

# Vaccine preventable respiratory and meningial bacterial pathogens

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South African  
Surveillance and epidemiology

National Institute for  
Communicable Diseases



NICD



# NICD

National resource

- Reference laboratory
- Specialised diagnostics
- Surveillance
- Research
  
- Infectious Disease expertise
  - Disease control
  - Case management

**NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES**  
Sandringham, Johannesburg – South Africa



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# Surveillance at the NICD

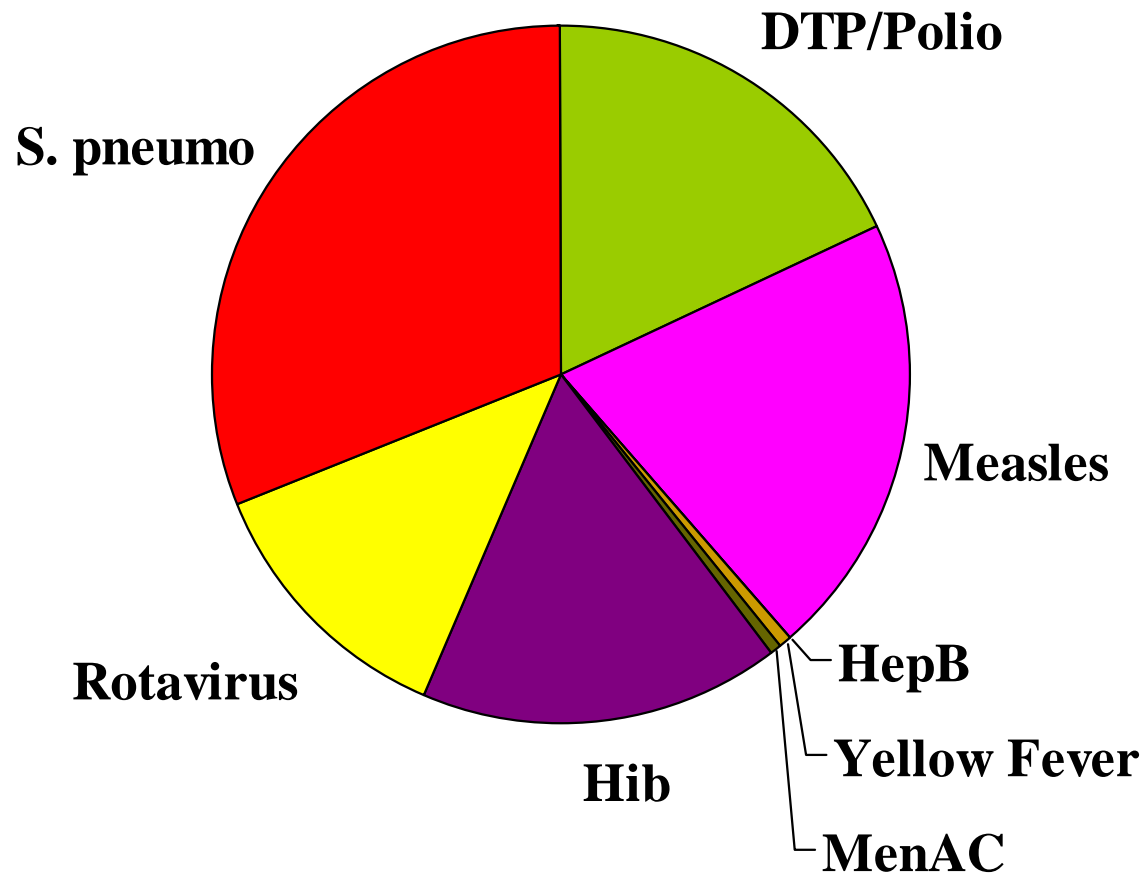
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The NICD conducts laboratory-based surveillance for a number of communicable diseases, including

- ❑ ***Epidemic-prone diseases*** to facilitate early outbreak identification and control e.g. meningococcal disease, typhoid, shigellosis and viral haemorrhagic fevers (VHF).
- ❑ ***Vaccine-preventable diseases*** to monitor the success of national vaccination programmes and guide priorities in disease control e.g. polio, measles, *Haemophilus influenzae* and *Streptococcus pneumoniae*, influenza
- ❑ ***Diseases targeted for eradication or elimination*** to confirm cases detected by clinical surveillance systems and comply with international standards for surveillance e.g. polio and measles
- ❑ ***Opportunistic infections*** associated with HIV infection which may provide an indirect marker of the burden of AIDS-related infections e.g. *Cryptococcus spp.*, *S. pneumoniae* and invasive *Salmonella spp.* infection

# WHO estimates 2.7M children <5 years old die from vaccine preventable illnesses

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Pneumo and Rota account for 44% of vaccine preventable deaths in children

# GERMS-SA

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- ❑ The NICD coordinates a programme of active national surveillance
- ❑ Public and private laboratories
- ❑ Send isolates of organisms under surveillance to NICD reference units with limited epidemiological data
- ❑ Selected sites – enhanced surveillance
  - Surveillance officers
  - Case investigation
    - ❑ HIV status
    - ❑ Outcomes etc
- ❑ Data in this presentation from RMPRU and are possible through the GERMS-SA surveillance

# Surveillance officers, data clerks and medical officers



# Diseases caused by *Streptococcus Pneumoniae*

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## PNEUMOCOCCAL INFECTION

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graph TD; A[PNEUMOCOCCAL INFECTION] --> B[Non-invasive disease]; A --> C[Invasive disease]; C --> D[Meningitis (CNS)]; C --> E[Endocarditis (heart)]; C --> F[Peritonitis (body cavity)]; C --> G[Septic arthritis (bones and joints)]; C --> H[Others (appendicitis, salpingitis, soft-tissue infections)];
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### Non-invasive disease

- Sinusitis (sinuses)
- Otitis media (middle ear)
- Pneumonia (lungs)

### Invasive disease

- Bacteraemia (blood)
- Meningitis (CNS)
- Endocarditis (heart)
- Peritonitis (body cavity)
- Septic arthritis (bones and joints)
- Others (appendicitis, salpingitis, soft-tissue infections)

# Cases counted

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- Normally sterile site specimens
  - Blood, CSV, fluid from joints, pleura, etc
- Culture positive for
  - *Neisseria meningitidis*
  - *Haemophilus influenzae*
  - *Streptococcus pneumoniae*
- Also included
  - positive latex agglutination tests from normally sterile site specimens with one or more confirmatory laboratory test/s (e.g. Gram stain and/or PCR result).



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# Limitations of laboratory based surveillance

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Not all people with disease, present to hospitals



Not all patients presenting to hospitals have specimens taken



Not all laboratories included



Not all included laboratories always send all isolates



Contextualising data



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# Meningococcal Disease

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- ❑ Endemic pattern of sporadic disease, with a seasonal increase during the winter and spring months
- ❑ Most cases reported from Gauteng and Western Cape
- ❑ Predominant serogroup differs by province
  - Western Cape serogroup B
  - Gauteng serogroup A, now W135
- ❑ One confirmed outbreak in 2005
  - 13 laboratory-confirmed cases over 32 weeks from one institution in Gauteng **surveillance essential!!**
- ❑ Burden of disease was greatest in children less than five years of age

# Case fatality rates

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- ❑ Calculated in enhanced surveillance sites where outcome is specifically looked for

2004	16/100 (16%)
2005	34/181 (19%)
USA*	(10%-14%)

\*Bilukha OO, Rosenstein N. Prevention and control of meningococcal disease. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2005 May 27;54(RR-7):1-21.



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# Antibiotic resistance

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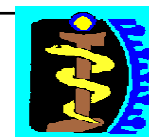
- ❑ Only 12/413 (3%) isolates had penicillin MICs  $>0.06\mu\text{g/ml}$ , and would be considered non-susceptible
- ❑ This was a reduction from previous years
- ❑ The clinical relevance of increasing MICs is unclear
- ❑ Penicillin is at present still recommended as the drug of choice for therapy

# Cases and incidence rates\* of meningococcal disease in South Africa

Province	2004		2005	
	n	Incidence*	n	Incidence*
Eastern Cape	29	0.44	10	0.15
Free State	22	0.80	25	0.90
Gauteng	184	1.89	355	3.52
KwaZulu Natal	23	0.23	25	0.25
Limpopo	11	0.20	12	0.22
Mpumalanga	6	0.18	21	0.62
Northern Cape	9	1.10	8	0.98
North West	18	0.47	15	0.38
Western Cape	58	1.19	68	1.36
<b>South Africa</b>	<b>360</b>	<b>0.76</b>	<b>539</b>	<b>1.12</b>

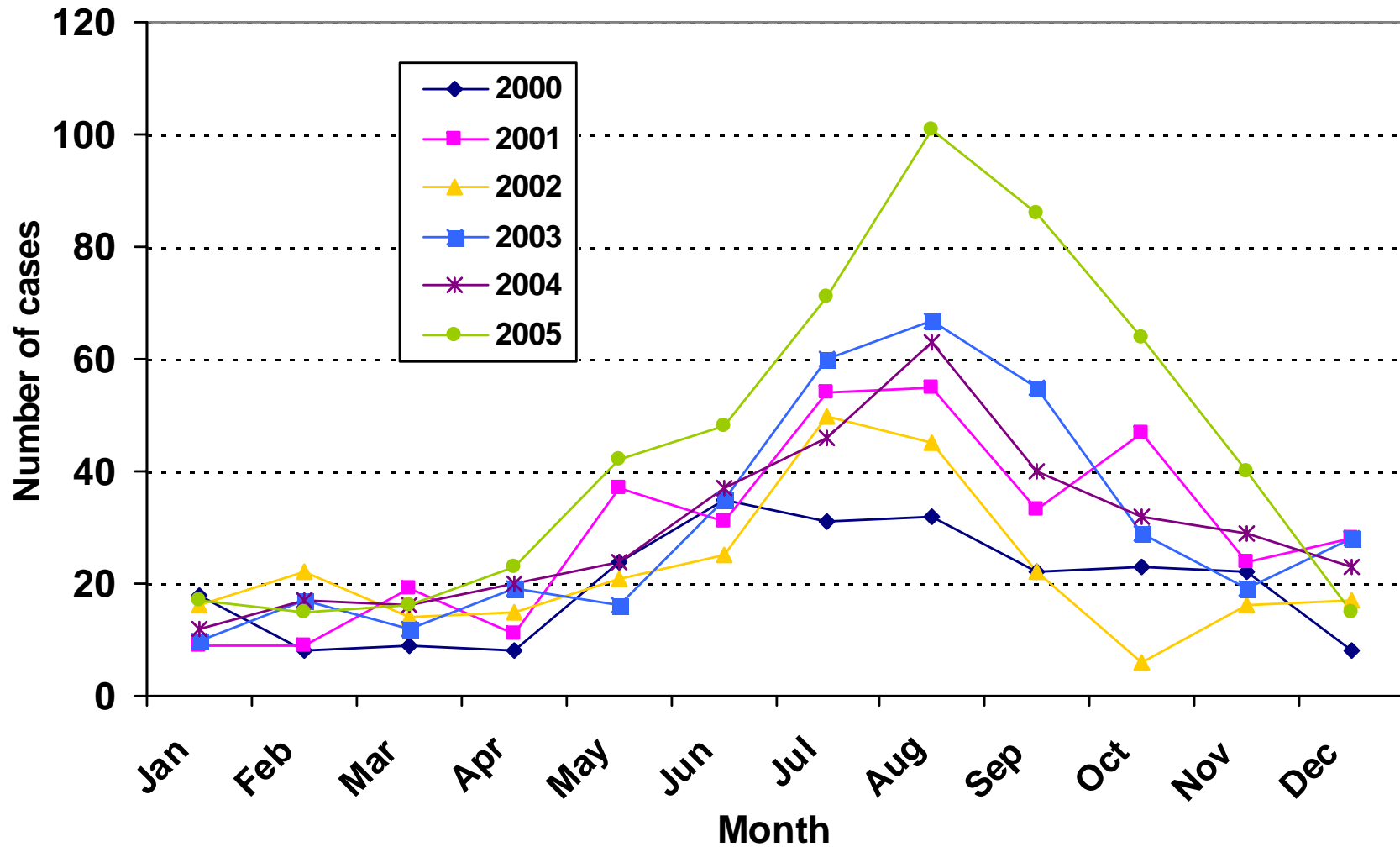


\*Cases per 100 000 mid-year population estimates, South African District Health Information System (DHIS)

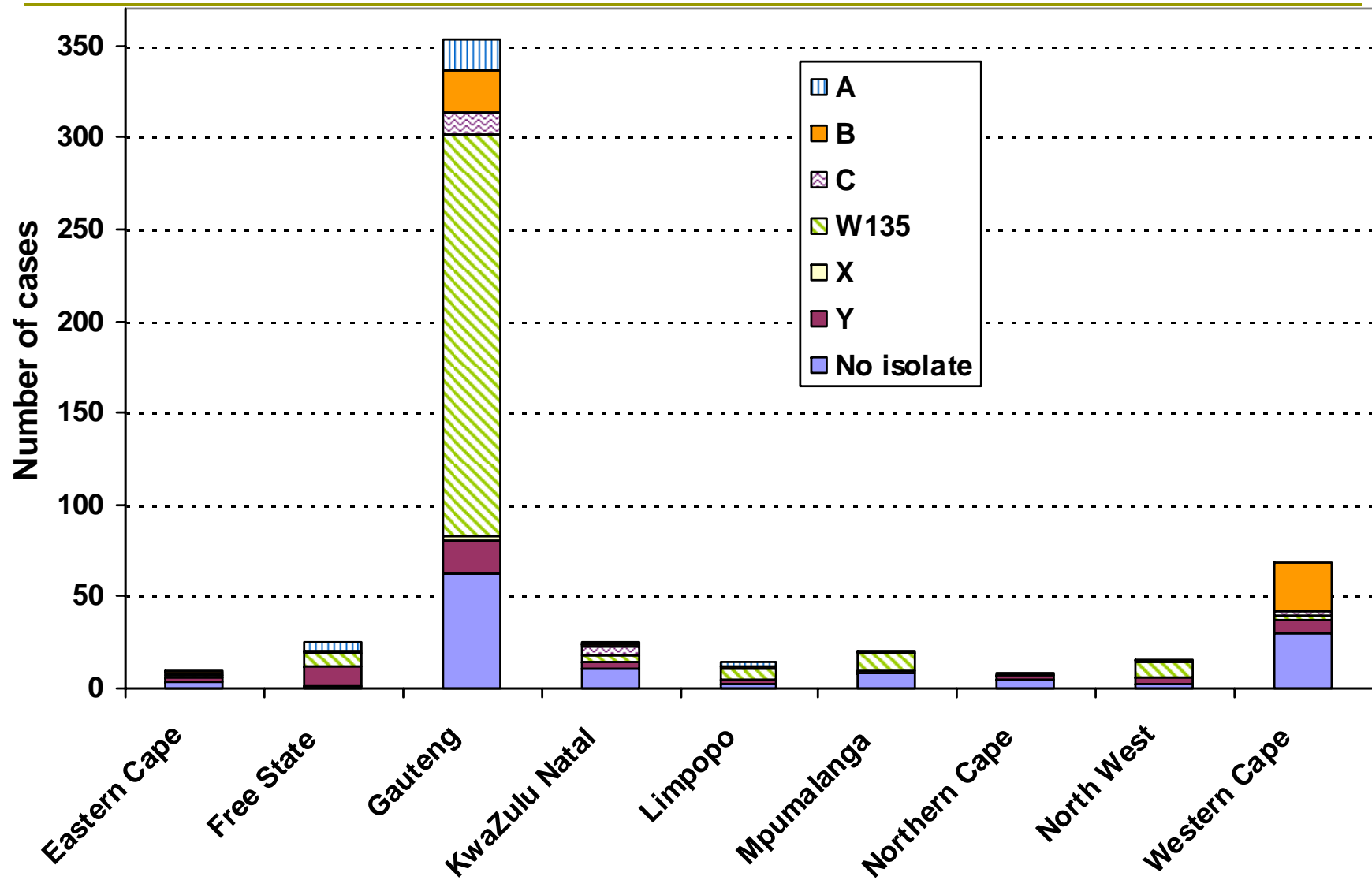


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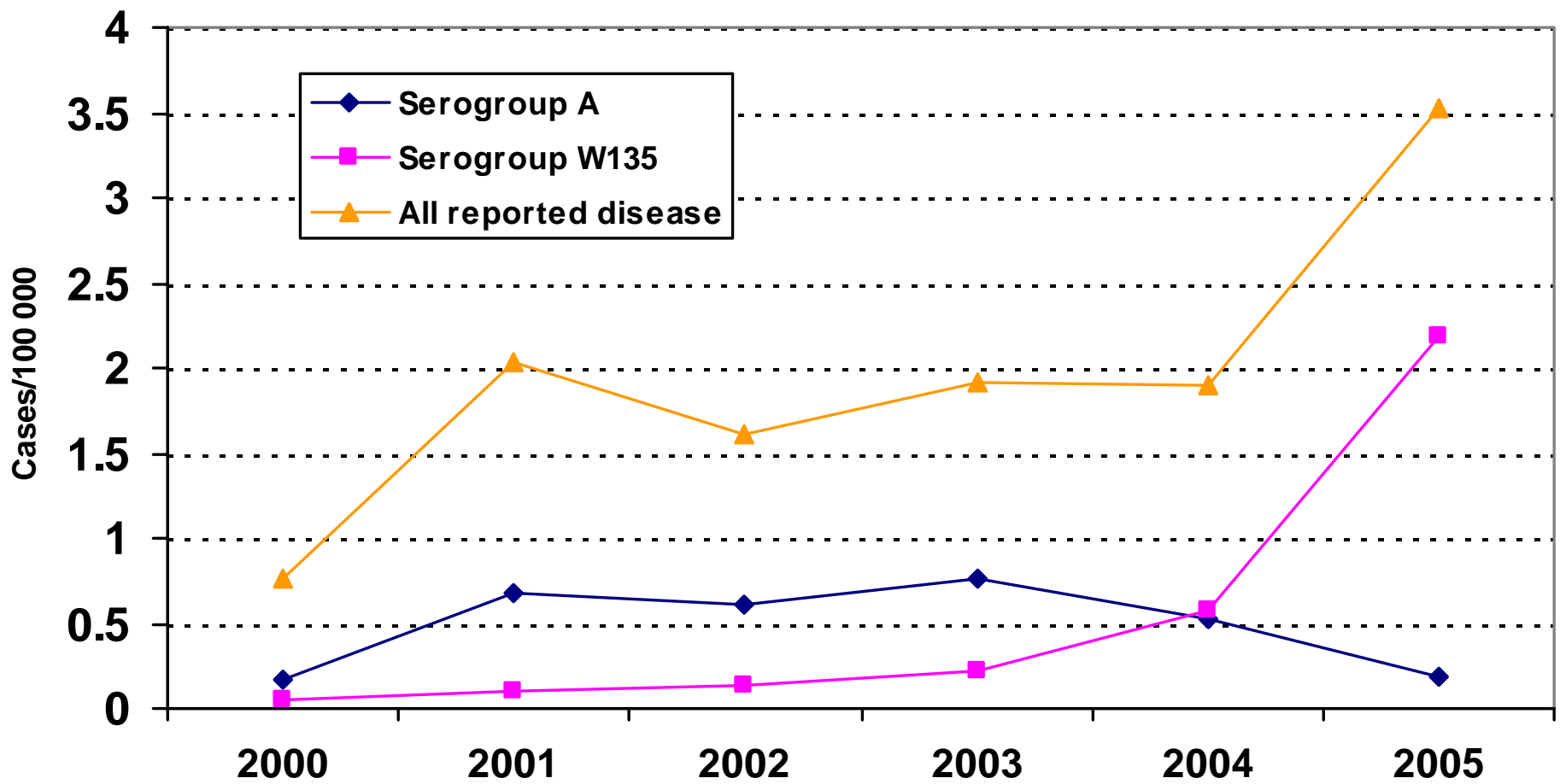
# Seasonal meningococcal disease variation, South Africa



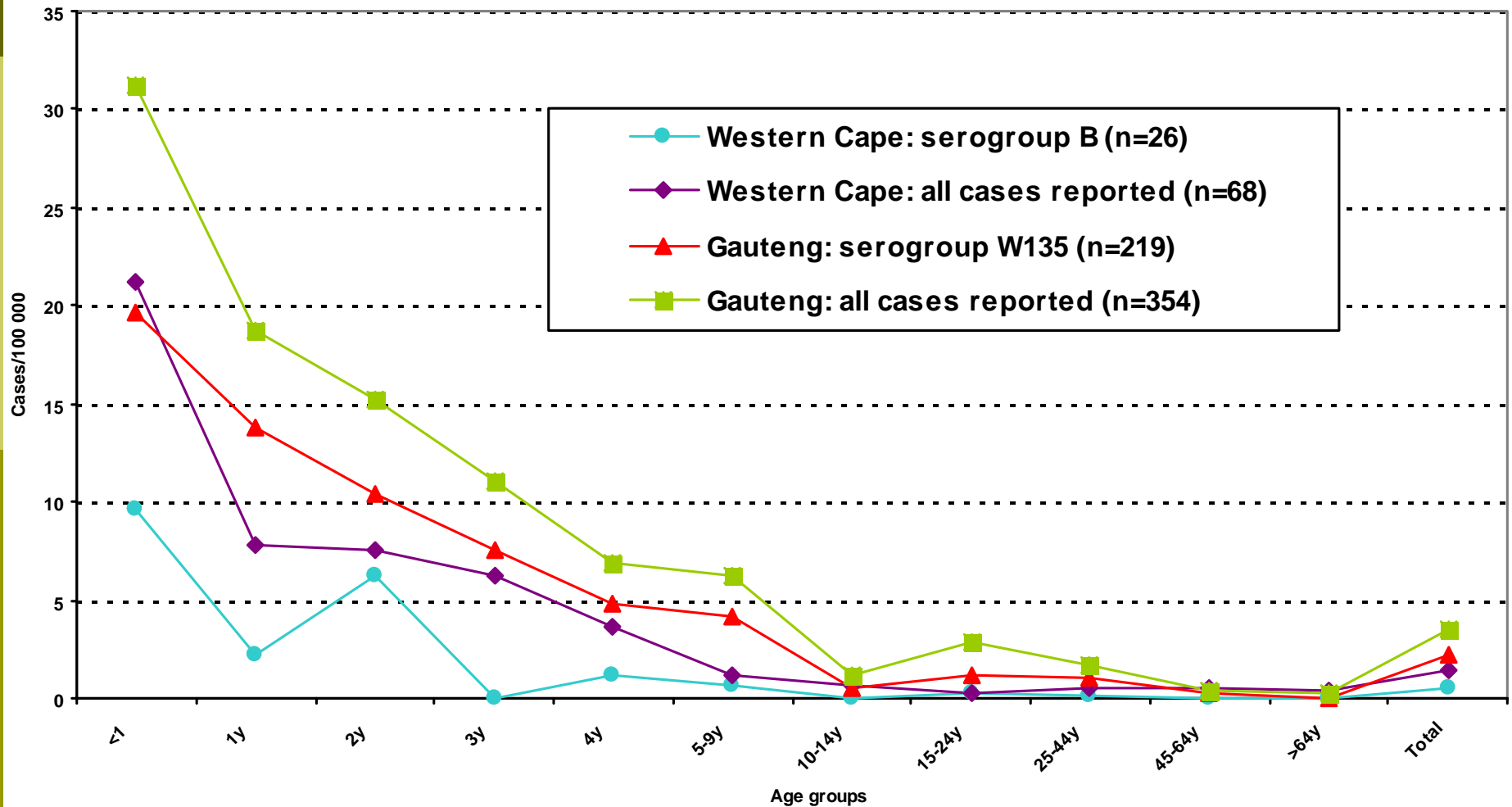
# Meningococcal serogroups, South Africa, 2005



# Meningococcal disease incidence rates in Gauteng



# Age-specific incidence rates for all reported meningococcal disease and confirmed serogroup B and W135 disease in the Western Cape and Gauteng , 2005



# *Haemophilus influenzae*

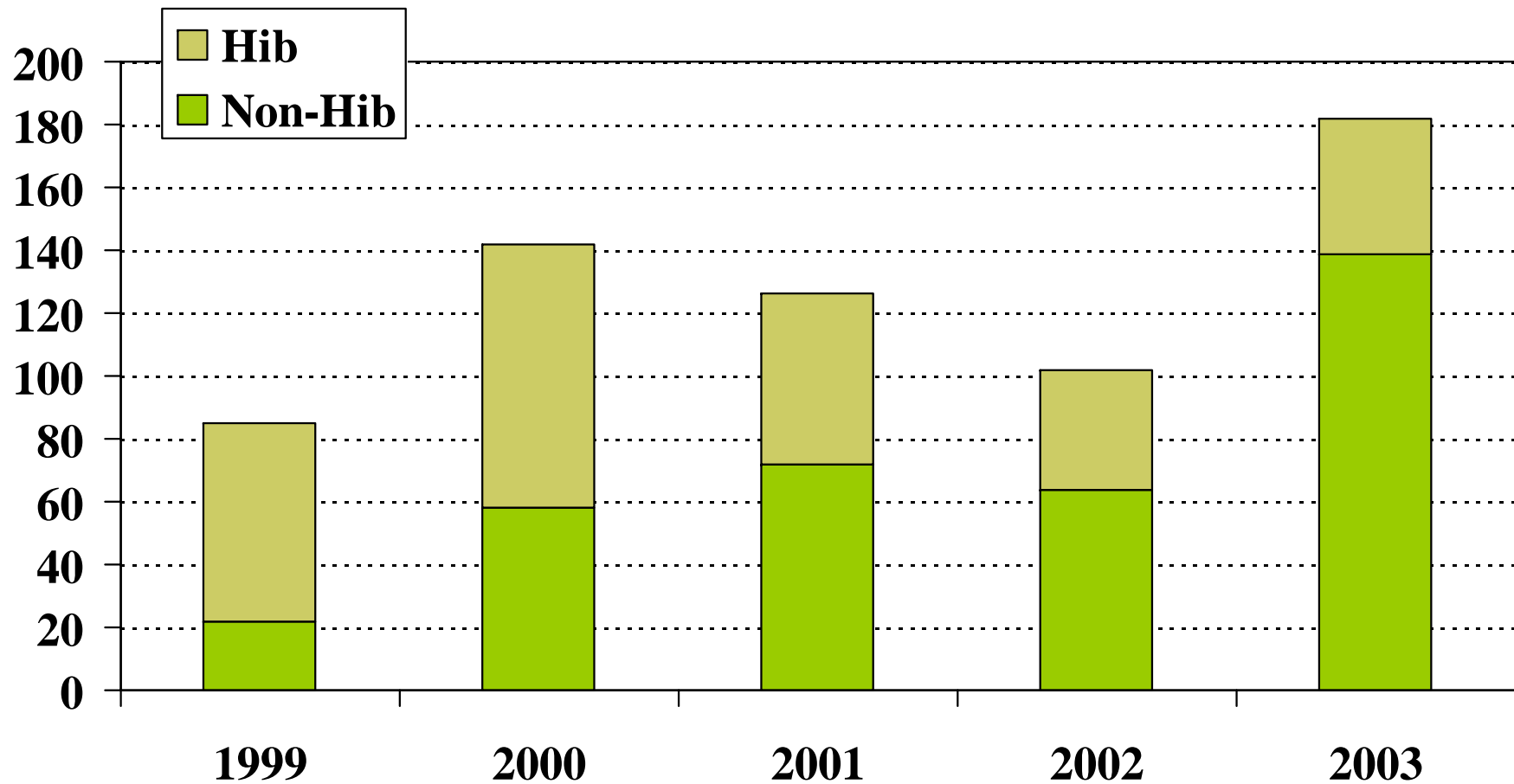
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- ❑ Hib conjugate vaccine introduced into EPI for South Africa in 1999
- ❑ Annual reduction in cases reported due to this serotype up to 2003
- ❑ No further reduction of Hib in children < 5 years of age since 2003
- ❑ Vaccination histories on children not routinely recorded, but may help understanding the dynamics of this residual disease
- ❑ Data from Soweto, Johannesburg, have shown that effectiveness of the Hib vaccine may be reduced in HIV-infected children
- ❑ As numbers of Hib cases have declined, non-typeable disease has become more common in almost all age groups in 2005



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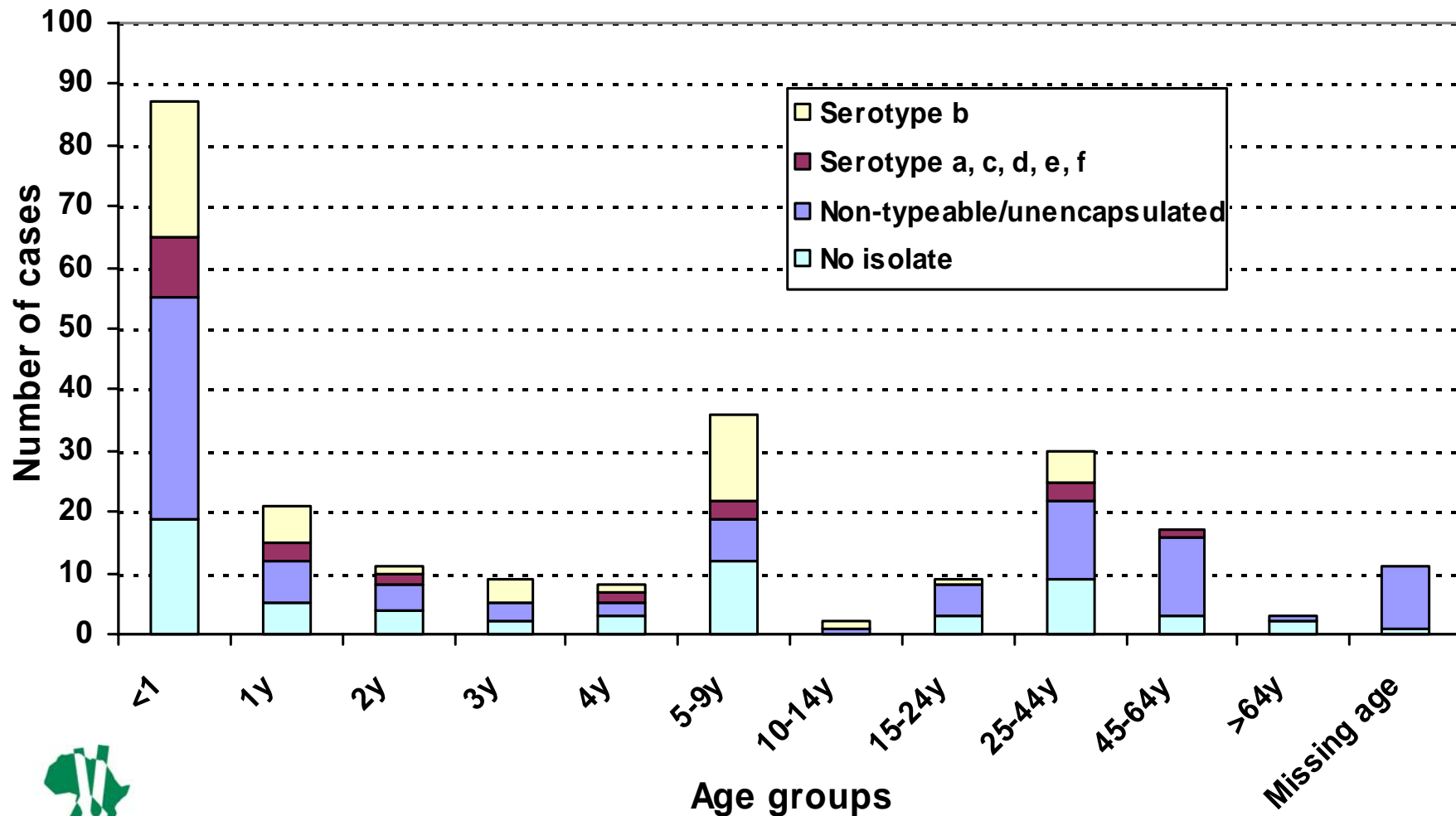
# Proportion of *Hib* in all ages



# Number of cases of *Haemophilus influenzae* reported to RMPRU in 2005 (n=244)



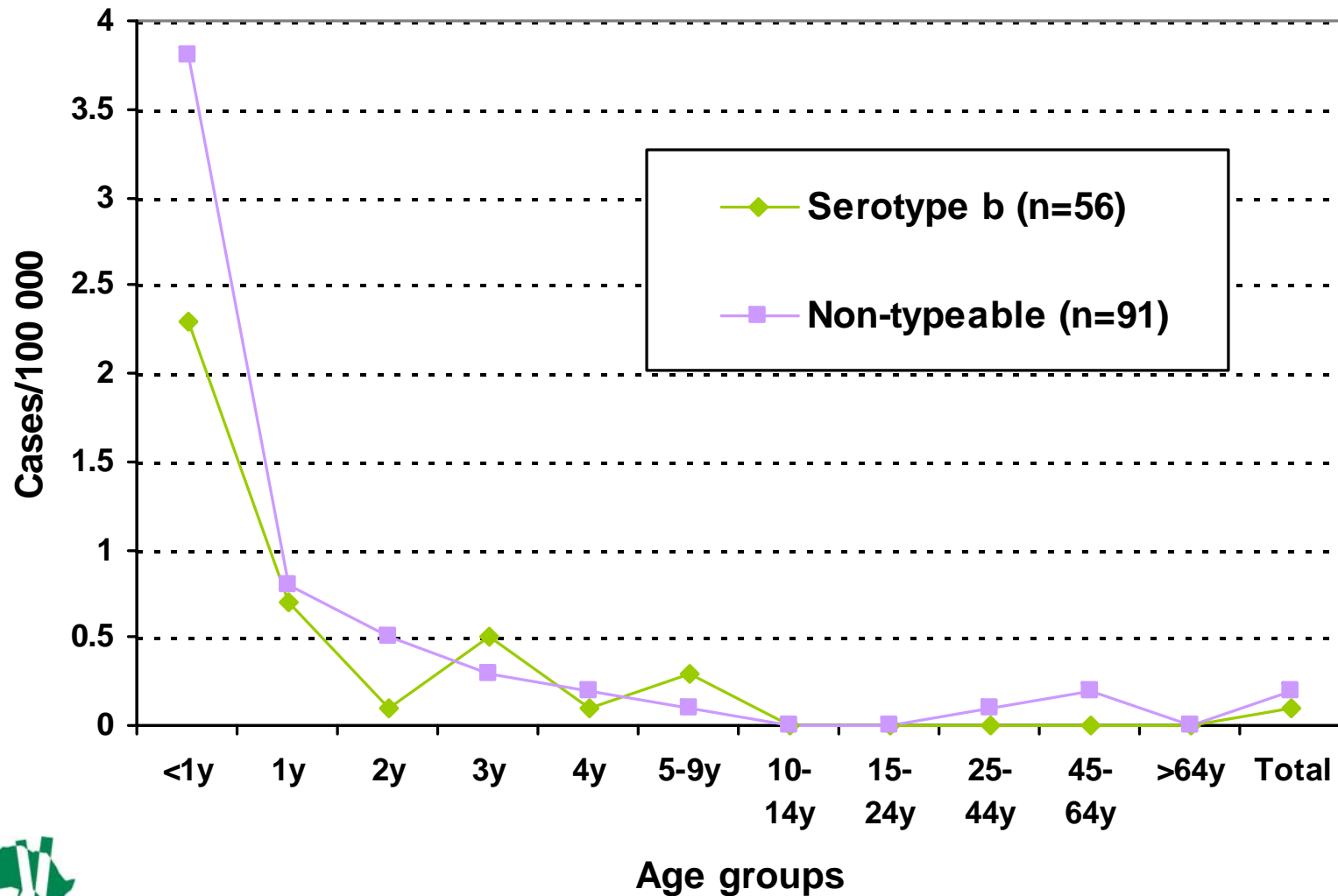
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# Age-specific incidence rates of *Haemophilus influenzae* disease in 2005



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# Invasive pneumococcal disease (IPD)

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- ❑ Calculated rates of invasive pneumococcal disease vary greatly between provinces
  - may reflect underreporting
  - differential specimen-taking practices by clinicians
- ❑ Rates of remain highest in children less than 1 year of age
- ❑ The second peak in adults is most likely associated with HIV co-infection

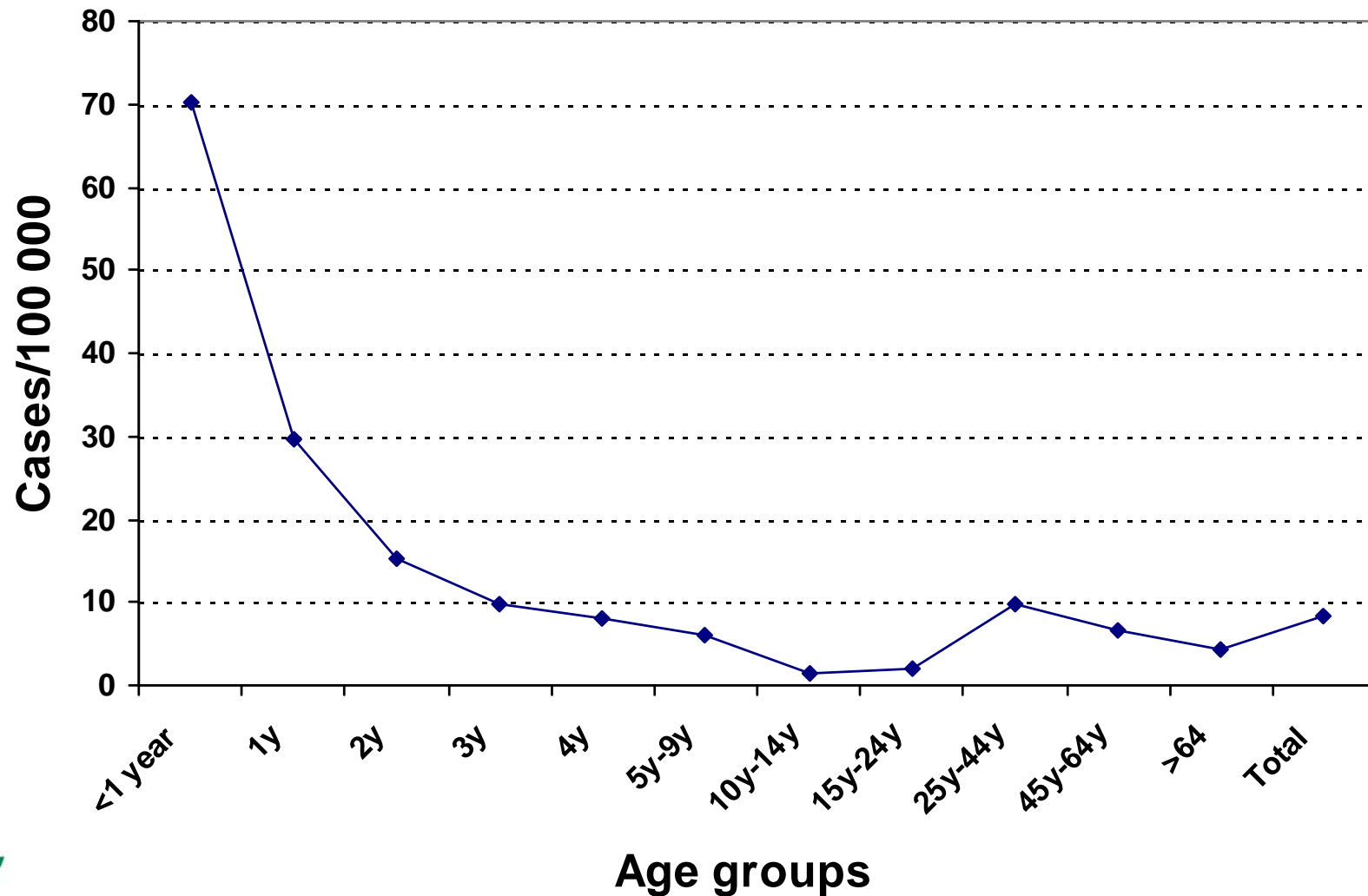
## Number of cases and incidence rates of invasive pneumococcal disease (IPD) in South Africa

Province	2004		2005	
	n	Incidence	n	Incidence
Eastern Cape	161	2.46	215	3.27
Free State	216	7.84	215	7.75
Gauteng	2024	20.77	2225	22.08
KwaZulu Natal	496	4.98	467	4.61
Limpopo	68	1.24	73	1.31
Mpumalanga	180	5.43	229	6.76
Northern Cape	21	2.57	32	3.93
North West	114	2.95	114	2.90
Western Cape	504	10.36	478	9.58
<b>South Africa</b>	<b>3784</b>	<b>7.99</b>	<b>4048</b>	<b>8.39</b>

# Incidence rates of IPD in 2005 by age group (n=3 744)



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# Penicillin susceptibility

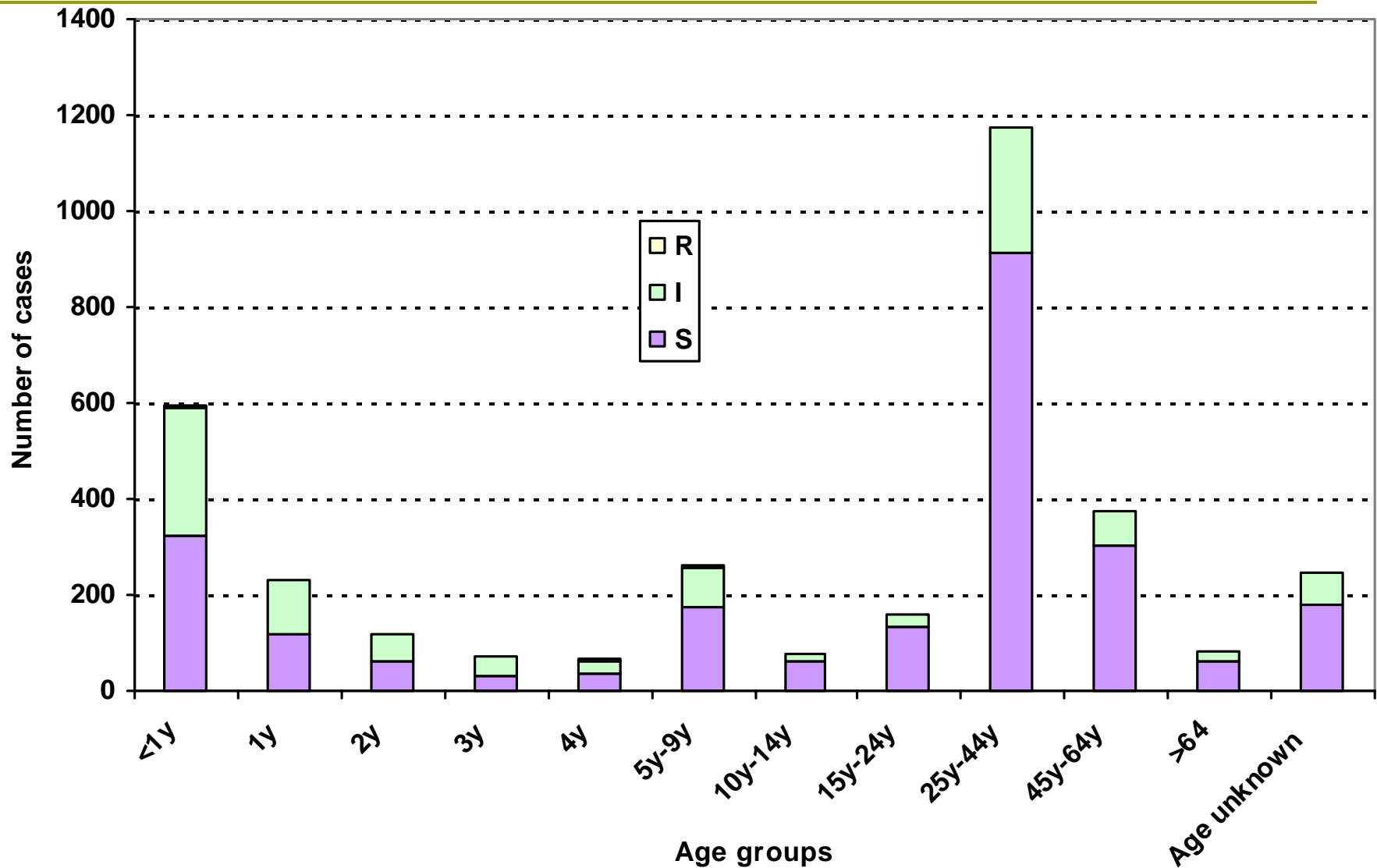
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- ❑ Penicillin non-susceptible isolates have increased from 2004, with 20 to 30% of isolates are non-susceptible across all provinces
- ❑ Non-susceptible isolates are more common in children less than 1 year (282/625, 45%) and have increased significantly from last year (236/602, 39%),  $p=0.04$
- ❑ There was no significant change in prevalence in adults aged 25 to 44 years, 274/1231 (22%) in 2005, compared to 204/1079 (19%) in 2004,  $p=0.053$ .
- ❑ Prevalence of ceftriaxone resistance (using meningitis breakpoints: non-susceptible  $>0.5\mu\text{g/ml}$ ) is still low, with only 25/3659 (0.6%) testing non-susceptible in 2005, and 30/3473 (0.8%) in 2004.

# Proportion of penicillin non-susceptible isolates from IPD cases in 2005

Province	Susceptible		Intermediately resistant		Resistant	
	n	%	n	%	n	%
Eastern Cape	141	73	51	26	1	0.5
Free State	149	73	54	26	2	1.0
Gauteng	1330	67	648	33	4	0.2
KwaZulu Natal	291	68	137	32	2	0.5
Limpopo	45	74	16	26	0	0.0
Mpumalanga	152	73	55	26	1	0.5
Northern Cape	21	72	8	28	0	0.0
North West	81	78	23	22	0	0.0
Western Cape	317	71	126	28	4	0.9
<b>South Africa</b>	<b>2527</b>	<b>69</b>	<b>1118</b>	<b>31</b>	<b>14</b>	<b>0.4</b>

# Number of cases of IPD in 2005 by age group and susceptibility to penicillin (n=3458)



# Pneumococcal vaccine

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- ❑ A 7-valent conjugate pneumococcal vaccine was launched in South Africa in the private sector in 2005
- ❑ Currently only vaccine for the prevention of pneumococcal disease in children in SA
- ❑ As clinicians and parents advocate for the vaccine price to be reduced and with the possible inclusion of this vaccine in the EPI in the future, potential coverage of disease serotypes in children less than five is more than 50% in South Africa according to our data and this increases to 788/1155 (68%) if potential cross-protection with serotype 6A is considered

Number of cases reported in 2005 in children less than 5 years of age caused by the serotypes contained in the 7-valent vaccine (4, 6B, 9V, 14, 18C, 19F and 23F), with total viable isolates confirmed for this age group and proportion of disease caused by the 7-valent serotypes

Province	n	Viable isolates	%
Eastern Cape	32	65	49
Free State	44	71	62
Gauteng	332	574	58
KwaZulu Natal	78	160	49
Limpopo	11	16	69
Mpumalanga	37	59	63
Northern Cape	1	5	20
North West	6	20	30
Western Cape	109	185	59
<b>South Africa</b>	<b>650</b>	<b>1155</b>	<b>56</b>

# GERMS-SA coordinators

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**Don't forget the NICD website [www.nicd.ac.za](http://www.nicd.ac.za)**