NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
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FOREWORD

Three important communicable disease surveillance reports for 2011 are presented in this issue. These were produced by the case-based measles surveillance programme, the rotavirus sentinel surveillance programme and the Group for Enteric, Respiratory and Meningeal disease Surveillance in South Africa (GERMS-SA).

The case-based measles surveillance report shows that the number of laboratory-confirmed measles cases was relatively low in 2011 compared to the previous two years during which a substantial measles outbreak occurred in South Africa. The rotavirus report shows that the introduction of rotavirus vaccine into the routine immunisation programme in South Africa led to a delayed onset and shortened duration of the rotavirus season in 2011. The GERMS-SA report for 2011 contains summaries of national surveillance data by disease including data collected from the enhanced surveillance sites (ESS) that cover all nine of South Africa's provinces. Of particular interest and importance are evidence of emerging resistance to fluoroquinolones in *Salmonella* Typhi isolates, an increased incidence of invasive non-typhoidal Salmonellae which are intermediately or fully resistant to ciprofloxacin, a decline in the number of incident cases of cryptococcosis, a decreased incidence of invasive pneumococcal disease in children less than 1 year of age and stabilising rates of *Haemophilus influenzae* type b (Hib), also in children less than 1 year of age.

These surveillance reports summarise data that have been used to develop clinical guidelines for several communicable diseases as well as to enhance immunisation programmes in South Africa, emphasising the importance of ongoing disease surveillance despite a weakened economy and financial strain within the public health sector. All participating laboratories and contributors to these reports are thanked for their inputs, especially Vanessa Quan and Susan Meiring who co-edited the GERMS-SA report.

Basil Brooke, Editor

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SUSPECTED MEASLES CASE-BASED SURVEILLANCE, SOUTH AFRICA, 2011

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Introduction

The case-based measles surveillance programme with laboratory support started in 1998 as part of the National Department of Health's measles elimination strategy. The National Institute for Communicable Diseases (NICD) of the National Health Laboratory Service (NHLS) is accredited by the WHO to perform measles and rubella IgM testing for the national case-based surveillance and to track the molecular epidemiology of measles virus in South Africa. Blood and urine or throat/nasopharyngeal swab specimens from suspected measles cases (patients with fever ≥38°C and rash, and at least one of: cough, coryza or conjunctivitis) nationally are submitted to the NICD for laboratory confirmation. Data presented in this report are generated from the case-based measles surveillance programme and represent specimens received by the NICD. These data may differ from those presented by the National Department of Health because they may receive information on cases where no specimens were taken.

All blood specimens were tested by Enzygnost (Siemens, Marburg, Germany) diagnostic kits for the presence of anti-measles and anti-rubella Immunoglobin M (IgM). Amplification of ribonucleic acid (RNA) for genotyping was attempted in a sample of cases testing positive or equivocal for anti-measles IgM. For molecular analysis RNA was extracted directly from clinical specimens and tested for the presence of measles virus by reverse transcriptase polymerase chain reaction (RT-PCR) and nested PCR followed by sequencing. Molecular characterization is useful for tracking transmission and the importation of measles virus. The preferred specimen type for this test is a throat/nasopharyngeal swab in virocult virus transport swab/medium.

A widespread measles outbreak occurred in South Africa during 2009 and 2010 with 2011 as the post epidemic period. From 1 January to 31 December 2011, a total of 8668 suspected measles cases was tested. Of these, 1% (99/8668) were measles IgM positive (seven of which were vaccination related) and 38% (3268/8668) were rubella IgM positive. Six of the measles IgM antibody-positive case-patients were also positive for rubella IgM antibodies.

Measles

Laboratory-confirmed measles cases were reported from all nine of South Africa's provinces during 2011. However, the number of cases varied between and within provinces. Gauteng (39%, 36/92) and KwaZulu-Natal (25%, 23/92) accounted for the highest proportions of the total (table 1). Within Gauteng and Kwazulu-Natal, the City of Johannesburg and Ethekwini metropolitan municipalities respectively accounted for the highest proportion of cases. The highest number of measles cases was recorded in January following which the incidence gradually declined throughout the rest of the year (figure 1). Age and gender were reported in 90% (83/92) and 93% (86/92) of laboratory-confirmed measles cases respectively. Males accounted for 55% (47/86) and females 45% (39/86) of the cases. Age ranged from one month to 41 years with a median of one year. Children <5 years accounted for 65% (54/83) of cases with 45% (37/83) occurring in those aged <1 year (figure 2). Of those aged less than 1 year, 65% (24/37) were less than 9 months.

Molecular characterization was performed on a subset of cases testing positive or equivocal for measles IgM antibodies. The outbreak strain (genotype B3) was detected in 17/50 specimens that were tested before the end of June 2011. These 17 positives were collected from only four provinces (Gauteng, KwaZulu-Natal, Northern Cape and Western Cape). During the period July to December 2011 all cases testing positive or equivocal for measles IgM antibodies were subsequently tested for the presence of measles virus using the polymerase chain reaction (PCR) technique. Only 7 specimens were PCR-positive for measles during this period and all were vaccine-related (genotype A).

Rubella

Rubella IgM positive case-patients were also reported from all nine of South Africa's provinces during 2011. Gauteng (23%, 750/3268), Eastern Cape (16%, 518/3268) and Limpopo (14%, 474/3268) accounted for the highest proportions of the total (table 1). An increase in the number of rubella IgM positive cases occurred from August onwards, peaking in September (figure 1). Patient age was reported in 97% (3170/3268) of rubella IgM positive cases. Children aged <12 years accounted for 89% (2810/3170) of the cases with 60% (1918/3170) occurring in those aged 5-11 years. Age ranged from less than 1 month to 94 years with a median of six years. Where both age and gender were recorded (n=3091), females accounted for 49% (1506) and males 51% (1585) of the total number of rubella cases. Twelve percent (184/1506) of the female cases occurred in women of reproductive age i.e. 12-49 years.

Table 1: Numbers of measles IgM and rubella IgM positives and rates of non-measles febrile rash illness by province, South Africa, January to December 2011.

Province	Suspected measles cases	Measles IgM positive	Rubella IgM positive	Non-measles febrile rash illness per 100 000 population
Eastern Cape	1058	4	518	16
Free State	266	2	58	9
Gauteng	2290	36	750	21
KwaZulu-Natal	1053	23	407	10
Limpopo	980	1	474	19
Mpumalanga	1158	2	429	32
Northern Cape	237	8	83	20
North West	870	8	358	25
Western Cape	756	8	191	13
South Africa	**8668**	**92**	**3268**	**17**

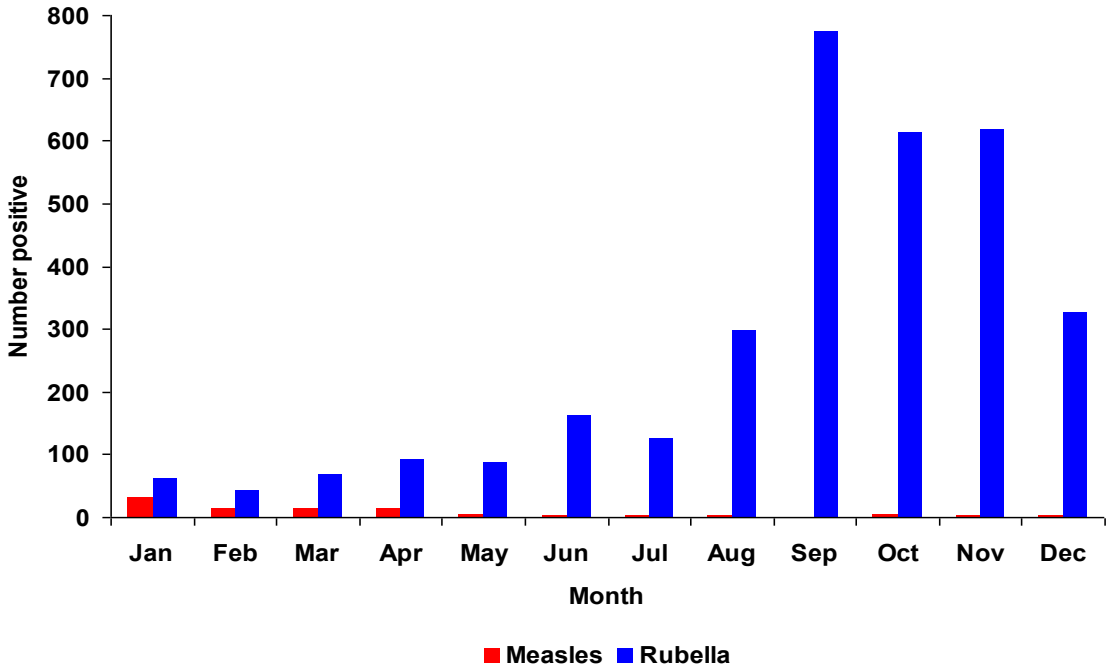

Figure 1: Numbers of measles IgM and rubella IgM positive cases in South Africa by month, 2011.

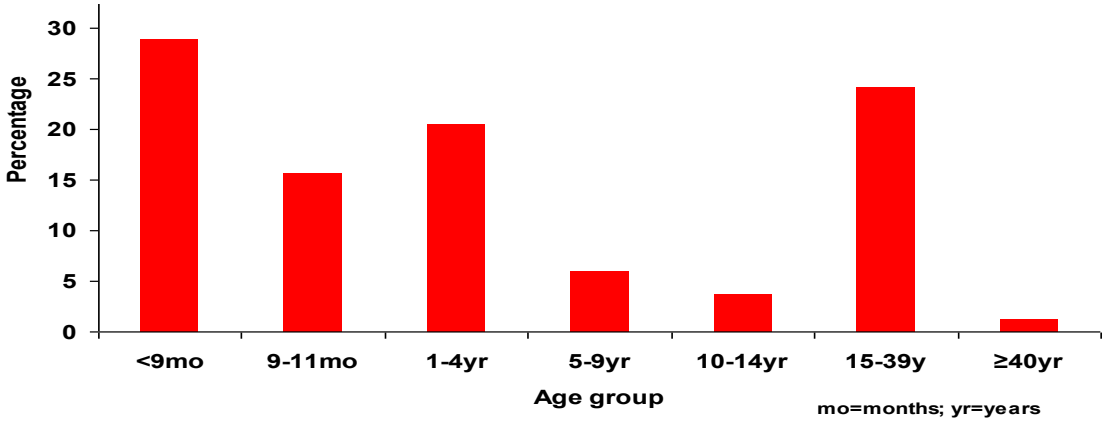

Figure 2: Age distribution of patients with measles, South Africa, January to December 2011.

Discussion

Urine/throat swab specimens are not submitted to the laboratory often. In addition to blood specimens, health care workers are encouraged to collect throat swab specimens from suspected measles cases. Efforts to improve the collection of these specimens should be strengthened.

The number of laboratory-confirmed measles cases was relatively low in 2011 as compared to the previous two years during which a substantial measles outbreak occurred in South Africa. A higher proportion of laboratory-confirmed measles cases were aged less than nine months, similar to what was observed during the 2009-2010 epidemic. This subpopulation does not routinely receive the first dose of measles vaccine in South Africa which is only administered at nine months. Measles at this young age may be attributed to early waning of vaccine-induced maternal antibodies rather then the more durable antibodies produced from natural infection.[1,2] In addition, the severe HIV epidemic in South Africa could be an additional contributor to early waning of passive immunity.[3-5] Ongoing disease in this subpopulation is of concern because they are at increased risk of severe and complicated measles.

Thirty five percent of measles cases were aged less than 5 years. This suggests that there are still pockets of susceptible individuals within communities. Risk assessments should be conducted to identify high risk areas/groups and mop-up activities should be implemented where necessary.

Increasing numbers of rubella cases were reported from August 2011 onwards. This is similar to what has previously been observed during late winter and spring in South Africa. However, several rubella outbreaks were reported in crèches and schools in some provinces during 2011. The median age of rubella cases has been similar for several years (range 5 to 7 years). This is expected as rubella mainly affects children. Rubella is also of particular concern if acquired during pregnancy, especially during the first trimester. Rubella infection in pregnancy may spread to the unborn baby and lead to congenital rubella syndrome (CRS) which can cause severe birth defects.

Limited epidemiologic information was available for the measles and rubella cases submitted to the NICD for testing. The clinical presentation and/or severity of these cases as well as their vaccination status could not be commented on as this information is rarely submitted to the NICD. Efforts to collect the minimal data required for public health action should be strengthened.

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We wish to thank the staff of the Serology and General Isolation Units, NICD, as well as staff of the NICD Receiving Laboratory.

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ROTAVIRUS SURVEILLANCE IN SOUTH AFRICA, 2011

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Introduction

Rotavirus causes gastroenteritis accompanied by acute diarrhoea, vomiting, fever and abdominal pain. It is the leading cause of diarrhoea in young children globally, causing more than half a million deaths per year in children less than five years of age. Two rotavirus vaccines are currently licensed for use in infants, RotaTeq® and Rotarix®.[1]

The National Institute for Communicable Diseases (NICD) introduced a sentinel surveillance programme for rotavirus in five hospitals serving four provinces in April 2009, prior to the introduction of the Rotarix® vaccine into the expanded programme on immunisation (EPI) in August of 2009. These hospitals include: Chris Hani Baragwanath in Gauteng, Dr. George Mukhari in Gauteng (serving Gauteng and North West), Mapulaneng and Matikwana in Mpumalanga, and Edendale in KwaZulu-Natal.

The main objectives of this surveillance programme are to describe the epidemiology of rotavirus infection and to monitor the effect of the introduction of Rotarix® into the EPI.

Methods

All children who are admitted to the sentinel hospitals with acute diarrhoea (less than 7 days duration) are enrolled into the programme following informed consent. Detailed demographic information, medical histories, clinical presentation data and in-hospital outcomes are recorded for each child. In addition, a stool sample is collected for subsequent rotavirus (and other diarrhoeal pathogens) testing.

Testing for rotavirus is performed at the Viral Gastroenteritis Unit (VGU), NICD, and at the Diarrhoeal Pathogens Research Unit (DPRU), University of Limpopo Medunsa campus. The ProSpecT Rotavirus ELISA kit (Oxoid, UK) is used to assign stools as rotavirus positive or negative.

Results

Epidemiology

A total of 816 children was enrolled into the surveillance program in 2011. Stool samples were available from 786 (96%) children and 729 (93%) of these were sufficient for testing.

The total number of rotavirus positive samples for 2011 was 150 amounting to a detection rate of 21% (150/729), similar to the 21% (233/1131) detection rate of 2010. The start of the 2011 rotavirus season was in late May (week 21). The peak detection rate was 80% (8/10) which occurred in late July (week 30). By the beginning of October (week 40) the detection rate had dropped to below 20% indicating the end of the rotavirus season (figure 1). The start of the 2011 rotavirus season was five weeks later than in 2009 and one week later than in 2010. The 2011 season lasted for 19 weeks as compared to 17 weeks in 2010 and a minimum of 24 weeks in 2009.

A total of 887 diarrhoea cases was enrolled in 2009, with 617 enrolled in 2010 and 513 for the same period in 2011. This represents a 42% decrease in the number of diarrhoea cases enrolled from 2009 to 2011. The number of rotavirus positive cases decreased from 426 in 2009 to 150 in 2011, a 65% decrease.

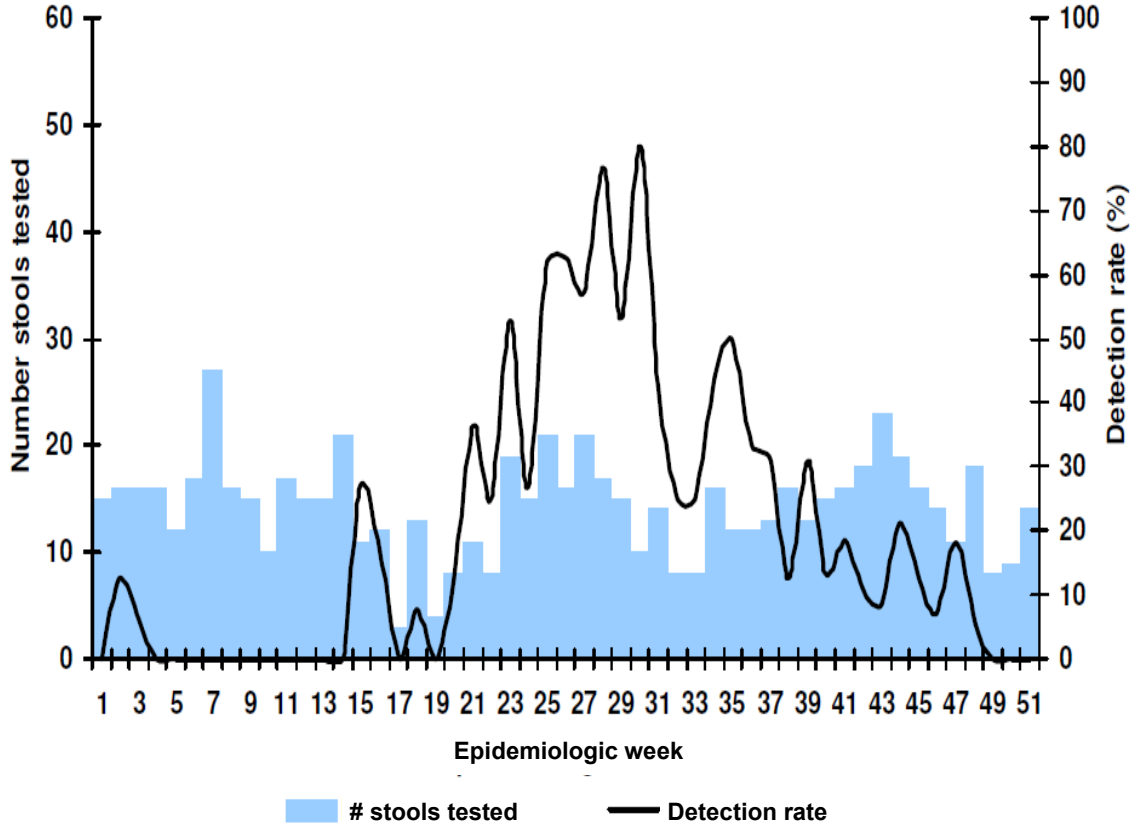

Figure 1: Numbers of diarrhoea samples tested and rotavirus detection rate (%) by week in children less than 5 years of age hospitalised for diarrhoea, South Africa, 2011.

Molecular characterization of rotavirus strains

Group A rotaviruses have been classified into 27 G or VP7 genotypes and 35 P or VP4 genotypes, based on the genetic constellation of the outer capsid proteins. However, only 12 G genotypes and 15 P genotypes have been associated with rotavirus infections in humans.

Rotavirus positive samples detected using enzyme immunoassays were further characterized to determine the G and P genotype of each strain. The dsRNA was extracted from the stool using the QIAamp Viral RNA Mini kit (Qiagen, Hilden, Germany) and genotyped using standardized RT-PCR methods and primers for G-specific (G1, G2, G3, G4, G8, G9, G10, G12) and P-specific (P[4], P[6], P[8], P[9], P[10], P[11], P[14]) genotypes. Tables 1 and 2 summarize the genotyping results for 2009 to 2011.

In Gauteng (Chris Hani Baragwanath and Dr George Mukhari), the G12P[8] and G9P[8] strains were predominant in 2011. Predominance has shifted annually from G1P[8] and G2P[6] in 2009 to G8P[4], G2P[4] and G1P[8] in 2010. Similarly, the G12P[8] strains predominated in the Mapulaneng and Matikwane sites in Mpumalanga in 2011 with G1P[8] and G9P[8] circulating at lower levels. In 2009, the G1P[8], G9P[8] and G2P[4] strains circulated in Mpumalanga followed by a predominance shift to G8P[4] and G2P[4] in 2010. The predominant rotavirus strains from Edendale Hospital in Kwa-Zulu Natal also genotyped as G12P[8] in 2011. These strains were predominant in 2010 together with G8P[8] following a shift from the 2009 G2P[4] and G2P[6] predominant genotypes.

Table 1: Rotavirus genotyping results for Chris Hani Baragwanath, Mapulaneng and Matikwane Hospitals, South Africa, 2009 to 2011. The shaded boxes indicate the predominant genotypes circulating in the areas under surveillance.

	Chris Hani Baragwanath						Mapulaneng						Matikwane					
	2009		2010		2011		2009		2010		2011		2009		2010		2011	
Genotype	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Rotavirus strains covered by the monovalent vaccine																		
G1P[8]	63	36	37	29	3	7	14	33	2	20	0	0	33	72	8	20	4	20
G1P[6]	5	3	0	0	1	2	2	5	0	0	0	0	1	2	0	0	0	0
G1P[4]	2	1	2	2	1	2	1	2	1	10	0	0	1	2	1	3	0	0
G2P[8]	3	2	3	2	0	0	0	0	0	0	0	0	1	2	0	0	0	0
G3P[8]	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G4P[8]	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
G8P[8]	1	1	15	12	2	4	3	7	0	0	0	0	0	0	1	3	1	5
G12P[8]	16	9	11	9	22	49	4	9	0	0	8	67	2	4	0	0	9	45
G9P[8]	4	2	0	0	8	18	6	14	1	0	3	25	1	2	9	23	3	15
Total	94	54	69	55	38	84	30	70	4	40	11	92	39	85	19	48	17	85
Rotavirus strains not covered by the monovalent vaccine																		
G2P[4]	22	13	9	7	0	0	6	14	2	20	0	0	5	11	12	30	0	0
G2P[6]	43	25	3	2	1	2	4	9	1	10	0	0	1	2	0	0	1	5
G8P[4]	10	6	34	27	0	0	3	7	3	30	0	0	0	0	6	15	0	0
G8P[6]	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G9P[4]	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G9P[6]	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5
G12P[4]	1	1	2	2	0	0	0	0	0	0	0	0	1	2	0	0	0	0
G12P[6]	0	0	0	0	4	9	0	0	0	0	0	0	0	0	0	0	1	5
Total	78	45	50	40	5	11	13	30	6	60	0	0	7	15	18	45	3	15
Mixed and non-typeable rotavirus strains																		
Mixed	2	1	7	6	2	4	0	0	0	0	1	8	0	0	2	5	0	0
Negative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0
Total	2	1	7	6	2	4	0	0	0	0	1	8	0	0	3	8	0	0
Grand total	**174**		**126**		**45**		**43**		**10**		**12**		**46**		**40**		**20**	

Table 2: Rotavirus genotyping results for Dr George Mukhari and Edendale Hospitals, South Africa, 2009 to 2011. The shaded boxes indicate the predominant genotypes circulating in the areas under surveillance.

	Edendale						Dr George Mukhari					
	2009		2010		2011		2009		2010		2011	
Genotype	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Rotavirus strains covered by the monovalent vaccine												
G1P[8]	7	18	1	6	2	7	70	55	10	22	7	15
G1P[6]	0	0	0	0	0	0	1	1	0	0	2	4
G1P[4]	0	0	0	0	0	0	1	1	2	4	0	0
G8P[8]	1	3	3	19	1	4	1	1	1	2	0	0
G12P[8]	0	0	6	38	20	71	14	11	5	11	11	24
G9P[8]	0	0	0	0	0	0	4	3	0	0	17	37
Total	8	21	10	63	23	82	91	71	18	39	37	80
Rotavirus strains not covered by the monovalent vaccine												
G2P[4]	9	24	2	13	0	0	2	2	15	33	0	0
G2P[6]	19	50	0	0	3	11	26	20	2	4	2	4
G4P[6]	0	0	0	0	1	4	0	0	0	0	0	0
G8P[4]	0	0	2	13	0	0	0	0	11	24	0	0
G9P[6]	0	0	0	0	0	0	0	0	0	0	2	4
G12P[4]	0	0	0	0	0	0	1	1	0	0	0	0
G12P[6]	0	0	0	0	0	0	0	0	0	0	3	7
Total	28	74	4	25	4	14	29	23	28	61	7	15
Mixed and non-typeable rotavirus strains												
Mixed	0	0	2	13	1	4	0	0	0	0	2	4
Negative	2	5	0	0	0	0	8	6	0	0	0	0
Total	2	5	2	13	1	4	8	6	0	0	2	4
Grand total	**38**		**16**		**28**		**128**		**46**		**46**	

Discussion

Delays in the onset of the rotavirus season and a shortened duration of the season have been described from several countries following the introduction of rotavirus vaccine into the routine immunisation programme.[2-4] The reduction in the proportion of all diarrhoea cases testing positive for rotavirus has been sustained for two years following vaccine introduction into the routine immunisation programme in South Africa.

Variation in the total numbers of patients enrolled may be affected by the number of patients presenting to health facilities as well as the proportion of patients enrolled into the surveillance programme. As data on patient enrolment is currently being reviewed these numbers should be treated as preliminary.

Despite the detection of rotaviruses (G2P[4], G2P[6] and G8P[4]) not covered by the monovalent vaccine, these strains have not persisted in the South African population. In fact, the G12P[8] and G9P[9] strains were predominant in the majority of surveillance sites in South Africa in 2011. These data suggest that genotypes not covered by the monovalent vaccine do not persist after vaccine introduction.

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Rotavirus Surveillance Programme Members 2012

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- Centre for Respiratory Diseases and Meningitis: Cheryl Cohen, Babatyi Malope-Kgokong, Jocelyn Moyes, Akhona Tshangela, Sibongile Walaza
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Surveillance officers and Research Assistants

Data entry team

Patients who participated in the surveillance programme

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GROUP FOR ENTERIC, RESPIRATORY AND MENINGEAL DISEASE SURVEILLANCE FOR SOUTH AFRICA (GERMS-SA) REPORT FOR 2011.

Susan Meiring and Vanessa Quan

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Introduction

The 2011 Annual GERMS-SA Report summarises the findings from national surveillance, including the enhanced surveillance sites (ESS) at 25 hospitals in all nine of South Africa's provinces. In 2011, reductions in the numbers of organisms reported were noted for all pathogens under surveillance. Factors that likely influenced this trend to varying degrees include: difficulties in conducting audits, financial strain within the NHLS, improvements in and introduction of multiple health interventions. These factors are discussed in more detail below.

As in previous years audits were conducted through the Central Data Warehouse (CDW). However, because of the roll out of TrakCare Lab which replaced Disa*Lab throughout the country, there were challenges with the auditing processes, and KwaZulu-Natal was not fully audited. Furthermore, financial strain within the National Health Laboratory Service (NHLS) during 2011 may have negatively affected the taking of specimens, ultimately impacting on laboratory based surveillance. Lastly, the National Department of Health implemented and improved on multiple health interventions. GERMS-SA, as a mature surveillance system, was well positioned to monitor the impact of these interventions. These included new vaccine introductions and the addition of booster vaccines; the Comprehensive Care, Management and Treatment Programme for HIV/AIDS; and the Prevention of Mother to Child Transmission of HIV (PMTCT).

The methods utilised by the GERMS-SA surveillance programme have previously been described in detail.[1] In brief, approximately 200 South African clinical microbiology laboratories participated in the surveillance programme during 2011. The population under surveillance was estimated at 50.5 million (table 1). Incidence rates in the HIV-infected and AIDS populations were calculated for 2010 and 2011 using estimated population denominators from the Actuarial Society of South Africa (ASSA) 2008 model, assuming that the HIV/AIDS prevalence amongst cases with known status was similar to those with unknown status. [2] As of July 2010, seven sentinel sites reported cases of *Staphylococcus aureus* and *Klebsiella pneumoniae* bacteraemia to GERMS-SA. Their incidence rates were calculated using mid-year population estimates for 2010 and 2011 from Statistics South Africa (table 1).[3] All reported incidence rates are expressed as cases per 100,000 population, unless otherwise stated.

Table 1: Population denominators used to calculate incidence rates for 2010 and 2011.

Province	General population*		HIV-infected population**		AIDS population**	
	2010	2011	2010	2011	2010	2011
Eastern Cape	6 743 823	6 829 959	695 707	715 736	57 821	60 525
Free State	2 824 570	2 759 644	348 832	351 746	36 085	35 390
Gauteng	11 192 029	11 328 203	1 207 378	1 215 856	122 551	126 240
KwaZulu-Natal	10 645 508	10 819 128	1 550 955	1 576 025	143 549	149 621
Limpopo	5 439 552	5 554 657	394 221	409 161	28 508	32 285
Mpumalanga	3 617 513	3 657 181	472 882	482 288	44 720	44 827
Northern Cape	1 103 918	1 096 731	74 963	76 966	6 044	6 868
North West	3 200 649	3 253 390	427 023	431 576	44 222	44 230
Western Cape	5 223 908	5 287 863	266 180	273 114	21 119	24 533
South Africa	**49 991 470**	**50 586 756**	**5 438 141**	**5 532 468**	**504 619**	**524 519**

Data source: * Statistics South Africa; ** Actuarial Society of South Africa (ASSA)

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ENHANCED SURVEILLANCE REPORT

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In 2011, of 17 981 surveillance case patients detected by GERMS-SA, 4074 (23%) were diagnosed at enhanced surveillance sites. Of case patients with recorded HIV status, 82% (2627/3223) were HIV-infected (table 2). The proportion of case patients with confirmed HIV infection varied by surveillance disease. As expected, a very high proportion of patients with AIDS-defining infections like cryptococcosis (98%) were HIV-infected. HIV infection amongst patients with invasive pneumococcal disease and non-typhoidal salmonellosis, for which HIV is a known risk factor, were 69% and 71% respectively, and less than one third (26%) of patients with invasive meningococcal disease were HIV-infected.

Table 2: Numbers and percentages* of patients diagnosed with laboratory-confirmed invasive disease at GERMS-SA enhanced surveillance sites, with confirmed HIV-1 infection**, South Africa, 2011.

Pathogen	Case patients, n	Case patients with completed case report forms, n (%)	Case patients with known HIV status, n (%)	Case patients with confirmed HIV infection, n (%)
Cryptococcus species	1915	1734 (91)	1651 (95)	1620 (98)
Neisseria meningitidis	127	105 (83)	86 (81)	22 (26)
Streptococcus pneumoniae	1457	1276 (88)	1090 (84)	754 (69)
Haemophilus influenzae	214	160 (75)	129 (80)	48 (37)
Salmonella species	327	288 (88)	245 (85)	174 (71)
Shigella species	34	27 (79)	22 (81)	9 (41)
Total	**4074**	**3590 (88)**	**3223 (90)**	**2627 (82)**

*The percentage (in brackets) in each cell was calculated using the numerator from that cell and the corresponding denominator from the cell to the left; **HIV infection was confirmed by an age-appropriate, laboratory test and recorded by surveillance officers at enhanced surveillance sites.

SALMONELLA ENTERICA SEROTYPES TYPHI AND PARATYPHI

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Results

Salmonella Typhi isolates from invasive and non-invasive sites are reported for 2011 in table 3. Cases of enteric fever were higher in January, although there was an unusual peak in June, including a cluster from the Western Cape province (figure 1). No isolates of *Salmonella* Paratyphi C were received. The number of isolates within each age group is reported in table 4, indicating that most isolates were from patients in the 5 – 34 year age group, although infections were also detected in older and younger age groups. Eleven (17.5%) *Salmonella* Typhi isolates received in 2011 were intermediately resistant to ciprofloxacin, the treatment of choice (table 5), following the revised Clinical and Laboratory Standards Institute (CLSI) guidelines.[1] Two of eight isolates of *Salmonella* Paratyphi A received from blood cultures were from a 47-year old female (Gauteng province) and a 15-year old male (Western Cape) and showed intermediate resistance to ciprofloxacin.[1] The remaining six were identified from stool speci-

mens. Three isolates of *Salmonella* Paratyphi B L (+) tartrate (+) (*Salmonella* Paratyphi B var. Java) were received; two from stool specimens from children less than 5 years (Gauteng and KwaZulu-Natal provinces) and one from a urine specimen from a 62 year old female (KwaZulu-Natal).

Discussion

Salmonella Typhi isolates from both invasive and non-invasive sites are included in these analyses, as both add to the burden of infection in South Africa and thus represent a public health risk, although data may not reflect the actual burden of disease. This is compounded by the challenges of alternative diagnostic methods for typhoid fever, including clinical and serological methods. The number of reported *Salmonella* Typhi isolates was regarded as a substantial underestimate and thus incidence rates were not calculated. These results excluded those patients in whom a serological or clinical diagnosis was made without culture. Revised CLSI guidelines for *Salmonella* Typhi and extra-intestinal non-typhoidal *Salmonella* have highlighted the emerging resistance in this pathogen to the fluoroquinolones.[1] Ceftriaxone is regarded as the alternative therapy of choice in these cases, as well as those typhoid fever cases where the organism is fully resistant to ciprofloxacin.

Table 3: Numbers of invasive and non-invasive *Salmonella* Typhi cases reported to GERMS-SA by province, South Africa, 2011. n=72 (including audit reports, missing isolates, mixed and contaminated cultures).

Province	Non-invasive *Salmonella* Typhi	Invasive *Salmonella* Typhi
Eastern Cape	1	9
Free State	0	2
Gauteng	3	17
KwaZulu-Natal	2	10
Limpopo	0	1
Mpumalanga	1	9
Northern Cape	0	0
North West	0	1
Western Cape	2	14
South Africa	**9**	**63**

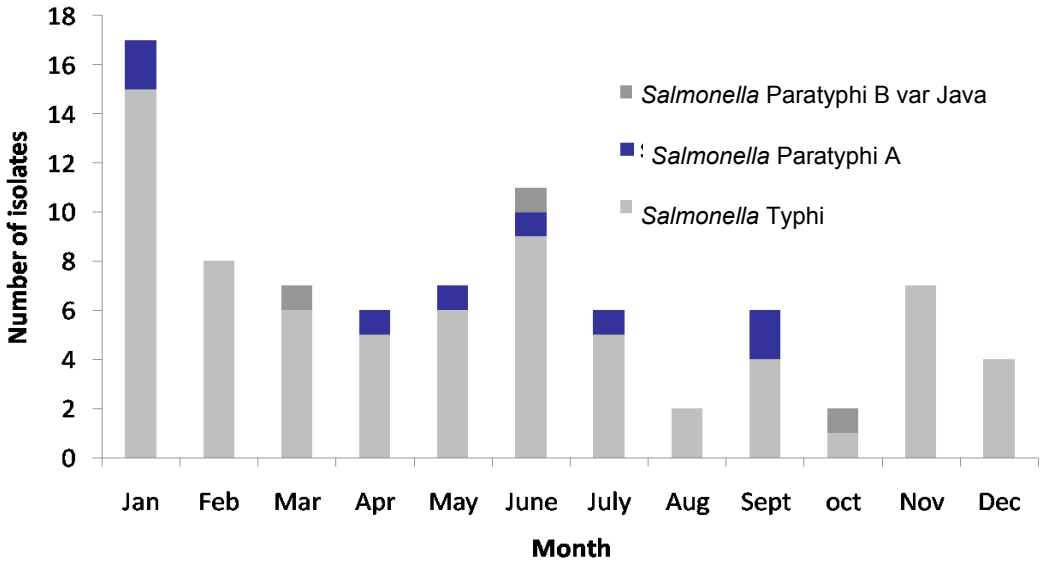

Figure 1: Numbers of non-invasive and invasive cases of *Salmonella* Typhi (n=72) and Paratyphi (n=11) reported to GERMS-SA, by month of specimen collection, South Africa, 2011 (including audit reports).

Table 4: Number of *Salmonella* Typhi isolates reported to GERMS-SA by age category, South Africa, 2011. n=72 (including audit reports, missing isolates, mixed and contaminated cultures).

Age category (years)	*Salmonella* Typhi isolates
0 - 4	8
5 – 14	21
15 – 24	16
25 – 34	13
35 - 44	6
45 - 54	1
55 - 64	1
≥ 65	0
Unknown	6
Total	**72**

Table 5: Antimicrobial susceptibility test results for all *Salmonella* Typhi isolates received by GERMS-SA, South Africa, 2011. n=63 (excluding audit reports, missing isolates, mixed and contaminated cultures).

Antimicrobial agent	Susceptible (%)	Intermediate (%)	Resistant (%)
Ampicillin	48 (76)	0 (0)	15 (24)
Trimethoprim	48 (76)	0 (0)	15 (24)
Sulphamethoxazole	37 (59)	0 (0)	26 (41)
Chloramphenicol	48 (76)	0 (0)	15 (24)
Nalidixic acid	52 (83)	0 (0)	11 (18)
Ciprofloxacin	52 (83)	11 (18)	0 (0)
Streptomycin	48 (76)	0 (0)	15 (24)
Tetracycline	63 (100)	0 (0)	0 (0)
Imipenem	63 (100)	0 (0)	0 (0)
Ceftriaxone	63 (100)	0 (0)	0 (0)

Reference

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NON-TYPHOIDAL *SALMONELLA ENTERICA* (NTS)

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Results

Invasive diseases tend not to have a seasonal prevalence, but increased numbers of non-invasive disease due to non-typhoidal *Salmonella enterica* (NTS) in the earlier months of 2011 and in December show seasonality (figure 2). The numbers of cases of invasive and non-invasive disease, by province, reported to GERMS-SA are given in table 6. The numbers of cases of invasive and non-invasive disease by age

group are shown in table 7. Note that incidence rates were only calculated for invasive NTS owing to differences in stool-taking practices in adult and paediatric medical care. Most invasive isolates were identified from blood cultures, although isolates were frequently identified from both blood culture and another site, such as stool and other normally-sterile sites (table 8).

Multi-drug resistance remains a challenge, including resistance to first-line antimicrobial agents and the fluoroquinolones (tables 9a and 9b). Furthermore, 14/475 (3.0%) of invasive NTS and 83/955 (8.7%) of non-invasive NTS produced extended spectrum beta-lactamases (ESBL). Fifty-six (67.5%) of 83 non-invasive ESBL-producing isolates were *Salmonella* Isangi (table 9a and table 10). *Salmonella* Enteritidis replaced *Salmonella* Typhimurium as the commonest NTS isolated (table 10).

Discussion

Non-typhoidal salmonellosis may be a food-borne disease, for which data are poorly captured in South Africa, and where the patients normally present with gastroenteritis, or it may be an AIDS-defining illness, in which case the organism frequently becomes invasive.

Clusters of food-borne disease were reported for South Africa during 2011,[1-7] and seasonal prevalence was noted for non-invasive disease. Due to revisions in reporting guidelines for invasive and non-invasive NTS, analysis of antimicrobial resistance has been reported separately. Greater numbers of isolates of invasive NTS received in 2011 appeared intermediately or fully resistant to ciprofloxacin, following the revised Clinical and Laboratory Standards Institute (CLSI) guidelines (table 9a).[8] Certain antimicrobial agents were tested for epidemiological reasons only, and should not be used for treatment. Antimicrobial resistance remains a cause for concern.

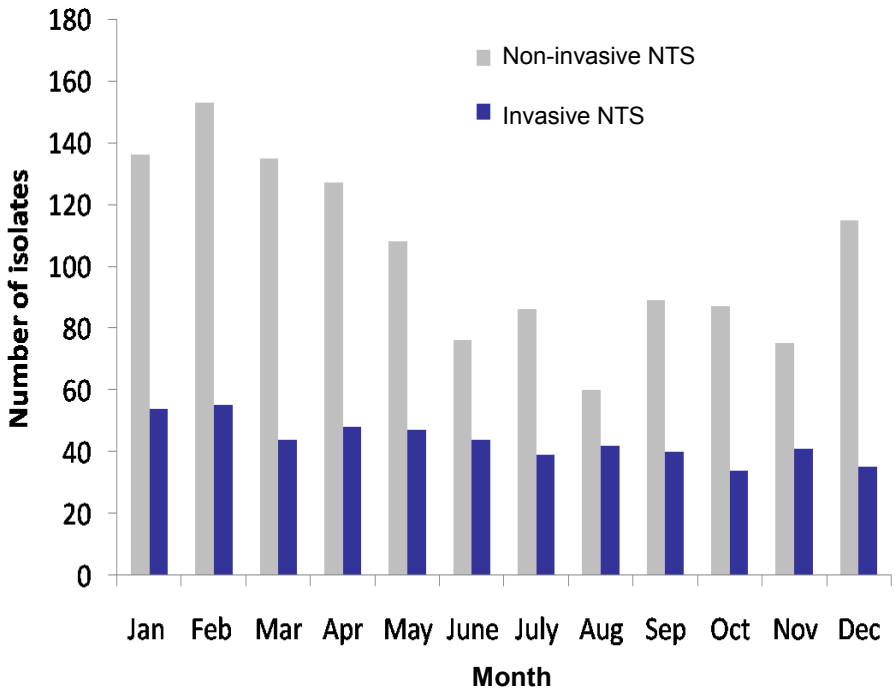

Figure 2: Numbers of non-invasive (n=1441) and invasive (n=608) non-typhoidal *Salmonella* (NTS) cases reported to GERMS-SA by month of specimen collection, South Africa, 2011 (including audit reports).

Table 6: Numbers* of invasive and non-invasive non-typhoidal *Salmonella* cases reported to GERMS-SA by province, South Africa, 2011. n= 2049 (including audit reports, missing isolates, mixed and contaminated cultures).

Province	Non-invasive, non-typhoidal *Salmonella* isolates	Invasive, non-typhoidal *Salmonella* isolates
Eastern Cape	162	35
Free State	27	25
Gauteng	575	307
KwaZulu-Natal	270	112
Limpopo	15	6
Mpumalanga	80	44
Northern Cape	24	7
North West	37	12
Western Cape	251	60
South Africa	**1441**	**608**

*Incidence rates were not calculated as there may have been regional differences in specimen collection practices.

Table 7: Numbers of cases and incidence rates for invasive* and non-invasive non-typhoidal *Salmonella* reported to GERMS-SA by age category, South Africa, 2011. n= 2049 (including audit reports, missing isolates, mixed and contaminated cultures).

Age Category (years)	Cases		Incidence rate for invasive disease**
	Non-invasive	Invasive	
0 - 4	560	165	3.2
5 - 14	125	29	0.3
15 - 24	103	29	0.3
25 - 34	150	114	1.3
35 - 44	154	105	1.7
45 - 54	107	67	1.6
55 - 64	84	28	0.9
≥ 65	74	26	1.0
Unknown	84	45	-
Total	**1441**	**608**	**1.2**

*Incidence rates for non-invasive non-typhoidal *Salmonella* were not calculated because specimens may not have been submitted for culture from all patients with gastroenteritis due to non-typhoidal *Salmonella*; **Incidence rates are expressed as cases per 100, 000 population.

Table 8: Numbers of non-typhoidal *Salmonella* cases reported to GERMS-SA by primary anatomical site of isolation*, South Africa, 2011. n=2049 (including audit reports, missing, mixed and contaminated cultures).

Specimen	n	%
CSF	14	0.7
Blood culture	531	25.9
Stool	1184	57.8
Other	320	15.6
Total	**2049**	**100.0**

*Many cases had multiple isolates of the same serotype, including those with isolates from an invasive site of origin and a second isolate from stool, or isolates from two different normally sterile sites.

Table 9a: Antimicrobial susceptibility test results for all invasive non-typhoidal *Salmonella* isolates received by GERMS-SA, South Africa, 2011. n=475 (excluding audit reports, missing isolates, mixed and contaminated cultures).

Antimicrobial agent	Susceptible (%)	Intermediate (%)	Resistant (%)
Ampicillin	410 (86)	2 (0)	63 (13)
Trimethoprim	411 (87)	0 (0)	64 (14)
Sulphamethoxazole	254 (54)	0 (0)	221 (47)
Chloramphenicol	419 (88)	3 (1)	53 (11)
Nalidixic acid	409 (86)	0 (0)	66 (14)
Ciprofloxacin	403 (85)	66 (14)	6 (1)
Tetracycline	394 (83)	20 (4)	61 (13)
Streptomycin	413 (87)	0 (0)	62 (13)
Imipenem	475 (100)	0 (0)	0 (0)
Ceftriaxone	461 (97)	0 (0)	14 (3)

Table 9b: Antimicrobial susceptibility test results for all non-invasive non-typhoidal *Salmonella* isolates received by GERMS-SA, South Africa, 2011. n=955 (excluding audit reports, missing isolates, mixed and contaminated cultures).

Antimicrobial agent	Susceptible (%)	Intermediate (%)	Resistant (%)
Ampicillin	805 (84)	0 (0)	150 (16)
Trimethoprim	823 (86)	0 (0)	132 (14)
Sulphamethoxazole	422 (44)	0 (0)	533 (56)
Chloramphenicol	791 (83)	11 (1)	153 (16)
Nalidixic acid	846 (89)	0 (0)	109 (11)
Ciprofloxacin	929 (97)	21 (2)	5 (1)
Tetracycline	677 (71)	35 (4)	243 (25)
Streptomycin	791 (83)	0 (0)	164 (17)
Imipenem	955 (100)	0 (0)	0 (0)
Ceftriaxone	871 (91)	1 (0)	83 (9)

Table 10: Commonest invasive and non-invasive non-typhoidal *Salmonella* serotypes reported to GERMS-SA by province, South Africa, 2011. n= 1184 (excluding audit reports, missing isolates, mixed and contaminated cultures).

Province	Serotype				
	Enteritidis	Heidelberg	Isangi	Newport	Typhimurium
Eastern Cape	23	2	23	3	76
Free State	11	0	1	4	20
Gauteng	339	12	12	16	156
KwaZulu-Natal	100	9	15	1	48
Limpopo	4	1	0	0	2
Mpumalanga	26	3	11	1	26
Northern Cape	4	0	0	0	15
North West	9	0	0	1	2
Western Cape	75	8	6	9	110
South Africa	**591**	**35**	**68**	**35**	**455**

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SHIGELLA SPECIES

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Results

Increased numbers of *Shigella* isolates from January to April 2011 suggest seasonality (figure 3). Although the primary burden of disease due to *Shigella* was non-invasive dysentery or diarrhoea, invasive disease remained an important cause of morbidity in South Africa in 2011 (table 11). The predominant burden of disease, including both invasive and non-invasive shigellosis, occured in the less than five year age group (table 12). Quinolone resistance remained low, but fluoroquinolone resistance appears to be emerging (table 13). Predominant serotypes confirm that *Shigella flexneri* 2a remains the commonest cause of shigellosis in South Africa. *Shigella dysenteriae* type 1 was not isolated in 2011 (table 14). Extended spectrum beta-lactamase (ESBL) production is rarely documented but remains important. Eight (0.5%) of 1467 *Shigella* isolates were ESBL-producers. Of these, a single *S. flexneri* 2a was identified from a blood culture and the remainder were from non-invasive specimens.

Discussion

Shigella infection is primarily associated with water-borne outbreaks in South Africa, although person-to-person transmission may play a role. The importance of systemic shigellosis in young children and women has been evaluated.[1]

Certain antimicrobials were tested for surveillance purposes only, and should not be used for treatment. Resistance to fluoroquinolones remains low, but should continue to be monitored. ESBL-production is rarely documented, but remains important as ESBL subtypes appear common to those identified in other nosocomial pathogens.[2]

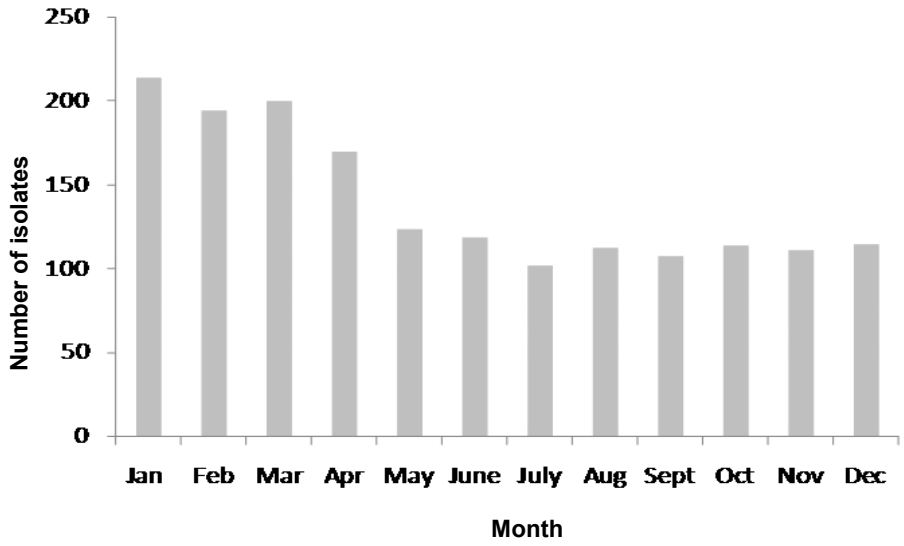

Figure 3. Numbers of non-invasive and invasive *Shigella* isolates reported to GERMS-SA by month of specimen collection, South Africa, 2011. n=1685 (including audit reports).

Table 11: Numbers of invasive and non-invasive *Shigella* isolates reported to GERMS-SA by province, South Africa, 2011. n=1685 (including audit reports, missing isolates, mixed and contaminated cultures).

Province	Non-invasive *Shigella*	Invasive *Shigella*
Eastern Cape	217	6
Free State	42	2
Gauteng	619	26
KwaZulu-Natal	187	16
Limpopo	14	0
Mpumalanga	34	2
Northern Cape	36	3
North West	18	0
Western Cape	451	12
South Africa	**1618**	**67**

Table 12: Numbers of cases* and incidence rates for *Shigella* (invasive and non-invasive)** reported to GERMS-SA by age category, South Africa, 2011. n=1685 (including audit reports, missing isolates, mixed and contaminated cultures).

Age Category (years)	Cases		Incidence rate for invasive disease**
	Non-invasive	Invasive	
0 - 4	783	33	0.64
5 - 14	235	4	0.04
15 - 24	76	2	0.02
25 - 34	172	13	0.15
35 - 44	109	4	0.06
45 - 54	82	4	0.09
55 - 64	52	1	0.03
≥ 65	56	2	0.08
Unknown	53	4	-
Total	**1618**	**67**	**0.13**

*Cases may be under-reported due to local clinical practices: no mixed infections were identified. **Incidence rates are expressed as cases per 100,000 population.

Table 13: Antimicrobial susceptibility test results for *Shigella* isolates received by GERMS-SA, South Africa, 2011. n=1467 (excluding audit reports, missing isolates, mixed and contaminated cultures).

Antimicrobial agent	Susceptible (%)	Intermediate (%)	Resistant (%)
Ampicillin	776 (53)	0 (0)	691 (47)
Trimethoprim	128 (9)	0 (0)	1339 (91)
Sulphamethoxazole	247 (17)	0 (0)	1220 (83)
Chloramphenicol	969 (66)	1 (0)	497 (34)
Nalidixic acid	1455 (99)	0 (0)	12 (1)
Ciprofloxacin	1464 (100)	0 (0)	3 (0)
Tetracycline	603 (41)	4 (0)	860 (59)
Streptomycin	589 (40)	0 (0)	878 (60)
Imipenem	1467 (100)	0 (0)	0 (0)
Ceftriaxone	1459 (99)	0 (0)	8 (1)

Table 14: Commonest* invasive and non-invasive *Shigella* serotypes, including *Shigella dysenteriae* type 1, reported to GERMS-SA by province, South Africa, 2011. n=1160 (excluding audit reports, missing isolates, mixed and contaminated cultures).

Province	*S. dysenteriae* type 1	*S. flexneri* type 2a	*S. sonnei* phase i/ii	*S. flexneri* type 3a	*S. flexneri* type 6
Eastern Cape	0	82	14	31	14
Free State	0	12	6	6	4
Gauteng	0	164	193	56	67
KwaZulu-Natal	0	48	39	19	19
Limpopo	0	3	2	0	0
Mpumalanga	0	9	1	7	5
Northern Cape	0	7	6	2	2
North West	0	1	2	3	1
Western Cape	0	200	56	41	38
South Africa	**0**	**526**	**319**	**165**	**150**

*Including *Shigella dysenteriae* type 1: Although these isolates are currently rare in South Africa, the potential for future epidemics remains while these strains are in circulation.

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DIARRHOEAGENIC *ESCHERICHIA COLI* (DEC)

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Results

Enteropathogenic *Escherichia coli* (EPEC) remains the commonest cause of diarrhoea in South Africa (table 15). The increased number of cases in the first half of the year is potentially a surveillance artefact (figure 4) and the predominance of cases in younger children under five years of age may reflect, in part, specimen-taking practices, as well as the burden of diarrhoeal disease in this age group (table 16).

Three patients acquired mixed infections with three different DEC pathotypes and 23 patients acquired mixed infections with two different DEC pathotypes. Six isolates of *E. coli* O157 were received of which two were enterohaemorrhagic *E. coli* (EHEC) and four were enteropathogenic *E. coli* (EPEC). Two serotypes of EHEC, including O157 and O26 (two isolates), were identified from infants less than one year of age, from Mpumalanga and Gauteng respectively. The commonest serotypes associated with EPEC included O55, O111, O119 and O127. Diverse serotypes were also noted for other enterovirulent *E. coli* isolates. Identification of EHEC was incidental.[1]

Discussion

Incidence rates were not calculated as numbers were not considered to be fully representative. Actual burden of disease due to diarrhoeagenic *E. coli* is probably greatly underestimated in South Africa, as management is primarily syndromic and centres on rehydration. As a consequence, clinicians are unlikely to prioritise stool-taking in uncomplicated cases of diarrhoea.

Disease in the past appears to have been primarily waterborne due to high levels of faecal contamination in water sources, and this trend appears to be continuing. The predominance of isolates received from children under the age of one year may reflect culturing practices: infants are more likely to have stools taken for culture due to the devastating effects of diarrhoea in children of this age. Seasonality is suggested by greater numbers of cases in the months January to April, 2011.

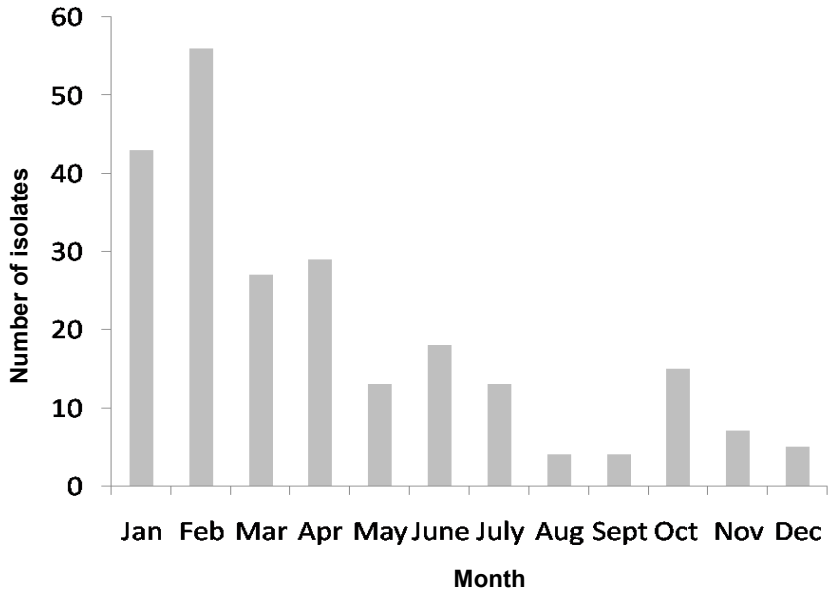

Figure 4: Numbers of diarrhoeagenic *Escherichia coli* isolates, reported to GERMS-SA by month of specimen collection, South Africa, 2011. n=234.

Table 15: Numbers of diarrhoeagenic *Escherichia coli* isolates reported to GERMS-SA by province, South Africa, 2011. n=234.

Province	DAEC	EAggEC	STEC/ EHEC	EIEC	EPEC	ETEC
Eastern Cape	4	7	0	1	26	0
Free State	0	0	0	0	0	0
Gauteng	6	8	1	0	108	0
KwaZulu-Natal	0	0	0	0	8	0
Limpopo	0	0	0	0	0	0
Mpumalanga	16	10	1	3	19	2
Northern Cape	2	0	0	0	0	0
North West	1	0	0	0	3	0
Western Cape	4	0	0	1	3	0
South Africa	**33**	**25**	**2**	**5**	**167**	**2**

DAEC: diffusely-adherent *E. coli*; EAggEC: enteroaggregative *E. coli*; STEC/EHEC: Shiga-toxigenic *E. coli* or entero-haemorrhagic *E. coli*; EIEC: enteroinvasive *E. coli*; EPEC: enteropathogenic *E. coli*; ETEC: enterotoxigenic *E. coli.*

Table 16: Numbers of diarrhoeagenic *E. coli* isolates reported to GERMS-SA by age category, South Africa, 2011. n=234.

Age category (years)	DAEC	EAggEC	EHEC/ STEC	EIEC	EPEC	ETEC
0 - 4	14	17	2	1	154	0
5 - 14	2	0	0	1	1	0
15 - 24	4	2	0	1	3	0
25 - 34	2	3	0	1	4	0
35 - 44	5	1	0	0	2	1
45 - 54	4	1	0	0	0	0
55 - 64	2	0	0	0	0	0
≥ 65	0	0	0	1	1	0
Unknown	0	1	0	0	2	1
Total	**33**	**25**	**2**	**5**	**167**	**2**

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VIBRIO CHOLERAE O1

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A single case of cholera due to *Vibrio cholerae* O1 Ogawa was reported in 2011 in South Africa. The organism was isolated from the stool of a 37 year old woman from Zimbabwe, who presented to a hospital in Limpopo in May with profuse watery diarrhoea.

CRYPTOCOCCUS SPECIES

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Results

During 2011, 6599 case patients with laboratory-confirmed incident cryptococcal episodes were reported. The overall incidence for the South African population decreased in 2011 compared to 2010 (table 17). Similarly, incidence amongst HIV-infected individuals decreased (132/100 000 in 2010 and 118/100 000 in 2011). Incidence decreased or remained stable in all of South Africa's provinces except KwaZulu-Natal where the incidence increased (table 17). The peak incidence of cryptococcosis was recorded amongst patients aged 35-39 years in 2010 and 2011 although incidence was lower in 2011 in almost all age categories (figure 5). One hundred and sixty-nine children younger than 15 years had laboratory-confirmed cryptococcosis of which 72/169 (43%) were younger than 5 years of age. Where gender was known (6493/6599, 98%), 50% of patients were female. Most patients (5845/6599, 89%) were diagnosed with meningitis (laboratory tests on cerebrospinal fluid positive for *Cryptococcus* species), and 665/6599 (10%) were diagnosed with fungaemia (specimen data were missing for 26 cases) (table 18). Sixty-three patients were diagnosed by culture of urine, sputum, pleural fluid and other specimen types. At enhanced surveillance sites, 1915 patients were diagnosed with cryptococcosis, with viable isolates received from 1289/1915 (67%) patients. Isolates were speciated from all these cases: 1235 (96%) were identified as *Cryptococcus neoformans* and 54 (4%) were identified as *C. gattii.* Cases of *C. gattii* disease were diagnosed in 7 provinces: Gauteng (n=17), Mpumalanga (n=15), Limpopo (n=9), KwaZulu-Natal (n=4), North West (n=4), Western Cape (n=1) and Northern Cape (n=4). The in-hospital case-fatality ratio for patients at enhanced surveillance sites decreased significantly between 2010 and 2011 (644/1835 (35%) vs. 530/1734 (31%) respectively, p=0.003).

Discussion

In 2011, approximately 600 fewer incident cases of cryptococcosis were detected by GERMS-SA compared with 2010. The overall incidence also decreased – a slow but steady decline has been noted for several years now. This may indicate that the antiretroviral treatment programme has made an impact on this AIDS-defining opportunistic infection. It is difficult to comment on trends in KwaZulu-Natal because case reporting is not subjected to an audit and an increase in incidence may indicate better reporting. Most patients continued to be diagnosed with meningitis. The demographic profile of patients with cryptococcosis remained unchanged. Although very few children were diagnosed with cryptococcosis, more than one-third of paediatric cases were diagnosed among children less than 5 years of age. *Cryptococcus neoformans* was the predominant pathogen causing disease although the small number of patients infected with *C. gattii* was diagnosed from across the country. The in-hospital mortality of patients with cryptococcosis decreased significantly for the first time and may be related to earlier health-seeking behaviour of patients with meningitis and/or improved in-hospital patient care.

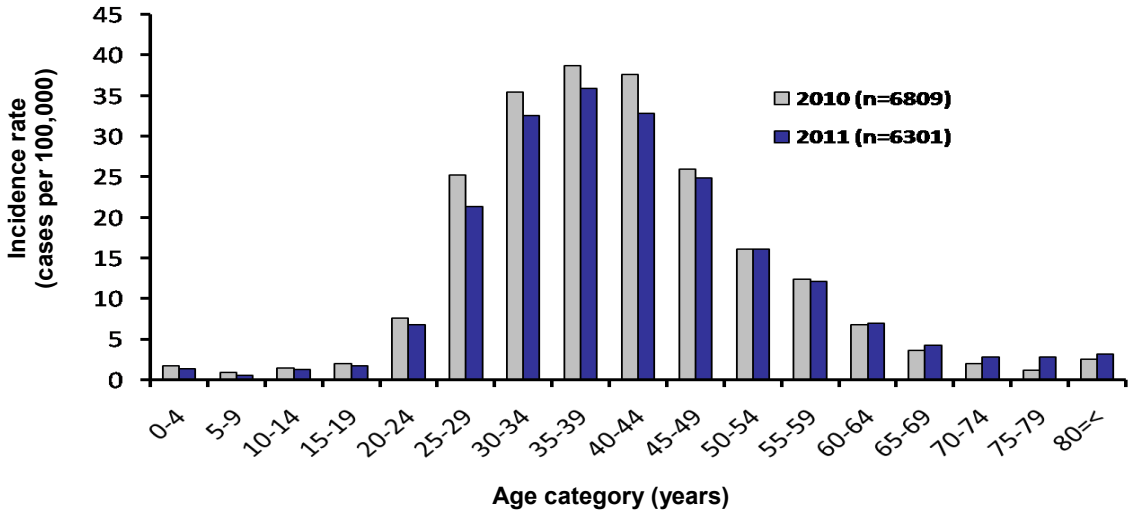

Figure 5: Age-specific incidence rates for laboratory-confirmed cryptococcal cases, reported to GERMS-SA, South Africa, 2010 and 2011. n=13110 (age unknown for 693 cases).

Table 17: Numbers of cases and incidence of cryptococcal disease reported to GERMS-SA by province, South Africa, 2010 and 2011. n=13803.

Province	2010*		2011*	
	n	Incidence**	n	Incidence**
Eastern Cape	1330	20	1236	18
Free State	457	16	357	13
Gauteng	2099	19	1938	17
KwaZulu-Natal	962	9	1037	10
Limpopo	568	10	417	8
Mpumalanga	703	19	597	16
Northern Cape	63	6	66	6
North West	532	17	453	14
Western Cape	490	9	498	9
South Africa	**7204**	**14**	**6599**	**13**

*A similar surveillance audit was performed for NHLS laboratories in 8 provinces (excluding KwaZulu-Natal) in 2010 and 2011, detecting additional microscopy (India ink), cryptococcal antigen and culture-confirmed cases; **Incidence rates were calculated based on population denominators provided by Statistics South Africa, and are expressed as cases per 100,000 population.

Table 18: Numbers and percentages of cases of cryptococcal disease reported to GERMS-SA by specimen type, South Africa, 2010 and 2011. n=13803.

Site of specimen	2010		2011	
	n	%	n	%
CSF	6474	90	5845	89
Blood	631	8	665	10
Other	75	<1	63	<1
Unknown	24	<1	26	<1
Total	**7204**		**6599**	

NEISSERIA MENINGITIDIS

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Results

In 2011, 289 cases of meningococcal disease were reported and an additional 36 cases were identified on audit, giving a total of 325 cases of laboratory-confirmed meningococcal disease identified by the surveillance system through the year in South Africa (table 19). Overall incidence had decreased from that of 2010 (0.83 cases per 100 000 population in 2010 compared to 0.64/100 000 in 2011, p=0.001). The number of cases reported was greatest during the winter and spring months (figure 6). Of all cases reported, cerebrospinal fluid (CSF) was the most common specimen type yielding meningococci (table 20). The number of cases diagnosed on blood culture remained similar in 2011 compared to 2010 (p=0.3). Cases of W135 disease were reported from all provinces, and this serogroup was the most predominant in South Africa in 2011 (137/275, 50%) (table 21), with a similar proportion to

that of 2010 (159/333, 48%; p=0.6). Minor year-on-year fluctuations of disease by province were noted. In Gauteng, the incidence of meningococcal disease was estimated at 1.19/100 000, most of which was due to serogroup W135 (65/116, 56%). In Western Cape, serogroup B disease decreased by ~40%, from 33 of 61 cases with serogroup data in 2010 to 17 of 51 cases in 2011 (p=0.03). Risk of disease was greatest amongst children less than five years of age. Age and serogroup-specific incidence rates show that infants were at greatest risk of disease for the three most common serogroups (figure 7). Preliminary analysis of case-fatality ratios, as calculated at enhanced surveillance sites where in-hospital outcome is specifically recorded, was 20/105 (19%) in 2011, comparable to that of 27/158 (17%) in 2010 (p=0.7). Of the viable isolates tested for antimicrobial resistance, 3% (5/197) had penicillin minimum inhibitory concentrations (MICs) >0.06µg/ml, and were therefore characterised as intermediately resistant.

Discussion

The overall incidence of meningococcal disease in 2011 declined from that of 2010. Serogroup W135 disease predominated in 2011 as in 2010. Fluctuations in meningococcal disease incidence in the provinces may be attributable to changes in the ability to confirm disease in the laboratory as well as changes in reporting to the surveillance network, or these fluctuations may reflect true changes in incidence. Case-fatality ratios for 2011 remained similar to those of 2010. The prevalence of intermediate resistance to penicillin remained low in 2011. The clinical relevance of increased MICs is unclear, and penicillin is, at present, still recommended as the drug of choice for treating confirmed meningococcal disease.

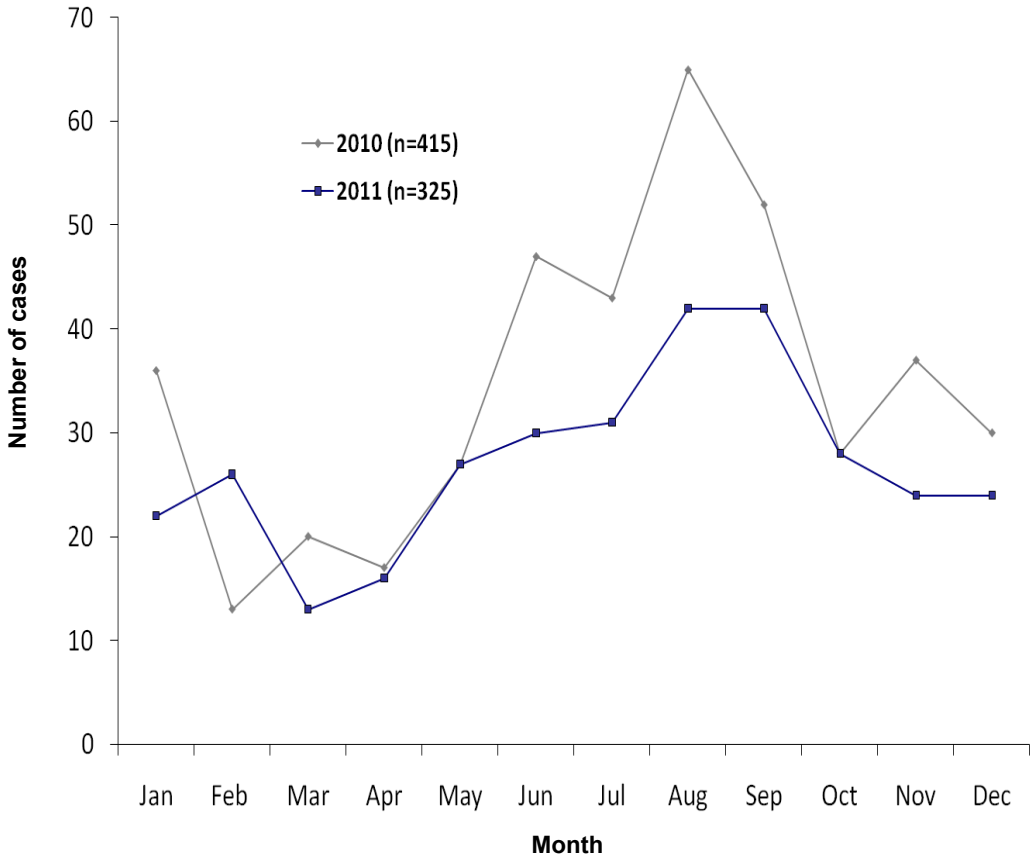
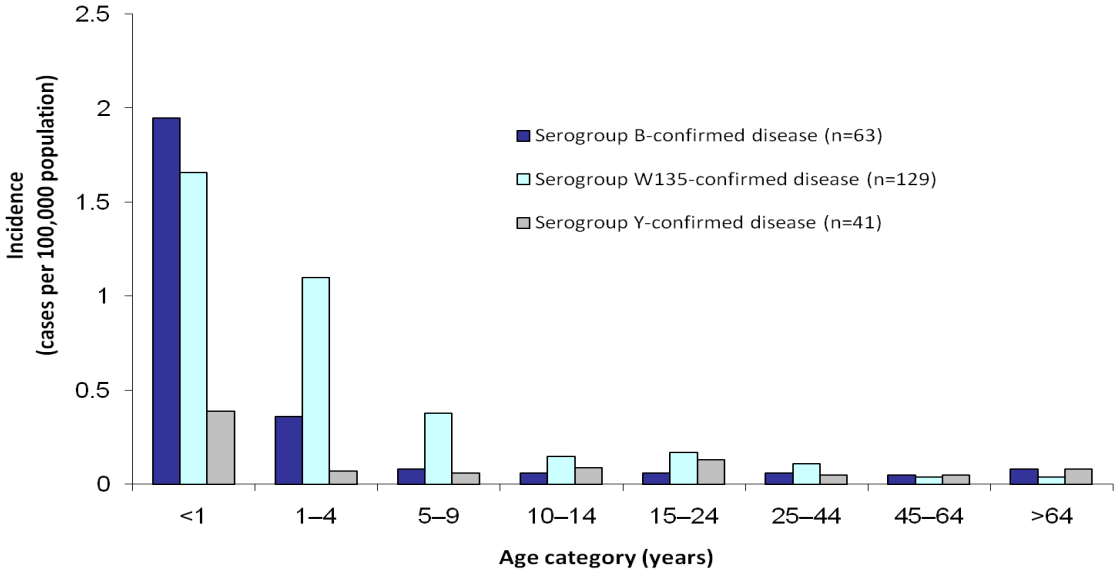


Figure 6: Numbers of laboratory-confirmed, invasive meningococcal cases reported to GERMS-SA, by month and year, South Africa, 2010-2011. n=740.

Figure 7: Age-specific incidence rates for laboratory-confirmed, invasive meningococcal cases by sero-group, South Africa, 2011. n=325*



*275 (85%) with specimens available for serogrouping, of which 261 had age known; 28 were serogroup C.

Table 19: Numbers of cases and incidence rates of meningococcal disease reported to GERMS-SA by province, South Africa, 2010 and 2011. n=740 (including audit cases).

Province	2010		2011	
	n	Incidence rate*	n	Incidence rate*
Eastern Cape	31	0.46	49	0.73
Free State	26	0.92	25	0.89
Gauteng	187	1.67	133	1.19
KwaZulu-Natal	33	0.31	29	0.27
Limpopo	13	0.24	8	0.15
Mpumalanga	28	0.77	18	0.50
Northern Cape	20	1.81	6	0.54
North West	11	0.34	5	0.16
Western Cape	66	1.26	52	1.00
South Africa	**415**	**0.83**	**325**	**0.64**

*Incidence rates were calculated based on population denominators provided by Statistics South Africa, and are expressed as cases per 100,000 population.

Table 20: Numbers and percentages of cases of meningococcal disease reported to GERMS-SA by specimen type, South Africa, 2010 and 2011. n=740.

Site of specimen	2010		2011	
	n	%	n	%
CSF	323	78	242	74
Blood	91	22	81	25
Other	1	0.2	2	0.6
Total	**415**		**325**	

Table 21: Numbers of cases of invasive meningococcal disease reported to GERMS-SA by serogroup and province, South Africa, 2011. n=325*.

Province	Serogroup							
	Serogroup not available	A	B	C	W135	X	Y	Total
Eastern Cape	14	0	8	3	21	0	3	49
Free State	6	0	10	2	4	0	3	25
Gauteng	17	0	24	10	65	0	17	133
KwaZulu-Natal	1	0	5	4	13	0	6	29
Limpopo	4	0	1	0	3	0	0	8
Mpumalanga	4	0	1	3	8	0	2	18
Northern Cape	2	0	1	0	1	0	2	6
North West	1	0	0	0	3	0	1	5
Western Cape	1	0	17	8	19	0	7	52
Total South Africa	**50**	**0**	**67**	**30**	**137**	**0**	**41**	**325**

*275 (85%) with specimens or viable isolates available for serogrouping.

HAEMOPHILUS INFLUENZAE

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Results

The number of cases of *Haemophilus influenzae* invasive disease reported in South Africa in 2011 was 308, while an additional 83 cases were identified during the national audit (total number of cases available for analysis was 391). Of these, 288 (74%) had isolates or specimens available for serotyping, and 111/288 (39%) were confirmed as serotype b (table 22). Serotype b isolates were more likely to be isolated from cerebrospinal fluid (CSF) than were non-typeable *H. influenzae* (61/111, 55% vs. 4/137, 3%, p<0.001) (Table 23). In 2011, a total of 75 cases of *H. influenzae* serotype b (Hib) was reported amongst children less than 5 years of age (figure 8), with the highest incidence occurring amongst infants (figure 9). Rates of Hib disease as recorded by the surveillance network amongst infants less than 1 year of age have remained similar since 2009 (chi-squared test for trend, p=0.3) (figure 10). Twenty-three percent (17/73 isolates tested) of serotype b strains were non-susceptible to ampicillin (MIC>1mg/L, all producing beta lactamase), while 12% (13/111) of non-typeable strains were non-susceptible (p=0.3).

Discussion

Since the introduction of the Hib conjugate vaccine into the Expanded Programme on Immunisation (EPI) for South Africa in 1999, there has been a reduction in cases reported due to this serotype.[1] Population-based studies in South Africa before the introduction of the conjugate Hib vaccine demonstrated annual rates of invasive Hib disease of 170 per 100 000 infants below one year of age.[2,3] Recent increases in incidence are small by comparison to the substantial decline in disease subsequent to the introduction of the vaccine. In April 2009, the updated infant vaccination programme in South Africa introduced a booster dose of conjugate Hib vaccine given at 18 months as part of a combination vaccine (Pentaxim: diphtheria-tetanus-acellular pertussis-inactivated poliovirus-*Haemophilus influenzae* type-b conjugate). The first children

benefiting from this would have received a dose in November 2010. It is hoped that this booster will improve long-term protection against disease and impact on ongoing Hib transmission in the community.[4]

Recognising that the surveillance system underestimates disease, reported cases of Hib disease amongst children less than 1 year are being monitored carefully. Rates of Hib in children less than 1 year have stabilised over the last 3 years. This could be related to interventions such as improved prevention and treatment of HIV in infants, the introduction of the booster dose of Hib vaccine, or changes in diagnosis and reporting of cases. More data are needed to evaluate the relative contribution of these factors and clinical and laboratory staff are urged to continue reporting all cases of *H. influenzae*.

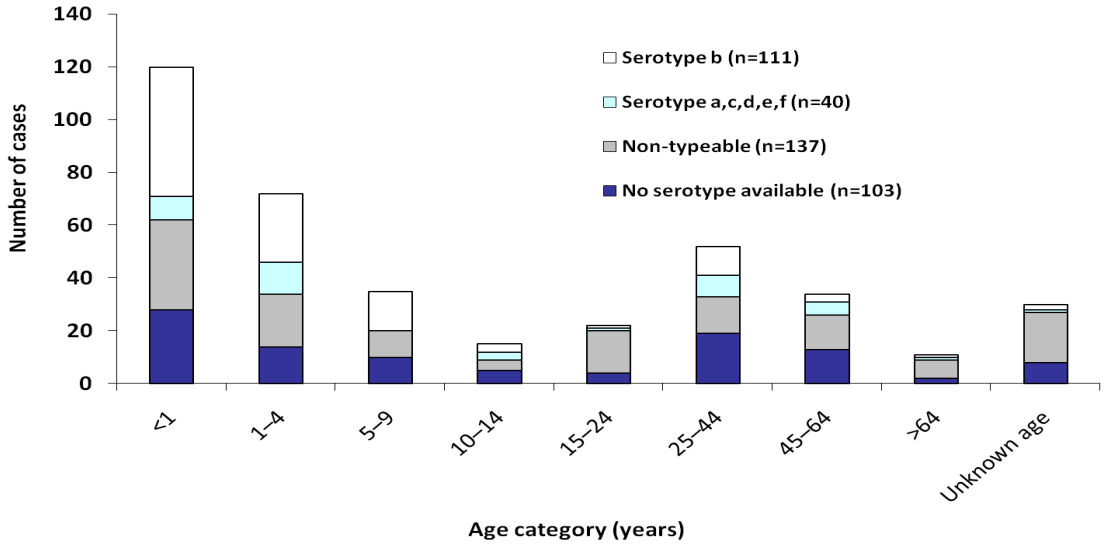

Figure 8: Numbers of laboratory-confirmed, invasive *Haemophilus influenzae* cases reported to GERMS-SA by serotype and age group, South Africa, 2011. n=391 (age unknown for n=30; specimens or viable isolates unavailable for serotyping for n=103).

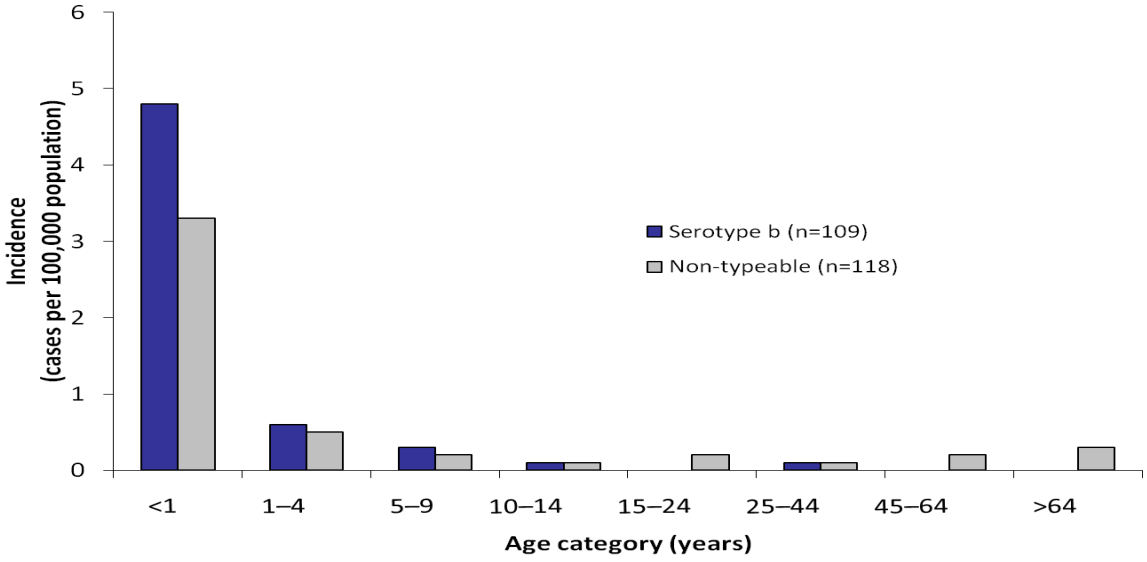

Figure 9: Age-specific incidence rates for laboratory-confirmed, invasive *Haemophilus influenzae* disease, reported to GERMS-SA, by serotype, South Africa, 2011. n=391.

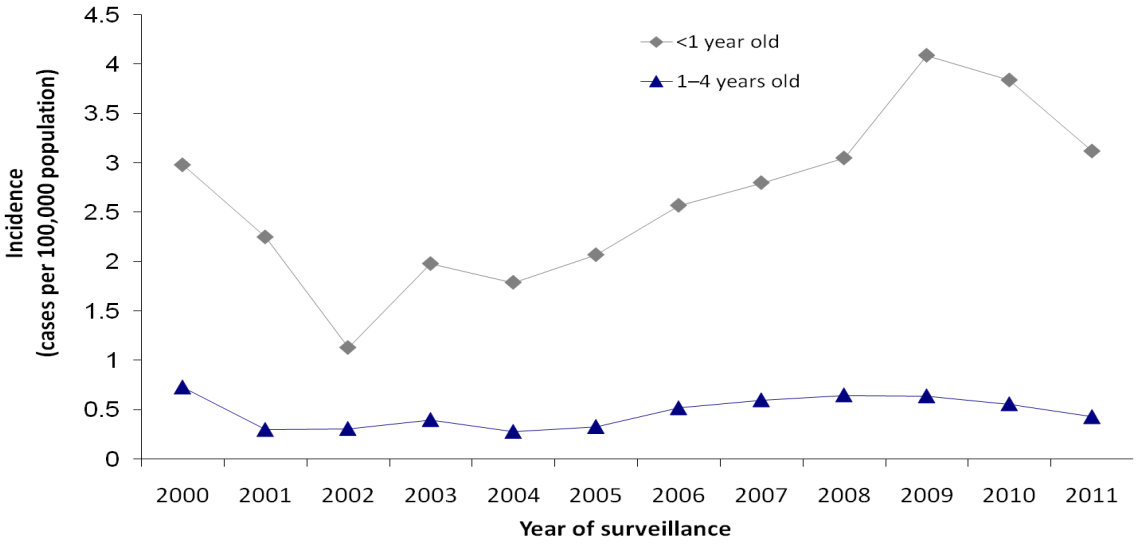

Figure 10: Incidence rates of laboratory-confirmed, *Haemophilus influenzae* serotype b disease reported to GERMS-SA in children less than 5 years old, South Africa, 2000-2011 (excluding cases identified using polymerase chain reaction (PCR) on specimens which was only done 2007-2011).

Table 22: Numbers of cases of invasive *Haemophilus influenzae* disease reported to GERMS-SA by serotype and province, South Africa, 2011. n=391*.

Province	Serotype								
	Serotype not available	a	b	c	d	e	f	Non-typeable	Total
Eastern Cape	14	0	10	0	0	1	0	4	29
Free State	10	0	10	0	0	0	1	5	26
Gauteng	41	4	30	1	6	3	7	61	153
KwaZulu-Natal	1	1	17	1	1	1	1	15	38
Limpopo	3	0	2	0	0	0	0	1	6
Mpumalanga	10	1	9	0	0	0	0	1	21
Northern Cape	3	0	8	0	0	0	0	1	12
North West	5	0	3	0	0	0	0	0	8
Western Cape	16	2	22	1	3	0	5	49	98
South Africa	**103**	**8**	**111**	**3**	**10**	**5**	**14**	**137**	**391**

*288 (74%) with specimens or viable isolates available for serotyping.

Table 23: Numbers and percentages of cases of invasive *Haemophilus influenzae* disease reported to GERMS-SA by specimen type, South Africa, 2011. n=391.

Site of specimen	No serotype available		Serotype b		Serotypes a, c, d, e, f		Non-typeable	
	n	%	n	%	n	%	n	%
CSF	23	22	61	55	9	23	4	3
Blood	44	43	45	41	31	78	104	76
Other	36	35	5	5	0	0	29	21
Total	**103**		**111**		**40**		**137**	

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STREPTOCOCCUS PNEUMONIAE

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Results

The 7-valent polysaccharide-protein conjugate pneumococcal vaccine (PCV7)[1] was introduced into the Expanded Programme on Immunisations (EPI) in South Africa from 1 April 2009. In April 2010, this vaccine was replaced by the 13-valent formulation (PCV-13). Incidence of reported invasive pneumococcal disease (IPD) varied widely by province in 2010 and 2011 (table 24). The age group at highest risk of disease in South Africa was infants less than 1 year of age. There has been an ongoing significant reduction in disease since 2009 (chi-squared test for trend, p<0.001) (figure 11).

The majority of episodes reported to GERMS-SA in 2010 and 2011 were diagnosed from positive blood culture specimens (table 25). Penicillin non-susceptible isolates (MIC>0.06mg/L) in all age groups have decreased (1210/2872, 42%, in 2010 compared to 823/2410, 34%, in 2011, p<0.001). The prevalence of non-susceptible strains (intermediate and resistant) ranged from 25% to 43% in different provinces (table 26). Penicillin non-susceptible isolates were common amongst children less than 5 years of age (figure 12), but numbers in this age group have decreased compared with 2010 (393/649, 61%, in 2010 compared to 208/468, 44%, in 2011, p<0.001). A smaller reduction in penicillin non-susceptibility was seen in individuals 5 years and older (778/2134, 36%, in 2010 compared with 589/1878, 31%, in 2011, p=0.001). Ceftriaxone non-susceptibility was detected amongst 5% (126/2410) of all IPD cases, a reduction from 2010 (8%, 223/2862, p<0.001), and in 2011 was less likely to be detected in cases with pneumococci isolated from cerebrospinal fluid (CSF) (4%, 35/866, compared to 6%, 91/1544, of isolates from all other specimens, p=0.05). The numbers of cases amongst children less than 5 years of age due to common serotypes for the period 2009-2011 are shown in figure 13. The percentages of disease in 2011 amongst children less than 5 years of age due to PCV7 and newer valency vaccine formulations are shown in table 27. The number of isolates in this age group available for serotyping has decreased in the last three years (1009/1337, 75%, in 2009, 649/909, 71%, in 2010 and 468/680, 69%, in 2011, p=0.001).

Discussion

Differences in IPD incidence by province have been documented for several years, and are partly due to differences in specimen-taking practices and laboratory reporting. However, real differences in disease incidence cannot be excluded. The decreases in incidence of disease in children less than 1 year of age are partly due to the introduction of PCV7 in South Africa. When these data are analysed by HIV-coinfection, vaccine and non-vaccine serotypes have decreased in HIV-infected infants, suggesting that HIV prevention and treatment improvements have also substantially impacted on IPD.[2,3]

Reductions in antimicrobial non-susceptibility can also be attributed to reductions in the least susceptible serotypes: paediatric and PCV-7. The low level of penicillin non-susceptibility from blood culture specimens supports the continued use of penicillin as the first-line treatment for community-acquired pneumonia. Vancomycin, together with ceftriaxone, should be considered for the empiric treatment of suspected pneumococcal meningitis (CSF specimens positive for Gram-positive cocci or latex agglutination tests positive for *S. pneumoniae*) that may be due to ceftri-

axone-resistant pneumococci, especially amongst unvaccinated children.[4] As ceftriaxone-resistant isolates are likely to be serotypes contained in PCV-7 and PCV-13, it is anticipated that the number of resistant isolates causing disease will continue to decrease with wider use of the vaccine.

Clinicians are urged to continue taking relevant specimens when pneumococcal disease is suspected and laboratorians are urged to submit all pneumococci isolated from normally sterile site specimens. Ongoing surveillance will assist in evaluating pneumococcal disease in South Africa during this period of multiple interventions.

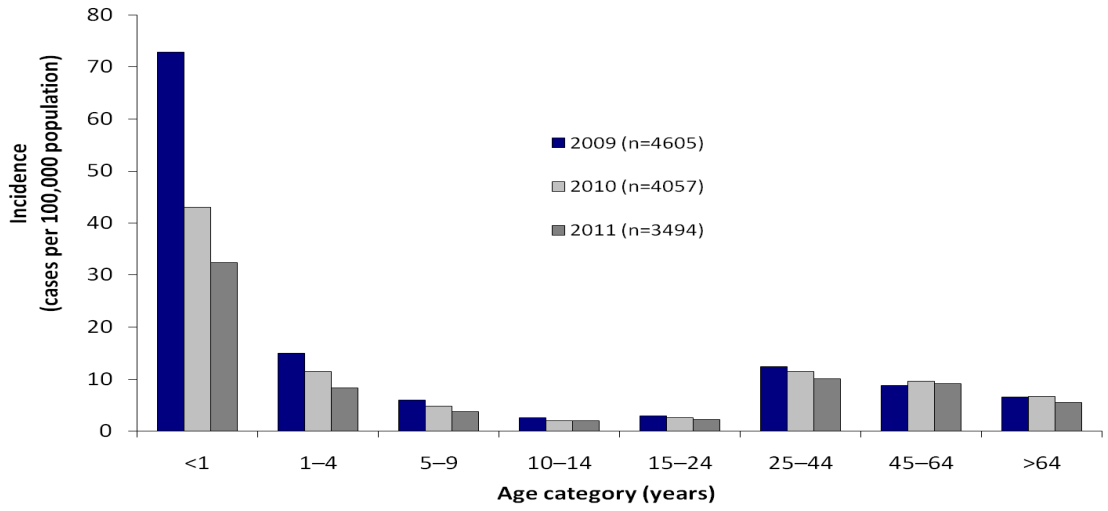


Figure 11: Age-specific incidence rates for laboratory-confirmed, invasive pneumococcal disease reported to GERMS-SA, South Africa, 2009 through 2011.

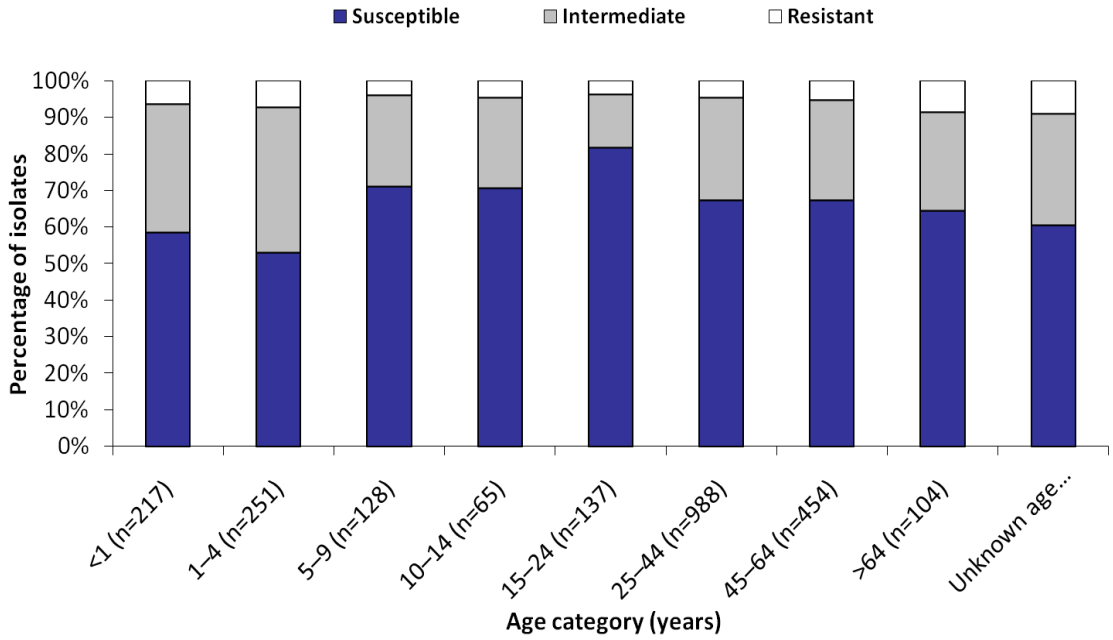
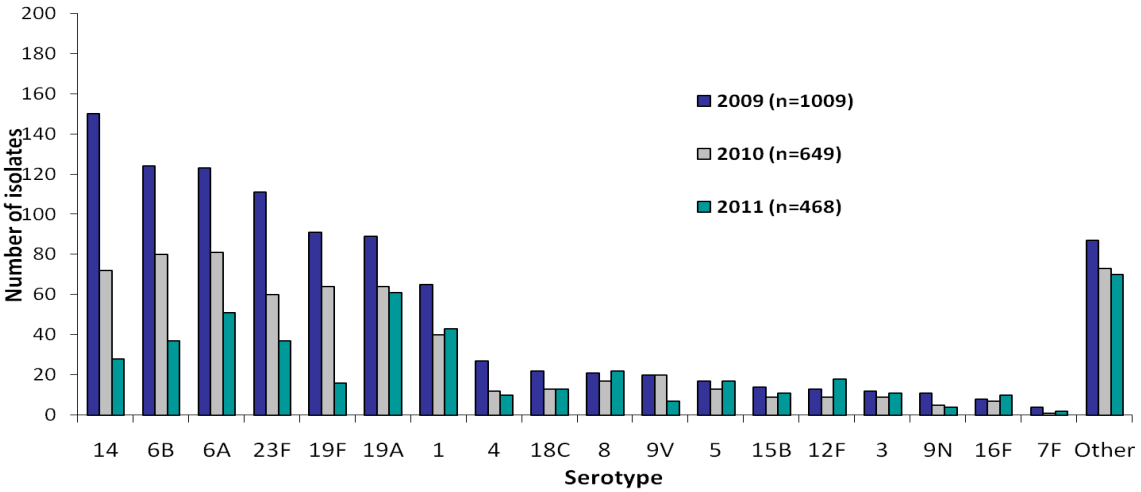


Figure 12: Numbers and percentages of laboratory-confirmed, invasive pneumococcal disease cases reported to GERMS-SA by age group and penicillin susceptibility, South Africa, 2011. n=3608 (n=2410 with viable isolates). 2011 CLSI breakpoints for penicillin (oral penicillin V) were used: susceptible ≤0.06mg/L; intermediately resistant 0.12-1mg/L; resistant ≥2mg/L.

Figure 13: Pneumoccocal serotypes, in descending order, causing laboratory-confirmed, invasive pneumococcal disease reported to GERMS-SA in children <5 years, South Africa, 2009-2011*.



*2009: n=1337, n=1009 (75%) with viable isolates; 2010: n=909; n=649 (71%) with viable isolates; 2011: n=680, n=468 (69%) with viable isolates.

Table 24: Numbers of cases and incidence rates of invasive pneumococcal disease reported to GERMS-SA by province, South Africa, 2010 and 2011. n=7807.

Province	2010		2011	
	n	Incidence rate*	n	Incidence rate*
Eastern Cape	390	5.78	344	5.04
Free State	318	11.26	230	8.33
Gauteng	1845	16.48	1593	14.06
KwaZulu-Natal	426	4.00	356	3.29
Limpopo	109	2.00	61	1.10
Mpumalanga	240	6.63	204	5.58
Northern Cape	105	9.51	67	6.11
North West	182	5.69	190	5.84
Western Cape	584	11.18	563	10.65
Total South Africa	4199	8.40	3608	7.13

*Incidence rates were calculated based on population denominators provided by Statistics South Africa, and are expressed as cases per 100,000 population.

Table 25: Numbers and percentages of cases of invasive pneumococcal disease reported to GERMS-SA by specimen type, South Africa, 2010 and 2011. n=7807.

Site of specimen	2010		2011	
	n	%	n	%
CSF	1707	41	1440	40
Blood	2024	48	1739	48
Other	468	11	429	12
Total	**4199**		**3608**	

Table 26: Numbers and percentages of penicillin susceptible, intermediate and resistant isolates from invasive pneumococcal disease cases reported to GERMS-SA by province, South Africa, 2011. n=3608.

Province	Isolate not available	Susceptible*		Intermediate*		Resistant*	
	n	n	%	n	%	n	%
Eastern Cape	181	99	61	59	36	5	3
Free State	91	98	71	35	25	6	4
Gauteng	515	731	68	282	26	65	6
KwaZulu-Natal	48	176	57	115	37	17	6
Limpopo	45	12	75	3	19	1	6
Mpumalanga	98	78	74	25	24	3	3
Northern Cape	18	30	61	16	33	3	6
North West	102	64	73	20	23	4	5
Western Cape	100	299	65	139	30	25	5
South Africa	**1198**	**1587**	**66**	**694**	**29**	**129**	**5**

*2011 CLSI breakpoints for penicillin (oral penicillin V) were used: susceptible, 0.06mg/L; intermediately resistant, 0.12-1mg/L; resistant, ≥2mg/L.

Table 27: Numbers and percentages of invasive pneumococcal cases reported amongst children less than 5 years of age caused by the serotypes contained in the 7-valent, 10-valent and 13-valent pneumococcal conjugate vaccines, South Africa, 2011. n=680 (n=468 with viable isolates).

Province	Total isolates available for serotyping	7-valent serotypes*		Serotype 6A#		10-valent serotypes*		13-valent serotypes*	
		n	%	n	%	n	%	n	%
Eastern Cape	20	4	20	2	10	11	55	14	70
Free State	30	12	40	6	20	14	47	18	60
Gauteng	214	58	27	21	10	90	42	122	57
KwaZulu-Natal	56	15	27	7	13	24	43	31	55
Limpopo	5	2	40	0	0	3	60	4	80
Mpumalanga	22	12	55	1	5	14	64	18	82
Northern Cape	18	9	50	0	0	11	61	13	72
North West	12	3	25	1	8	7	58	7	58
Western Cape	91	33	36	13	14	36	40	55	60
South Africa	**468**	**148**	**32**	**51**	**11**	**210**	**45**	**282**	**60**

*7-valent serotypes: 4, 6B, 9V, 14, 18C, 19F, 23F; 10-valent serotypes: 4, 6B, 9V, 14, 18C, 19F, 23F, 1, 5, 7F; 13-valent serotypes: 4, 6B, 9V, 14, 18C, 19F, 23F, 1, 5, 7F, 19A, 3, 6A.

Cross-protection with 6B has been demonstrated.[1]

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CASE-CONTROL STUDY TO ESTIMATE THE EFFECTIVENESS OF A 7-VALENT PNEUMOCOCCAL CONJUGATE VACCINE AGAINST INVASIVE PNEUMOCOCCAL DISEASE (IPD) IN SOUTH AFRICA

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South Africa introduced the 7-valent polysaccharide-protein conjugate pneumococcal vaccine (PCV7) in April 2009 using a three-dose schedule (6 and 14 weeks, and 9 months) with no catch-up. A preliminary analysis of the effectiveness of 2 or more (≥2) PCV7 doses against vaccine-serotype invasive pneumococcal disease (IPD) as well as all IPD in HIV-infected and uninfected children was conducted at the end of 2011. Invasive disease (pneumococcus isolated from a sterile site) was identified in children aged 16 to 40 weeks through GERMS-SA. Isolates were serotyped by Quellung or polymerase chain reaction (PCR). Four hospitalised controls, matched by age, HIV-status and hospital were selected for each case. Effectiveness was calculated as 1 minus matched odds ratio for vaccination. One hundred and thirty three HIV-uninfected cases and 535 controls, and 83 HIV-infected cases and 254 controls were enrolled from March 2010 through September 2011.

Coverage with two or more doses was 65% (346/535 [71/346, 21% received ≥3 doses]) in HIV-uninfected and 67% (170/254 [52/170, 31% ≥3 doses) in HIV-infected controls. The effectiveness of ≥2 doses against vaccine serotypes was 68% (95% CI: 4,89) in HIV-uninfected and -18% (95% CI: -303,65) in HIV -infected children. Effectiveness against all IPD was 46% (95% CI: -2,71) in HIV-uninfected and 26% (95% CI: -62,66) in HIV-infected children. In the subgroup aged 16-40 weeks, effectiveness against vaccine serotypes was 79% (95% CI: 5,95) in HIV-uninfected and 51% (-440,96) in HIV-infected children. Effectiveness against all IPD remained unchanged in the 16-40 age group.

These preliminary results indicate that PCV7 is protecting HIV-uninfected children in South Africa. A schedule including three primary doses that proved efficacious among HIV-infected children in an earlier South African trial may be needed for HIV -infected children. These children should then also receive a fourth dose (booster dose) at 9 months. These data were presented at the 8th International Symposium on Pneumococci and Pneumococcal Diseases (ISPPD), March 12-15, 2012, Iguaçu, Brazil.[1]

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KLEBSIELLA PNEUMONIAE

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Sentinel surveillance for *Klebsiella pneumoniae* bacteraemia was initiated in South Africa in July 2010 through GERMS-SA. Over 70% of all isolates were submitted to the reference laboratory in 2011.

Almost equal numbers of *K. pneumoniae* and *Staphylococcus aureus* isolates were recorded in 2011 (figure 14). From January through December, 1601 cases of *K. pneumoniae* bloodstream infections were reported (table 28). The highest number of cases (n=1038; 65%) occurred in Gauteng (table 28). Most cases of bacteraemia occurred amongst adults (figure 15).The lowest numbers of cases were detected during winter (June-September) although case numbers were comparatively high throughout the year (figure 16). Of the viable *K. pneumoniae* isolates tested for antimicrobial resistance, 684/996 (69%) were extended spectrum β-lactamase (ESBL) producers. A total of 561 (56%) of isolates was susceptible to ciprofloxacin and 92% to tigecycline. Most of ciprofloxacin resistant isolates (n=434) were ESBL producers (63%) (figure 17). ESBL production was common amongst *K. pneumoniae* isolates from four provinces (figure 18). Incidence of *K. pneumoniae* bacteraemia was not calculated.

Table 28: Numbers of *Klebsiella pneumoniae* cases reported to GERMS-SA sentinel sites by province, South Africa, January-December 2011. n=1601 (including audit cases).

Province	*Klebsiella pneumoniae*	
	n	%
Free State	113	7
Gauteng	1038	65
KwaZulu-Natal	157	10
Western Cape	293	18
All sentinel sites	**1601**	**100**

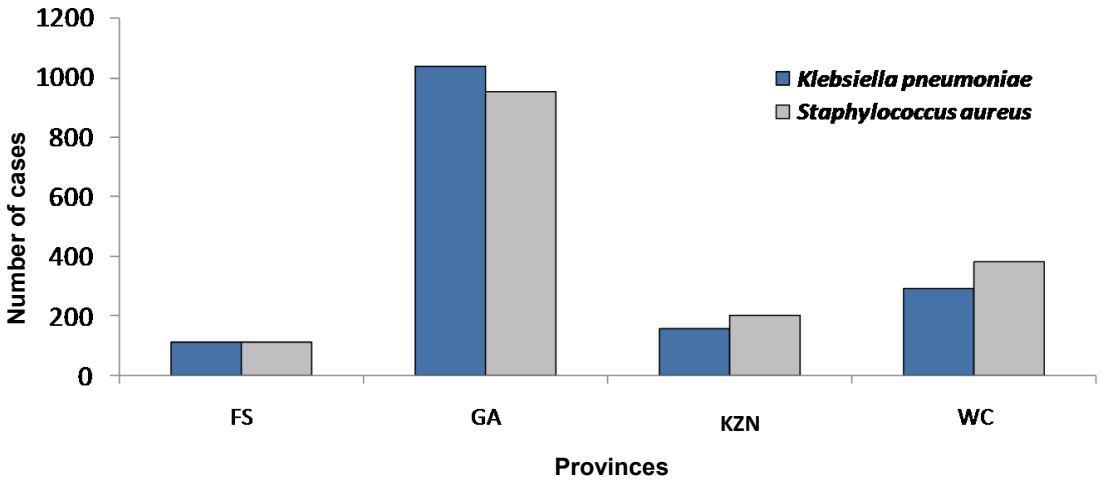

Figure 14: Numbers of cases of laboratory-confirmed *Klebsiella pneumoniae* (1601) and *Staphylococcus aureus* (1649) bacteraemia reported to GERMS-SA sentinel sites by province, January - December 2011. FS=Free State, GA=Gauteng, KZN=KwaZulu-Natal, WC=Western Cape.

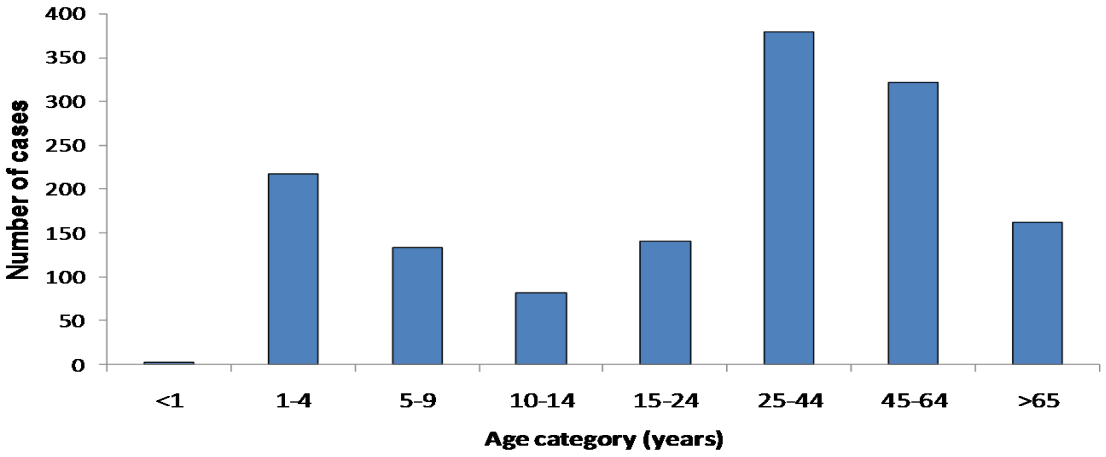

Figure 15: Numbers of cases of laboratory-confirmed *Klebsiella pneumoniae* bacteraemia reported to GERMS-SA sentinel sites by age category, January- December 2011. n=1440.

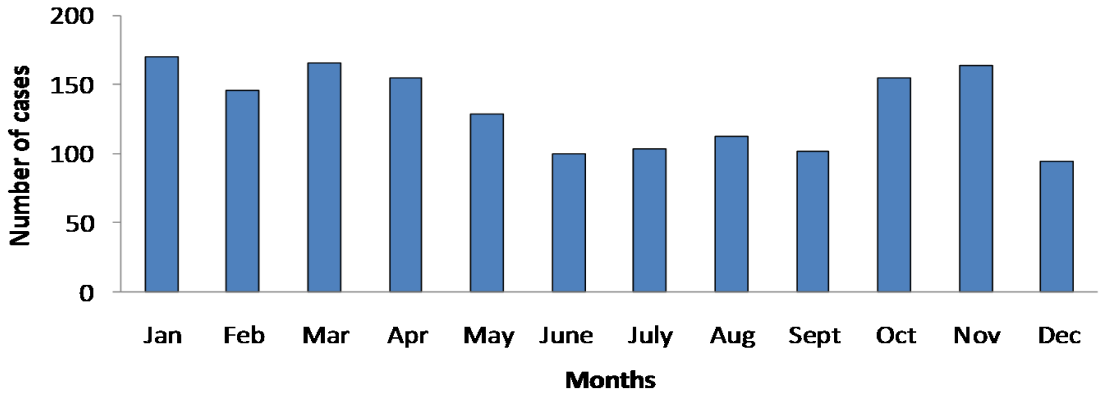

Figure 16. Numbers of cases of laboratory-confirmed *Klebsiella pneumoniae* bacteraemia reported to GERMS-SA from sentinel sites by month, January - December 2011. n=1599.

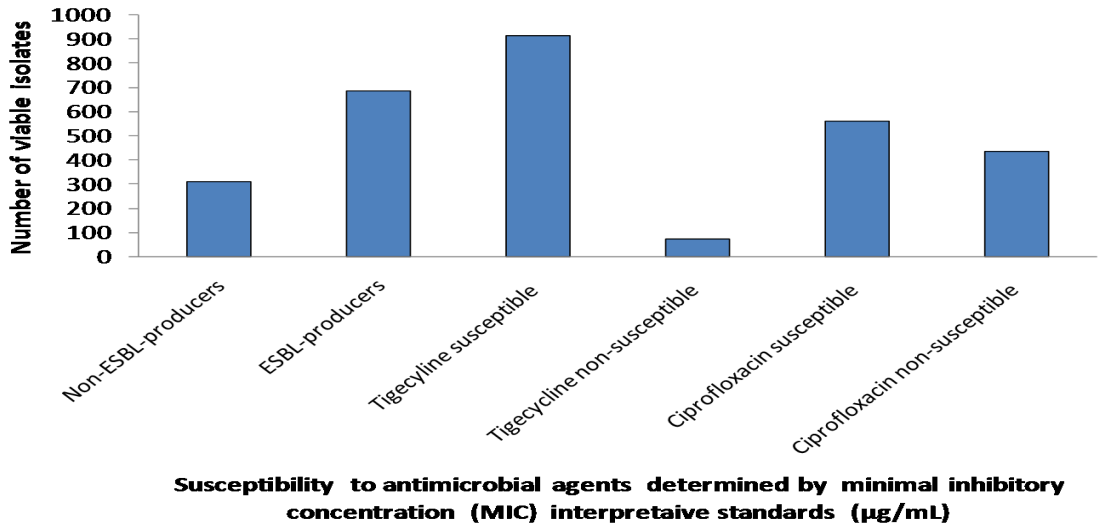

Figure 17: Numbers of viable, laboratory-confirmed *Klebsiella pneumoniae* isolates reported by GERMS-SA sentinel sites, by ESBL production and susceptibility to ciprofloxacin and tigecycline, January-December 2011. n=996.

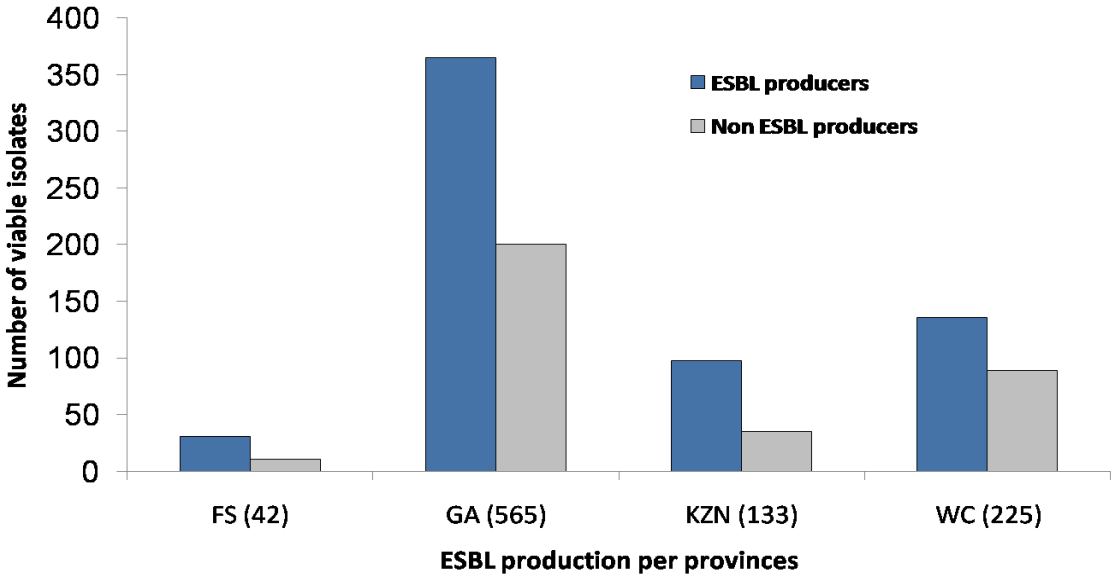

Figure 18: Number of viable, laboratory-confirmed *Klebsiella pneumoniae* isolates reported by GERMS-SA sentinel sites, by province and ESBL production, January-December 2011. n=996. FS=Free State, GA=Gauteng, KZN=KwaZulu-Natal, WC=Western Cape.

STAPHYLOCOCCUS AUREUS

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Results

The number of cases of *Staphylococcus aureus* bacteraemia reported to GERMS-SA from January through December 2011 was 1649 (see figure 14). Of these, the majority of cases were detected from sentinel sites in Gauteng (58%) followed by Western Cape (23%) (table 29). The numbers of cases were equally distributed throughout the year (figure 19). Most cases occurred amongst patients aged 25 to 65 years (figure 20). The percentage of isolates that were susceptible to mupirocin was 73% of which 22% exhibited low-level resistance and 5% high-level resistance (figure 21). Resistance to oxacillin (MRSA) was determined for 451 (45%) isolates overall, of which 53% were from Free State, 50% from Gauteng, 42% from KwaZulu-Natal and 34% from Western Cape provinces (figure 22).

Discussion

Incidence of *S. aureus* bacteraemia was not calculated. In addition, cases could not be separated into hospital versus community-acquired categories because only laboratory-based data were available. The majority of cases of *S. aureus* bacteraemia occurred amongst adult patients. The percentage of *S. aureus* isolates that were methicillin-resistant was almost half of the total number submitted to the NICD.

Table 29: Numbers of *Staphylococcus aureus* cases reported to GERMS-SA sentinel sites by province, South Africa, January-December 2011. n=1649 (including audit cases).

Province	*Staphylococcus aureus*	
	n	%
Free State	113	7
Gauteng	954	58
KwaZulu-Natal	200	12
Western Cape	381	23
All sentinel sites	**1648**	**100**

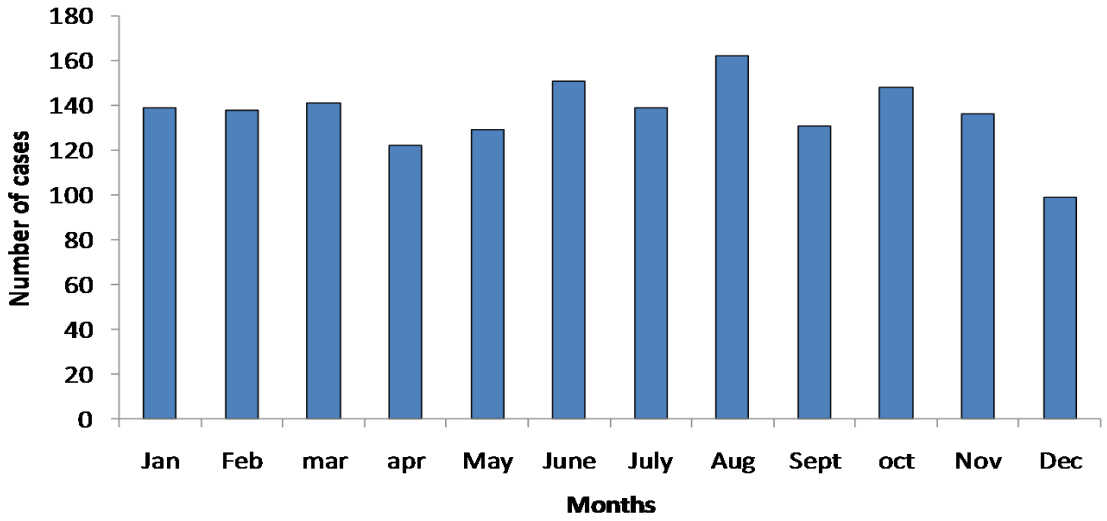

Figure 19: Numbers of cases of laboratory-confirmed *Staphylococcus aureus* bacteraemia reported to GERMS-SA sentinel sites by month, January - December 2011. n=1635.

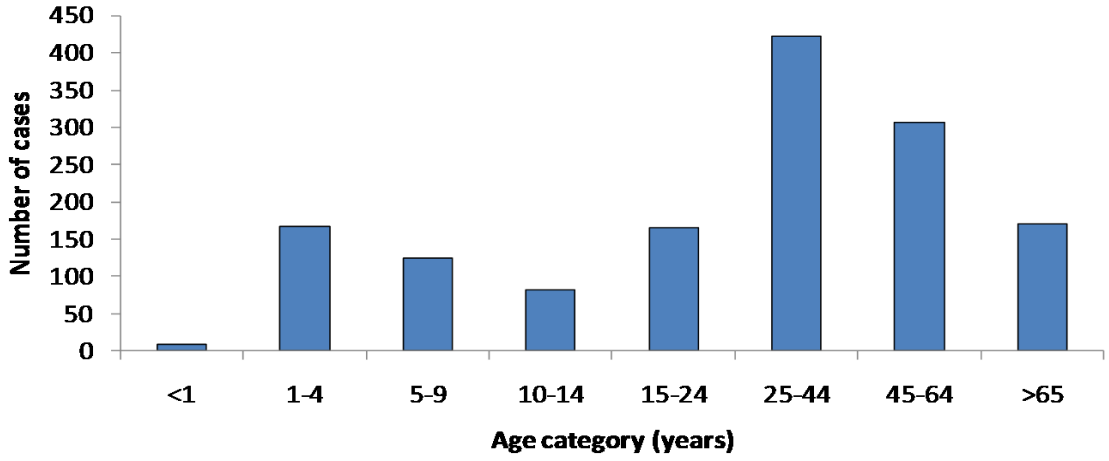

Figure 20: Numbers of cases of laboratory-confirmed *Staphylococcus aureus* bacteraemia reported to GERMS-SA from sentinel sites by age category, January - December 2011. n=1448.

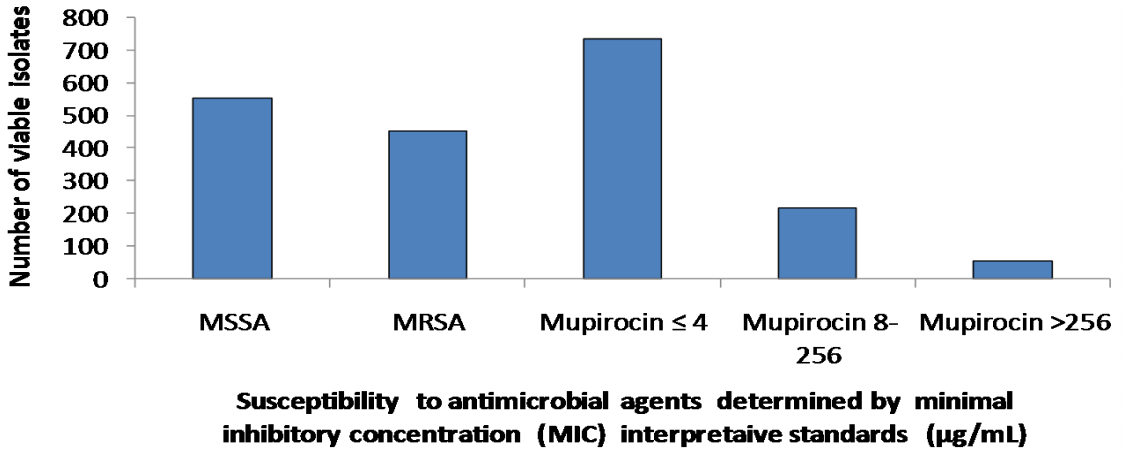

Figure 21: Numbers of viable, laboratory-confirmed *Staphylococcus aureus* isolates reported by GERMS-SA sentinel sites with susceptibility to oxacillin and mupirocin, January -December 2011. n=1003.

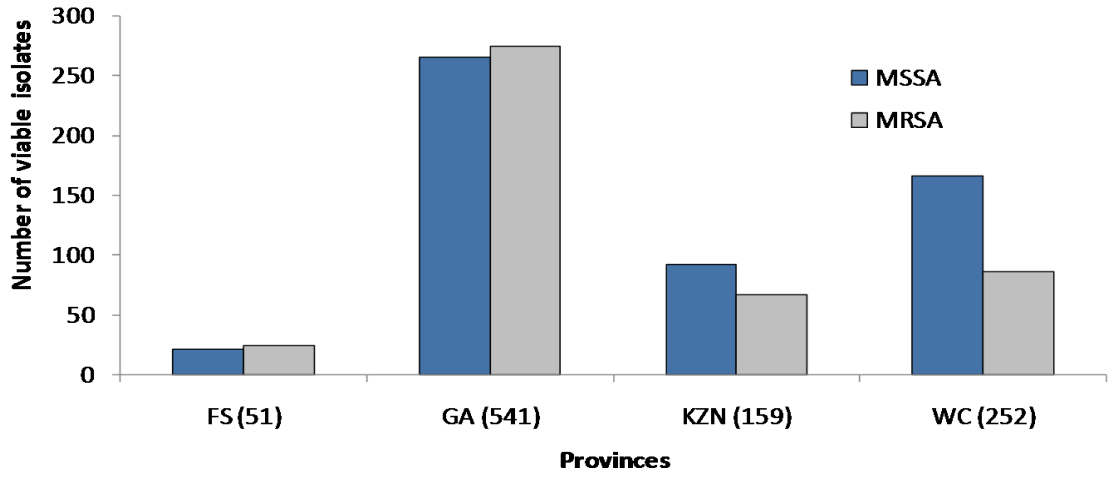

Figure 22. Numbers of viable, laboratory-confirmed *Staphylococcus aureus* isolates reported by GERMS-SA sentinel sites, by province and oxacillin resistance, January-December 2011. n=1003. FS=Free State, GA=Gauteng, KZN=KwaZulu-Natal, WC=Western Cape.

DISCUSSION – GERMS-SA 2011

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Some of the highlights of the GERMS-SA report for 2011 include:

- Emerging resistance to fluoroquinolones in *Salmonella* Typhi isolates and the increase in invasive non-typhoidal *Salmonellae* which are intermediately or fully resistant to ciprofloxacin.
- A slow but steady decline of incident cases of cryptococcosis over several years. In 2011 there were approximately 600 fewer cases reported by GERMS-SA, compared with 2010. This may indicate that the antiretroviral treatment programme has made an impact on this AIDS-defining opportunistic infection.

The in-hospital mortality of patients with cryptococcosis decreased significantly for the first time and may be related to earlier health-seeking behaviour of patients with meningitis and/or improved in-hospital patient care.

- Stabilising rates of *Haemophilus influenzae* type b (Hib) in children less than 1 year of age over the last 3 years as well as decreased invasive pneumococcal disease incidence in children less than 1 year of age. These are partly due to the introduction of Hib booster vaccine and PCV7 in South Africa respectively as well as to the impact of improvements in HIV prevention and treatment.
- Hospital-acquired infection surveillance data showing that methicillin resistant *Staphylococcus aureus* (MRSA) make up 50% of isolates submitted to the surveillance programme.

Surveillance data on epidemic-prone bacterial diseases, AIDS-associated opportunistic infections and vaccine-preventable bacterial diseases have significantly contributed to the development of clinical guidelines for pneumonia, meningococcal disease, cholera, cryptococcosis and typhoid fever. In addition, surveillance data have contributed to changes to the Expanded Programme on Immunisations with the introduction of pneumococcal conjugate vaccine as well as the Hib booster dose. More recently, data collected by GERMS-SA has enabled the National Department of Health to respond to a proposed cryptococcal antigen screening program which will facilitate the early diagnosis of cryptococcal meningitis.

A great strength of the GERMS-SA surveillance programme is its existing infrastructure of ~200 reporting public- and private-sector laboratories covering all of South Africa's nine provinces. These laboratories are able report on and send isolates matching the GERMS-SA case-definitions. This is important because GERMS-SA surveillance is only as strong as its participating laboratories. We thank all laboratory staff for their unyielding participation in national surveillance and urge clinicians to continue taking specimens and laboratory staff to continue sending isolates.

Table 1: Provisional number of laboratory confirmed cases of diseases under surveillance reported to the NICD - South Africa, corresponding periods 1 January - 30 June 2011/2012*

Disease/Organism	1 Jan - 30 June, year	EC	FS	GA	KZ	LP	MP	NC	NW	WC	South Africa
Anthrax	2011	0	0	0	0	0	0	0	0	0	0
	2012	0	0	0	0	0	0	0	0	0	0
Botulism	2011	0	0	0	0	0	0	0	0	0	0
	2012	0	0	0	0	0	0	0	0	0	0
Cryptococcus spp.	2011	616	180	932	519	247	304	23	248	225	3294
	2012	577	160	940	960	90	199	29	151	295	3401
Haemophilus influenzae, invasive disease, all serotypes	2011	14	14	71	18	0	13	6	1	40	177
	2012	19	6	51	17	1	7	2	2	35	140
Haemophilus influenzae, invasive disease, < 5 years											
Serotype b	2011	2	2	10	7	0	3	3	1	8	36
	2012	1	0	8	1	0	2	1	1	6	20
Serotypes a,c,d,e,f	2011	0	1	8	1	0	0	0	0	4	14
	2012	1	0	1	0	0	0	0	0	4	6
Non-typeable (unencapsulated)	2011	0	2	16	3	0	1	0	0	8	30
	2012	0	0	8	0	0	0	0	0	1	9
No isolate available for serotyping	2011	4	3	11	0	0	3	1	0	0	22
	2012	4	4	10	3	1	2	1	1	4	30
Measles	2011	1	2	32	23	1	1	8	6	6	80
	2012	0	0	2	5	1	0	0	1	1	10
Neisseria meningitidis, invasive disease	2011	18	7	68	8	3	7	5	1	17	134
	2012	13	1	44	12	1	2	0	3	29	105
Novel Influenza A virus infections	2011	0	0	0	0	0	0	0	0	0	0
	2012	0	0	0	0	0	0	0	0	0	0
Plague	2011	0	0	0	0	0	0	0	0	0	0
	2012	0	0	0	0	0	0	0	0	0	0
Rabies	2011	0	0	0	0	3	0	0	0	0	3
	2012	1	0	0	3	3	0	0	0	0	7
**Rubella	2011	51	3	123	69	66	69	33	50	50	514
	2012	186	15	69	137	12	55	32	31	113	650
Salmonella spp. (not typhi), invasive disease	2011	8	11	135	36	3	18	4	6	35	256
	2012	14	7	127	42	3	18	5	3	38	257
Salmonella spp. (not typhi), isolate from non-sterile site	2011	80	17	307	107	10	34	16	11	128	710
	2012	71	5	244	94	1	33	5	3	154	610
Salmonella typhi	2011	7	1	12	6	1	5	0	1	10	43
	2012	1	0	10	9	0	2	0	0	5	27
Shigella dysenteriae 1	2011	0	0	0	0	0	0	0	0	0	0
	2012	0	0	0	0	0	0	0	0	0	0
Shigella spp. (Non Sd1)	2011	100	24	284	70	6	12	16	6	239	757
	2012	122	23	310	84	0	6	12	0	209	766
Streptococcus pneumoniae, invasive disease, all ages	2011	149	106	671	162	28	77	34	80	281	1588
	2012	161	114	675	231	19	73	14	45	222	1554
Streptococcus pneumoniae, invasive disease, < 5 years	2011	22	23	139	28	5	20	10	12	63	322
	2012	32	16	132	43	1	9	3	5	29	270
Vibrio cholerae O1	2011	0	0	0	0	1	0	0	0	0	1
	2012	0	0	0	0	0	0	0	0	0	0
Viral Haemorrhagic Fever (VHF)											
Crimean Congo Haemorrhagic Fever (CCHF)	2011	0	0	0	0	0	0	0	0	0	0
	2012	0	0	0	0	0	0	0	0	0	0
***Other VHF (not CCHF)	2011	17	3	0	0	0	0	2	0	14	36
	2012	0	0	0	0	0	0	0	0	0	0

Footnotes

*Numbers are for cases of all ages unless otherwise specified. Data presented are provisional cases reported to date and are updated from figures reported in previous bulletins.

**Rubella cases are diagnosed from specimens submitted for suspected measles cases

***All cases for 2011 were confirmed as Rift Valley 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

Table 2: Provisional laboratory indicators for NHLS and NICD, South Africa, corresponding periods 1 January - 30 June 2011/2012*

Programme and Indicator	1 Jan to 30 June, 2011/2012	EC	FS	GA	KZ	LP	MP	NC	NW	WC	South Africa
Acute Flaccid Paralysis Surveillance											
Cases < 15 years of age from whom specimens received	2011	33	10	49	40	41	23	5	6	8	215
	2012	36	16	30	40	17	22	1	13	16	191

Footnotes

*Numbers are for all ages unless otherwise specified. Data presented are provisional numbers reported to date and are updated from figures re-

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

**Monitoring for the presence of polio in a country is based on acute flaccid paralysis (AFP) surveillance – the hallmark clinical expression of paralytic poliomyelitis. The clinical case definition of AFP is an acute onset of flaccid paralysis or paresis in any child under 15 years of age. AFP is a statutory notifiable disease and requires that 2 adequate stool specimens are taken as soon as possible, 24 to 48 hours apart, but within 14 days after onset of paralysis, for isolation and characterisation of polio virus. The differential diagnosis of AFP is wide, the most common cause of which is Guillain-Barre Syndrome. The incidence of AFP in a population has been studied in a number of developing countries and WHO have determined, as a result of these studies, that the criterion for adequate surveillance of AFP is 2 cases per 100 000 population of children less than 15 years of age (it was formerly 1 per 100,000 but this was thought to be inadequately sensitive).

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