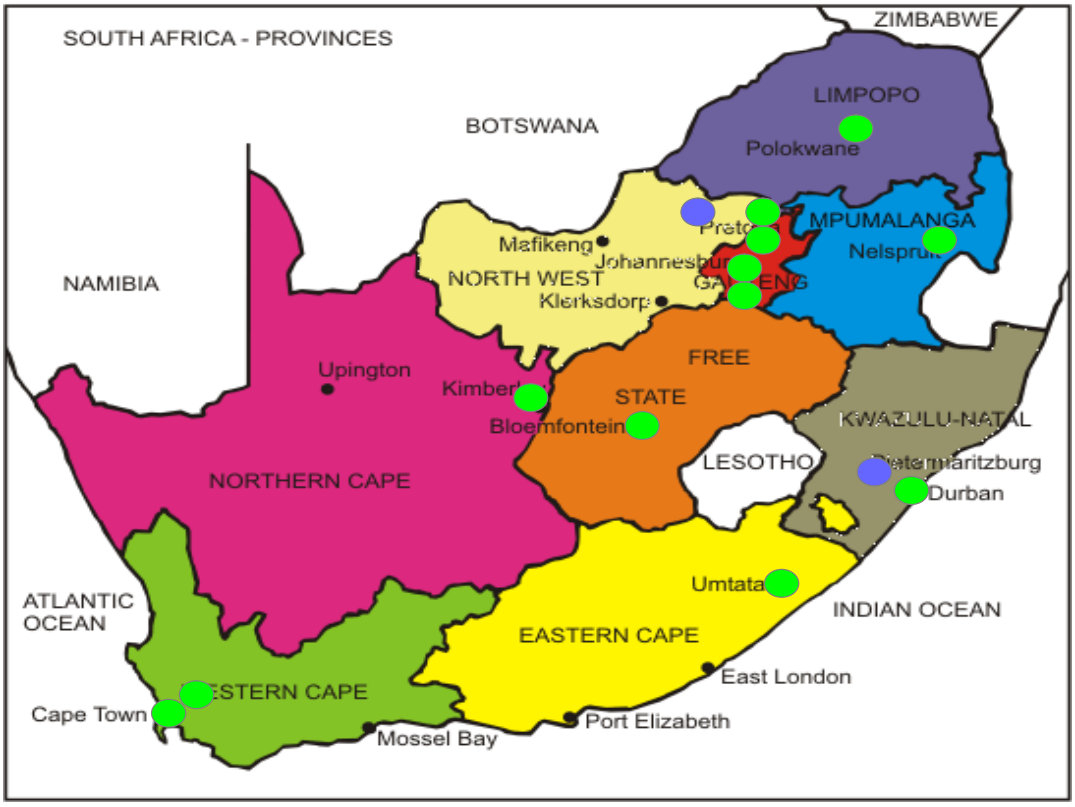

Figure 1: **Map of South African provinces showing enhanced surveillance sites (green circles: operational sites; blue circles: proposed sites)**

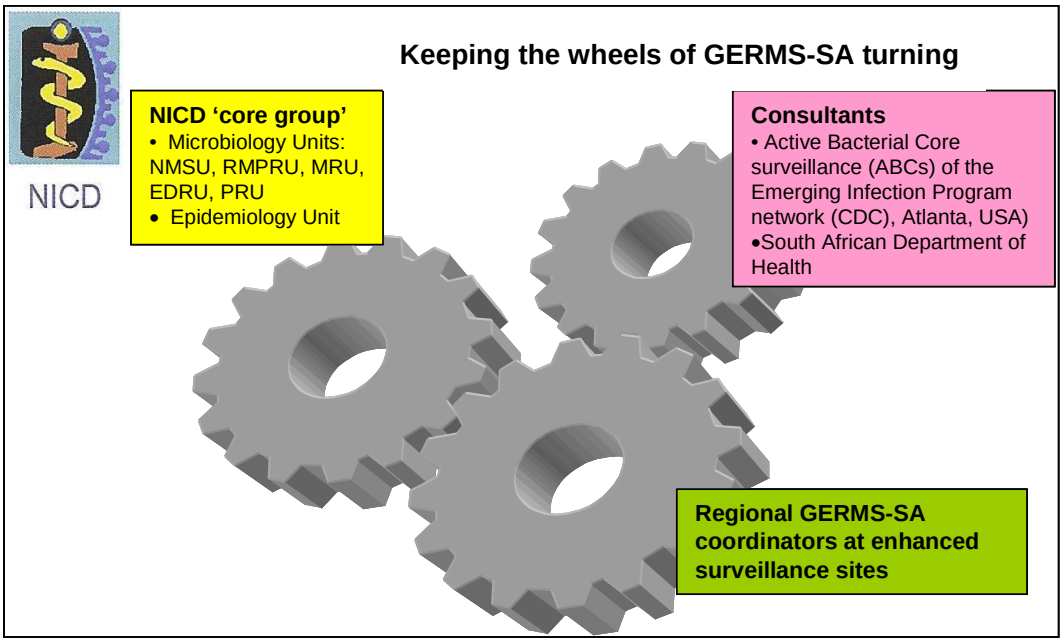

Figure 2: **Coordination of the GERMS-SA programme (NMSU: National Microbiology Surveillance Unit, RMPRU: Respiratory and Meningeal Pathogens Reference Unit, MRU: Mycology Reference Unit, EDRU: Enteric Diseases Reference Unit, PRU: Parasitology Reference Unit, CDC: Centers for Disease Control and Prevention)**

Erratum to table published in March 2006 Bulletin, page 2 - Provisional listing: number of laboratory-confirmed cases in South Africa of diseases under surveillance reported to the NICD, corresponding periods 1 January-31 December 2004/2005•

- *Streptococcus pneumoniae:* The figures published in 3 rows were erroneously swapped - figures in "Invasive disease, < 5 years" are for "Invasive disease, all ages: No isolate available for susceptibility testing"; those in "Invasive disease, all ages: Penicillin non-susceptible isolates" are for "Invasive disease, < 5 years"; and figures in "Invasive disease, all ages: No isolate available for susceptibility testing" are for "Invasive disease, all ages: Penicillin non-susceptible isolates".
- *Cryptococcus* spp: The row entitled "*C. neoformans*" should have been entitled "Total cases (incl. *C. neoformans*)".