Infectious Disease Surveillance in NZ

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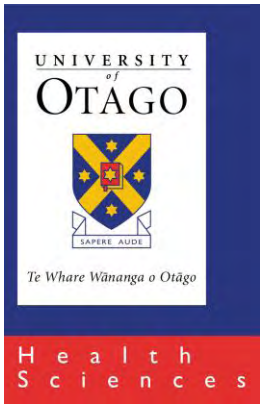


Outline

Current '*best practice*'

- High quality surveillance of specific infectious diseases & related health events

Future directions

- Broader uses for public health surveillance
- *Upstream* focus on risk factors & determinants
- Focus on cost-effective interventions

ID *Surveillance Sector Review* in NZ

- Description of multiple systems
- Gaps / areas for improvement
- Performance of ID surveillance

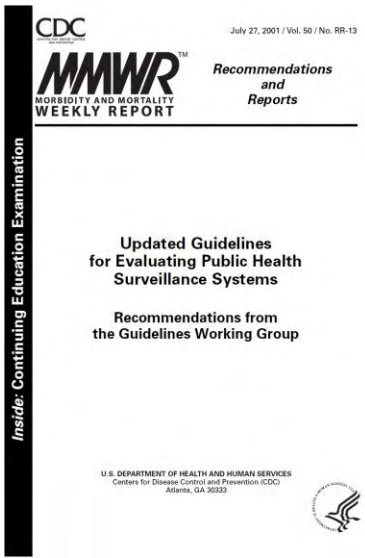
Summary

Public health surveillance

Public health surveillance is…

"the ongoing, systematic collection, analysis, interpretation and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health"

Source: Centers for Disease Control and Prevention. Updated guidelines for evaluating public health surveillance systems: recommendations from the guidelines working group. MMWR 2001; 50: 1-36.



Public health surveillance

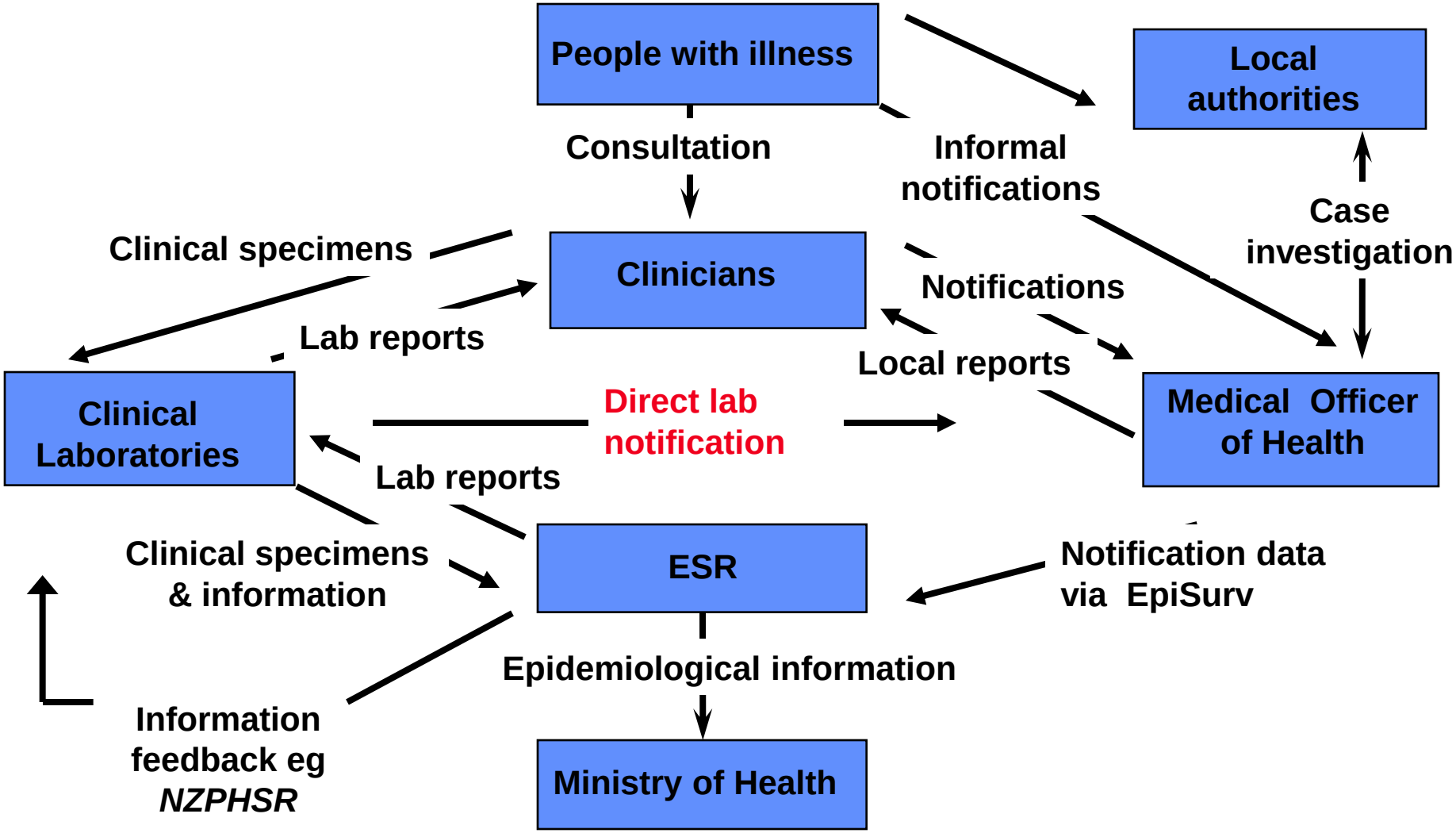
Attributes of a public health surveillance system

- Usefulness
- Simplicity
- Flexibility
- Data quality (completeness, validity)
- Acceptability
- Sensitivity
- Positive predictive value (incl. specificity)
- Representativeness
- Timeliness
- Stability (reliability, availability)

***Source: Centers for Disease Control and Prevention. Updated guidelines for evaluating public health surveillance systems: recommendations from the guidelines working group. MMWR 2001; 50: 1-36*.**

Public health surveillance

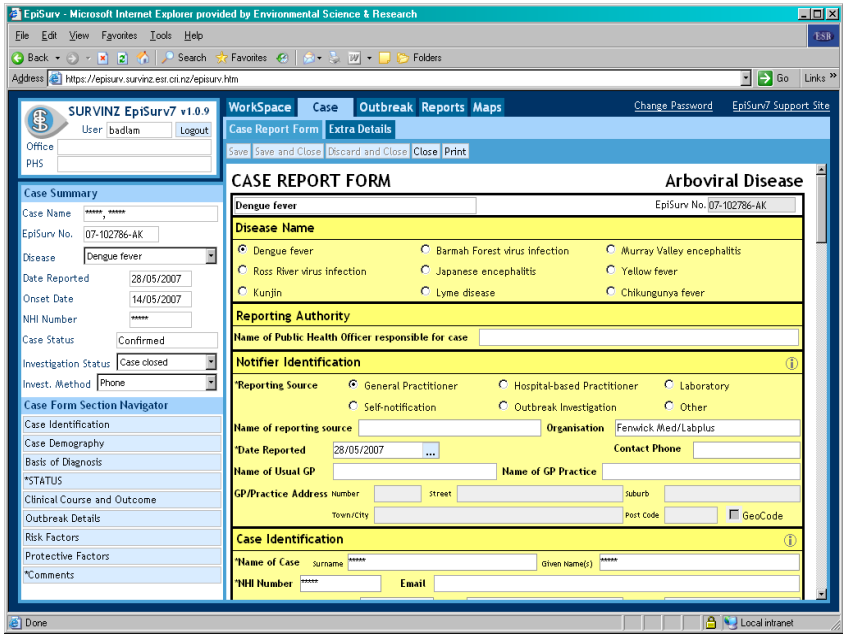
NZ notifiable disease surveillance system



Public health surveillance

EpiSurv

- Web based application, for real-time data entry & reporting of notifiable diseases and outbreaks
- Supports integration of disease and hazard data and case management functions eg contact tracing



Future directions

(1) Broader uses for public health surveillance

Control-focussed surveillance provides information to support control measures

1. Identify events that require a specific response

Snow's Cholera Map showing distribution of deaths in 1854 cholera outbreak in the Soho neighbourhood of London

Future directions

(1) Broader uses for public health surveillance

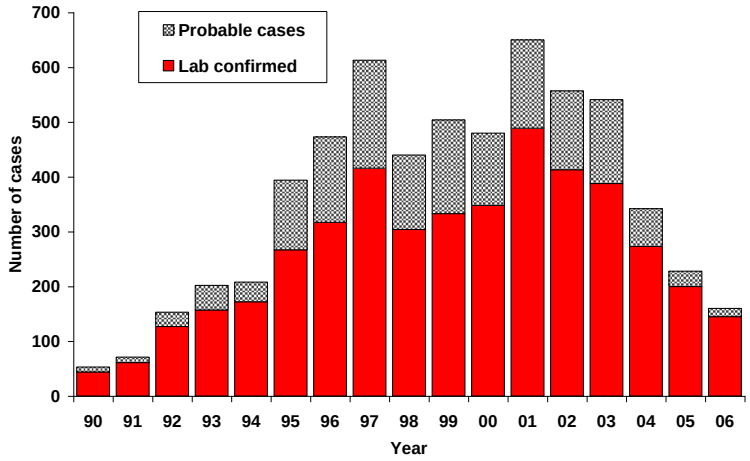
Control-focussed surveillance provides information to support control measures

1. Identify events that require a specific response

Strategy-focussed surveillance provides information to support prevention strategies

2. Monitor event occurrence & distribution ie descriptive epidemiology

Meningococcal disease incidence by year, 1990-2006



Future directions

(1) Broader uses for public health surveillance

Control-focussed surveillance provides information to support control measures

1. Identify events that require a specific response
2. Track delivery and quality of control measures

Strategy-focussed surveillance provides information to support prevention strategies

3. Monitor event occurrence & distribution
4. Monitor event impacts & help set priorities
5. Monitor hazards, risk factors & determinants to improve prevention
6. Monitor & evaluate interventions
7. Support modelling of future scenarios
8. Support research & identify hypotheses
9. Fulfil legislative & international reporting
10. Monitor context for surveillance

Future directions

(2) Upstream focus on risk factors & determinants

Leading causes of attributable global mortality and burden of disease, 2004

Attributable Mortality

		%
1.	High blood pressure	12.8
2.	Tobacco use	8.7
3.	High blood glucose	5.8
4.	Physical inactivity	5.5
5.	Overweight and obesity	4.8
6.	High cholesterol	4.5
7.	Unsafe sex	4.0
8.	Alcohol use	3.8
9.	Childhood underweight	3.8
10.	Indoor smoke from solid fuels	3.3

59 million total global deaths in 2004

Attributable DALYs

		%
1.	Childhood underweight	5.9
2.	Unsafe sex	4.6
3.	Alcohol use	4.5
4.	Unsafe water, sanitation, hygiene	4.2
5.	High blood pressure	3.7
6.	Tobacco use	3.7
7.	Suboptimal breastfeeding	2.9
8.	High blood glucose	2.7
9.	Indoor smoke from solid fuels	2.7
10.	Overweight and obesity	2.3

1.5 billion total global DALYs in 2004

Source: WHO. Global health risks: mortality and burden of disease attributable to selected major risks. 2009

Future directions

(3) Focus on interventions

Disease events and health states

- Eg. TB disease, TB infection

Hazards, incl. risk and protective factors

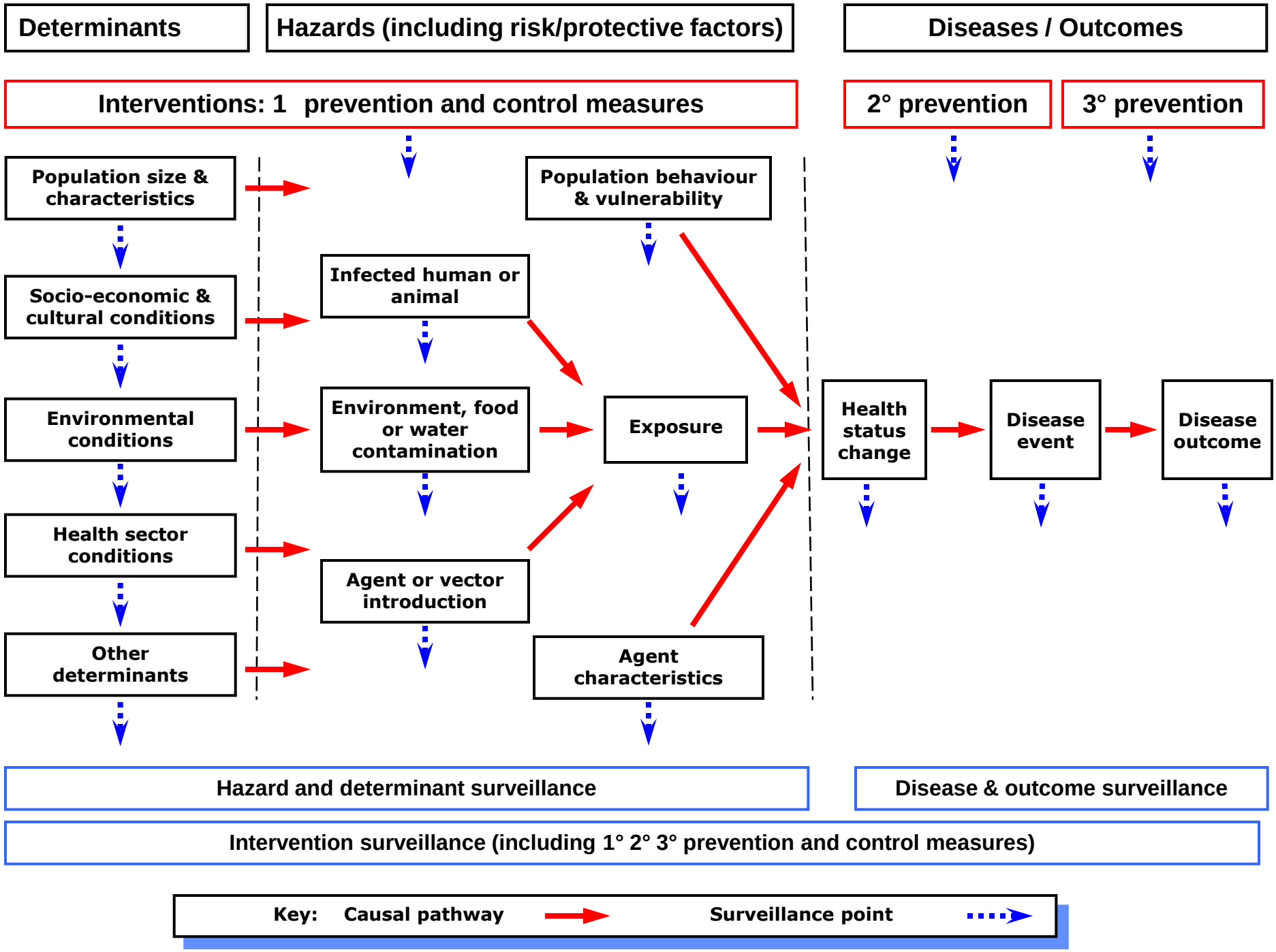
- Eg. Prevalence of multi-drug resistant TB in NZ

Determinants, incl. social & environmental

- Eg. Household crowding levels in NZ

Interventions

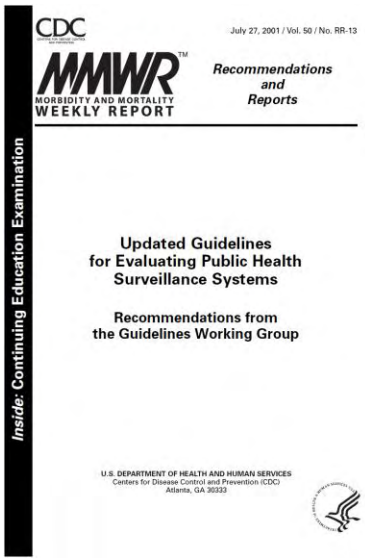
- Eg. Coverage of neonatal BCG programme


Determinants
Hazards (including risk/protective factors)
Diseases / Outcomes
Interventions: 1 prevention and control measures
2° prevention
3° prevention
Population size & characteristics
Socio-economic & cultural conditions
Environmental conditions
Health sector conditions
Other determinants
Population behaviour & vulnerability
Infected human or animal
Environment, food or water contamination
Agent or vector introduction
Agent characteristics
Exposure
Health status change
Disease event
Disease outcome
Hazard and determinant surveillance
Disease & outcome surveillance
Intervention surveillance (including 1° 2° 3° prevention and control measures)
Key: Causal pathway
Surveillance point

ID Surveillance sector review

Surveillance <u>system</u> evaluation

- Applied to important systems 'the trees'
- Aims to identify recommendations for improving usefulness, quality & efficiency of the system
- Probably no complete evaluations of any ID surveillance system have been carried out in NZ
- Selected attributes have been reviewed, notably timeliness and sensitivity



Source: Centers for Disease Control and Prevention. Updated guidelines for evaluating public health surveillance systems: recommendations from the guidelines working group. MMWR 2002; 50: 1-36.

ID Surveillance sector review

Surveillance sector review

- Applied to surveillance activities across a broad surveillance sector 'the forest'
- Aims to identify important gaps in surveillance sector capacity that need to be filled:
  - Leadership, organisational & resource gaps eg lack of coordination and trained staff
  - Design/ structural gaps eg important events not covered by public health surveillance
  - Operation/ functional gaps eg inadequate performance, integration, analysis and communication of information

Source: Baker, Easther, Wilson. A Surveillance Sector Review: Applied to Infectious Diseases in a Developed Country. University of Otago, 2009.

ID Surveillance sector review

Steps in surveillance sector review:

1. Plan surveillance sector review

↓

2. Systematically describe current surveillance sector

↓

3. Describe surveillance information needs of major end users

↓

4. Assess performance of current surveillance systems

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5. Identify important surveillance sector gaps

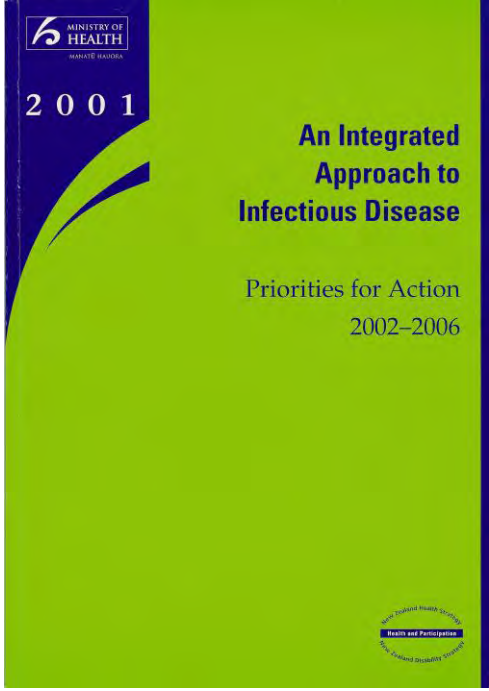
↓

6. Identify priorities for surveillance sector improvement

↓

7. Communicate and implement findings

ID Surveillance sector review



Describe surveillance sector:

1. Vaccine preventable e.g. measles
2. Respiratory e.g. meningococcal
3. Blood & tissue borne e.g. HCV
4. Sexually transmitted e.g. chlamydia
5. Food and waterborne e.g. campylobacteriosis
6. Hospital acquired & antibiotic resistance eg VRE
7. Environmental & Zoonotic e.g. leptospirosis
8. Congenital & perinatal e.g. group B streptococcal
9. Close physical contact e.g. staphylococcal infection
10. New, exotic & imported, including vectorborne & travel associated e.g. malaria

Source: An integrated approach to infectious diseases. Ministry of Health, 2001

ID Surveillance sector review

- **ID surveillance systems, total = 87**
  Incl. related activities such as Census
- **Disease & outcome surveillance = 38**
  Eg. Notifiable diseases surveillance
- **Hazard surveillance = 32**
  Eg. Antimicrobial resistance surveillance
- **Determinant, incl. population size = 8**
  Eg. Household crowding levels
- **Intervention surveillance = 9**
  Eg. National immunisation register

ID Surveillance sector review

- **Some disease areas have rich surveillance**

  Eg. Vaccine Preventable diseases, Influenza (generally), Food & waterborne diseases

- **Some areas have few surveillance systems**

  Eg. Respiratory & skin infections, hospital acquired infections, behaviour risk factors, surveillance in primary care

- **Sector gaps**

  Eg. Lack of clarity about purpose of surveillance

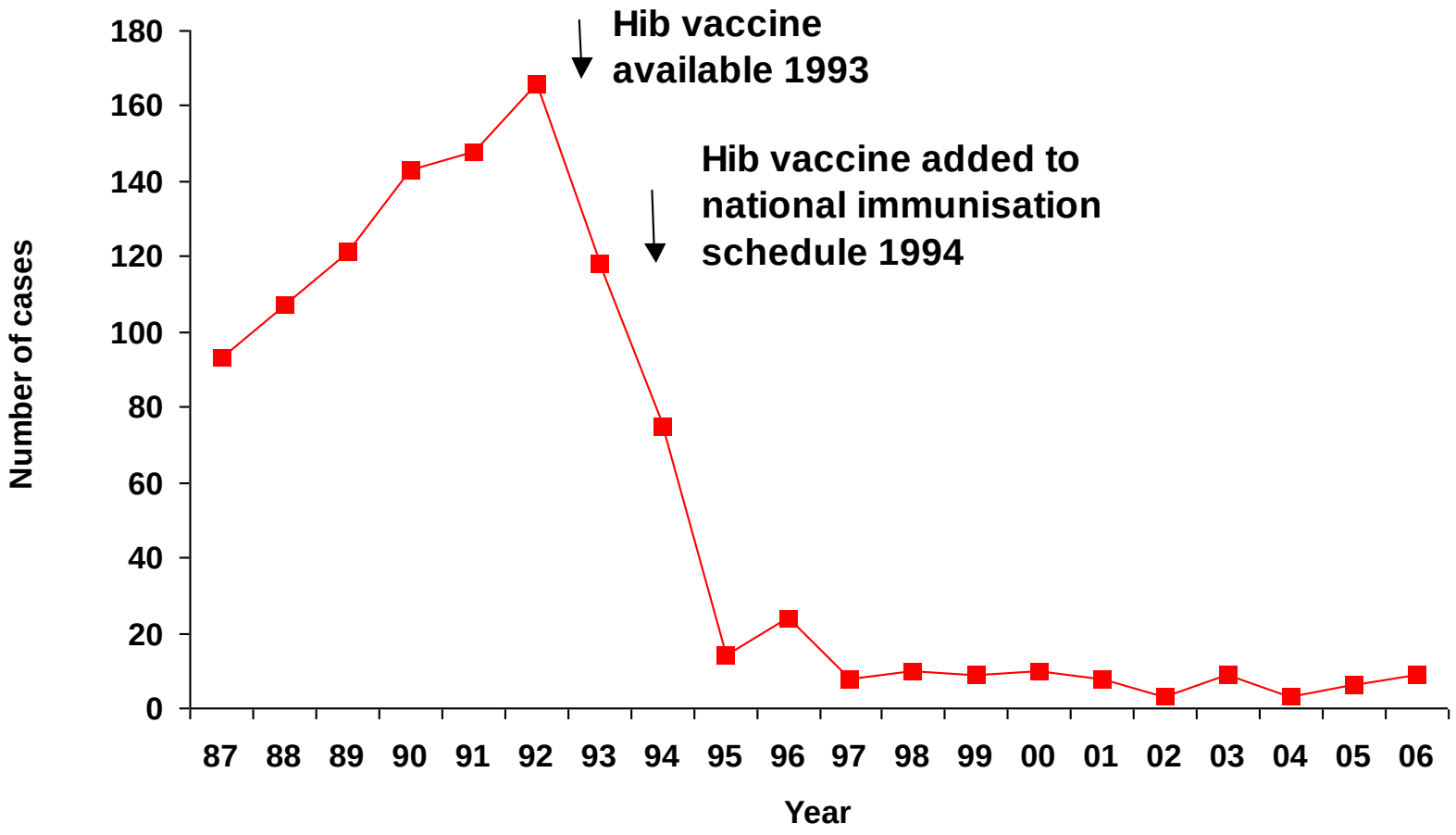
  Fragmentation of surveillance systems

  Insufficient analysis & reporting of ID burden

  Little performance information & evaluation

Performance of ID Surveillance

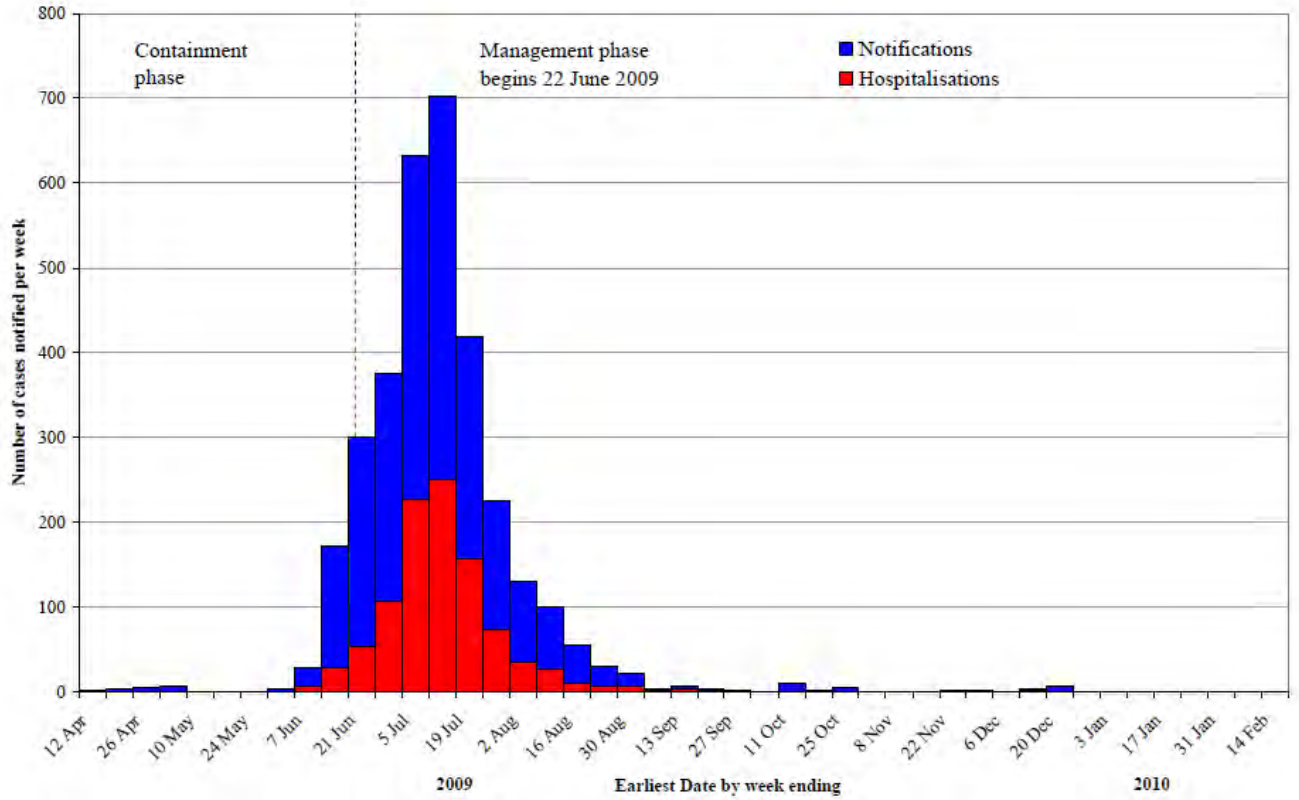
Describing decline in Hib, 1987-2006



Performance of ID Surveillance

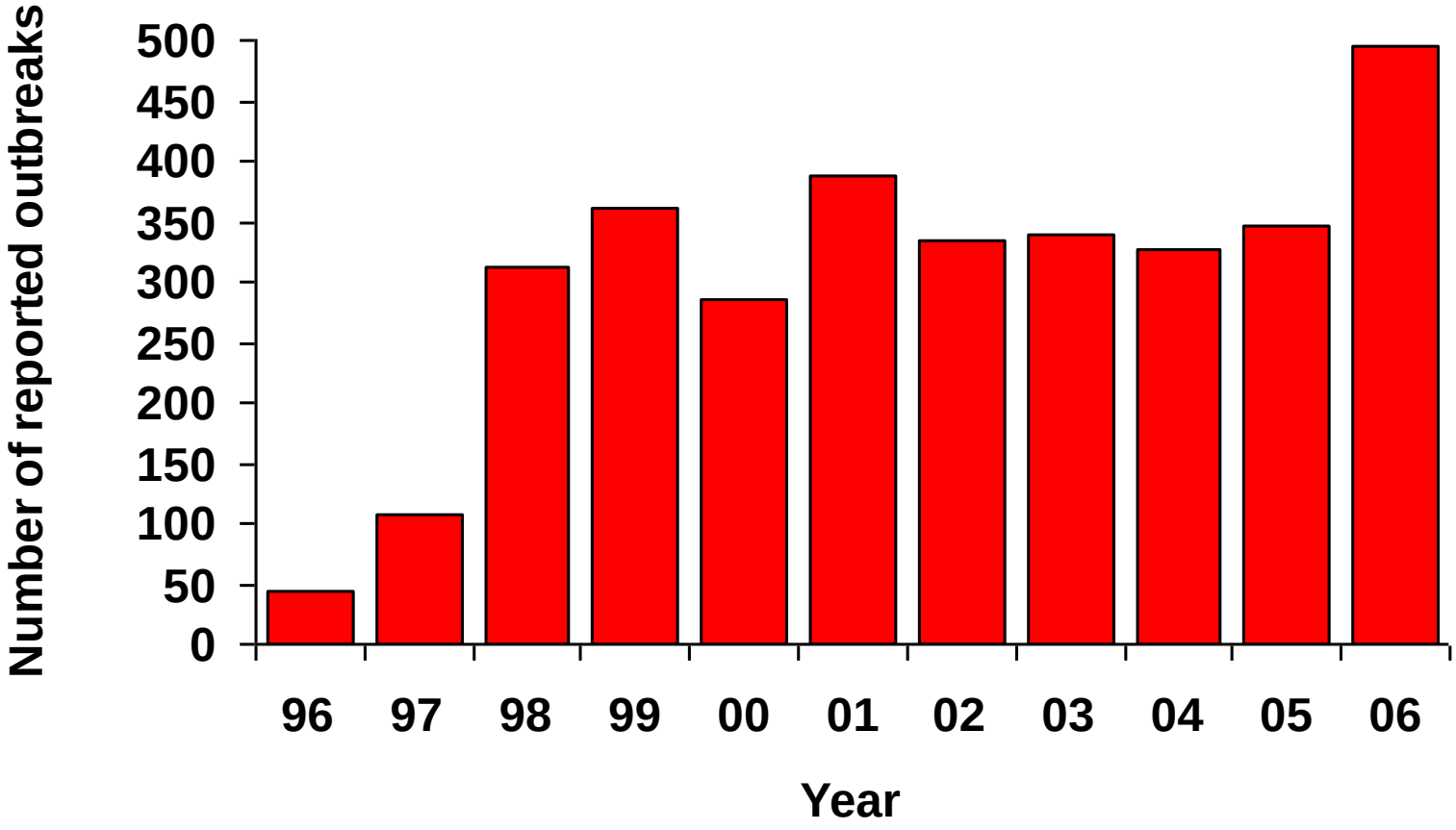
Describing H1N1 Pandemic, 2009

Multiple uses, eg estimating reproduction number (Ro) = 1.55 to 1.95 based on notified cases in containment phase



Performance of ID Surveillance

Reported outbreaks by year, 1996-2006

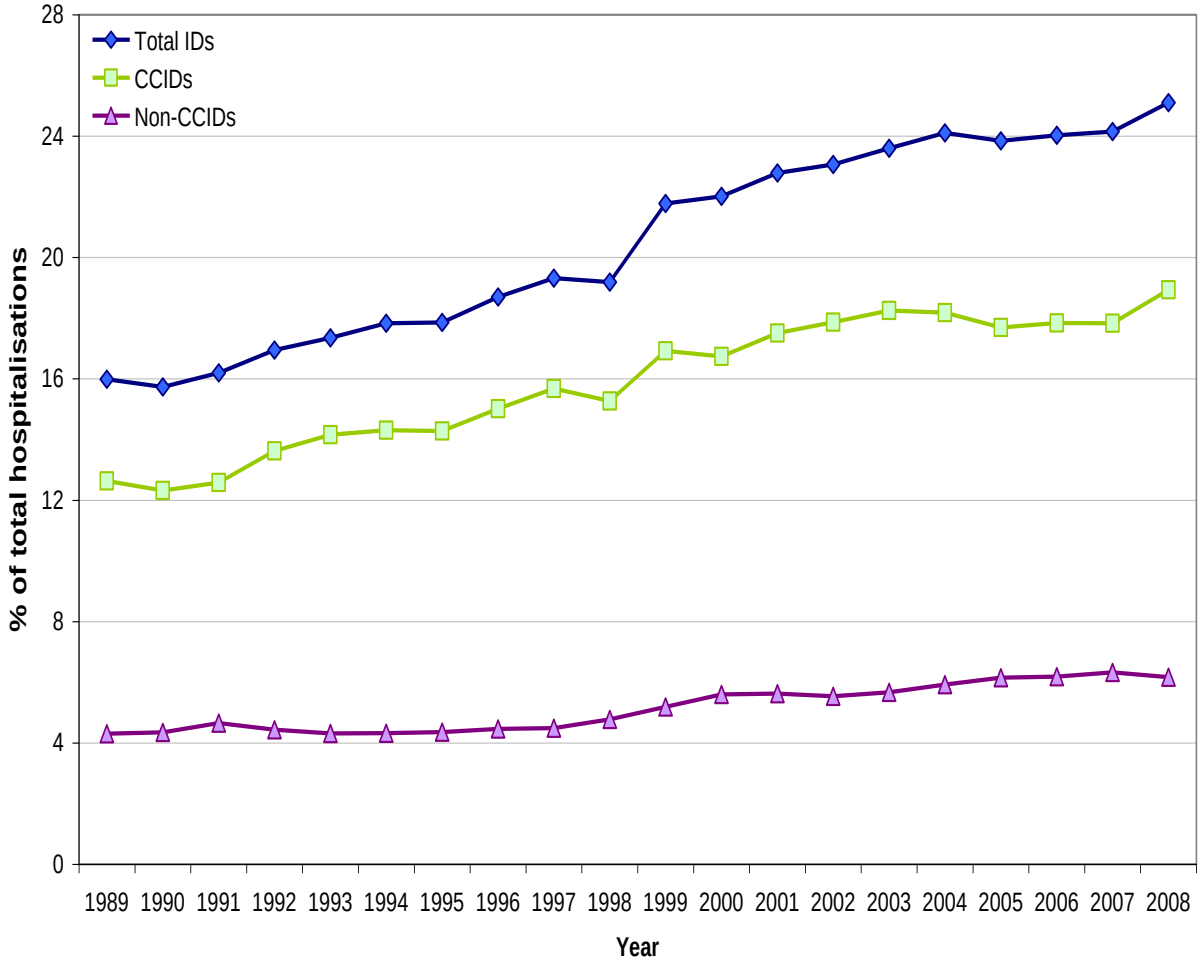


Performance of ID Surveillance

IDs increased from 17.9% of acute overnight hosps in 1989-93, to 25.8% in 2004-08

⇒ additional 22,000 hosp admissions per year

Driven by rise in respiratory & skin infections



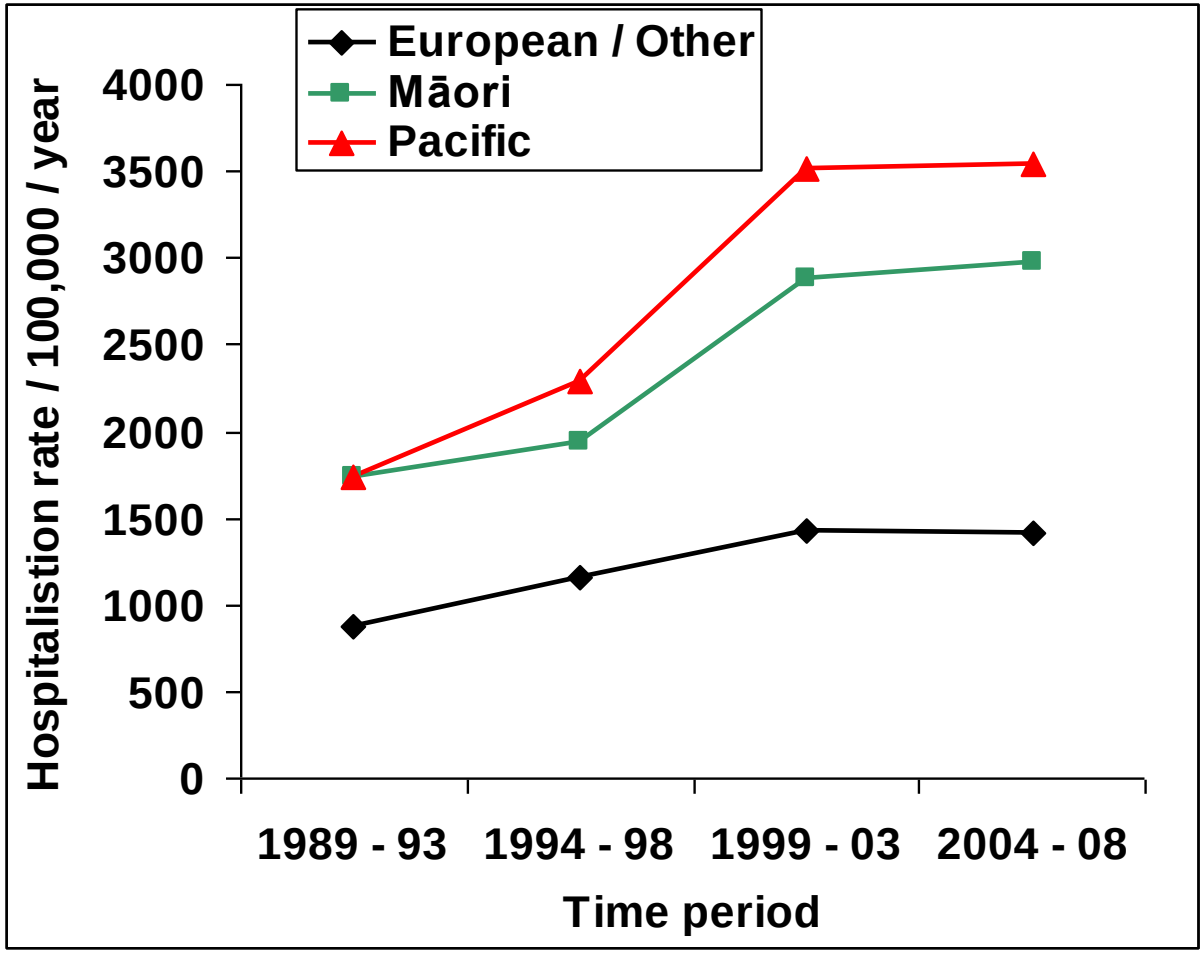
Performance of ID Surveillance

Persisting & increasing ethnic inequalities in ID rates

By 2004-08

RR = 2.1 Mäori

RR = 2.5 Pacific



Rates age standardised to 2006 Census pop

Summary

- Infectious disease surveillance has long history & now highly evolved for tracking specific diseases
- Increasing expectations to meet multiple aims, better support upstream prevention, & contribute to reduced burden of disease
- Advantages in moving from *system* to *sector* approach → identify important sector 'gaps'
- In NZ, evidence of increased ID burden & increasing inequalities over last 20 years (1989-2008) ⇒ need for improved surveillance & prevention