Responding to emerging infectious disease

The role of national public health and laboratory services

Virginia Hope

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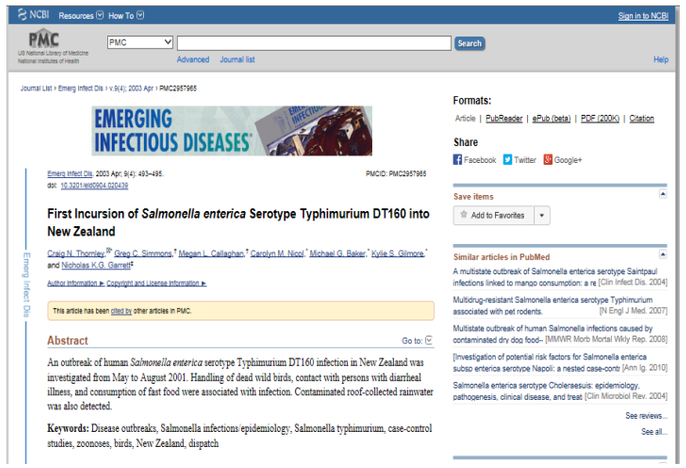
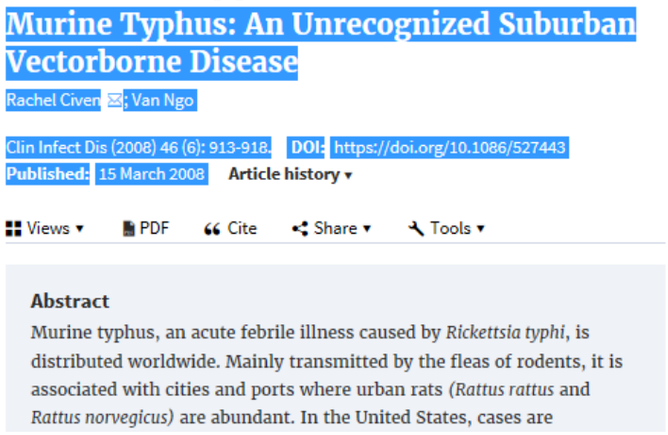
EIDs in NZ



***Salmonella* DT160 2001**

Murine typhus

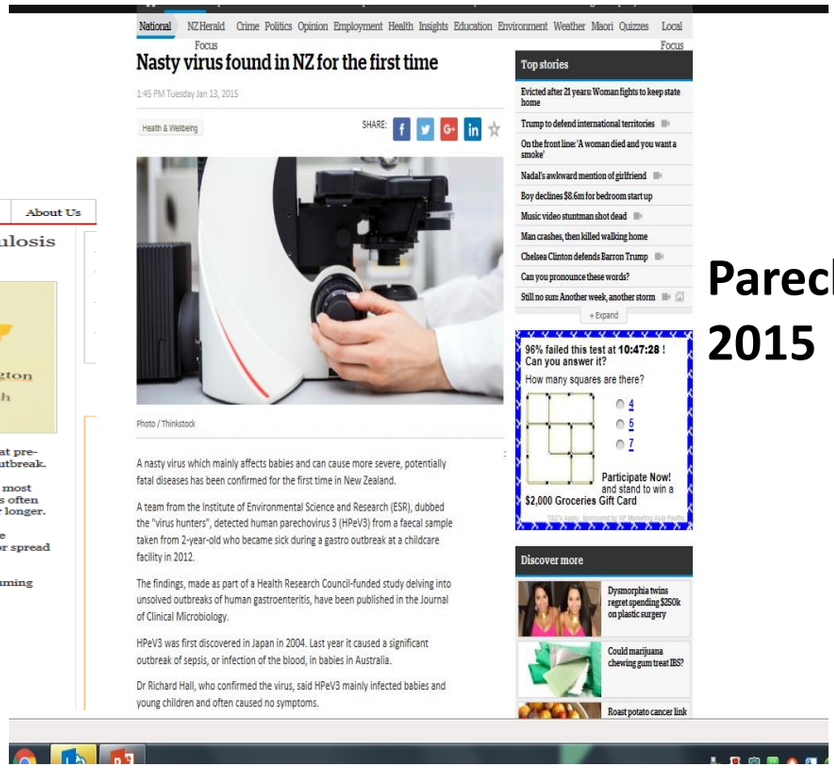


New Zealand Zika numbers balloon
2 June 2016

NZ-based mosquito could transmit Zika - researchers
23 July 2016

Risk of Zika infection low in New Zealand
19 August 2016

***Yersinia pseudotuberculosis* 2014**



Parechovirus 2015

Pandemic (H1N1) 2009 and Seasonal Influenza A (H1N1) Co-infection, New Zealand, 2009

Matthew Peacey, Richard J. Hall, Stephanie Sonnberg, Mariette Ducatez, Shevaun Paine, Mackenzie Nicol, Jacqui C. Ralston, Don Bandaranayake, Virginia Hope, Richard J. Webby, and Sue Huang

Co-infection with seasonal influenza A (H1N1) and pandemic (H1N1) 2009 could result in reassortant viruses that may acquire new characteristics of transmission, virulence, and oseltamivir susceptibility. Results from oseltamivir-sensitivity testing on viral culture suggested the possibility of co-infections with oseltamivir-resistant (seasonal A [H1N1]) and -susceptible (pandemic [H1N1] 2009) viruses.

Ebola scare sparks Parliament lockdown
6:14 PM Tuesday Nov 11, 2014

Anti-microbial resistance

Waikato Hospital close ward to stop spread of 'superbug'

Last updated 16:00, September 10 2015

Stuff

One ward at the Waikato Hospital has been closed after a superbug infected three patients.

A Waikato person holidaying in Australia contracted a multi-drug resistant superbug and infected three other patients at Waikato Hospital in Hamilton.

There are now four patients that have tested positive for carbapenem-resistant enterobacteriaceae (CRE), forcing the hospital to close one of its wards in the Older Persons and Rehabilitation building.

Canterbury superbug patients a 'frightening sign'

CATE BROUGHTON
Last updated 20:33, November 6 2015

KIRK HARGREAVES/FAIRFAX NZ

30 people tested positive for CRE in NZ between 2009 and 2014.

Confirmation three people have left Christchurch hospitals with a rare multi antibiotic-resistant bacteria was another sign of a growing world-wide problem, an antibiotics expert says.

Three people tested positive as potential carriers of Carbapenem-resistant Enterobacteriaceae (CRE) Canterbury District Health Board (CDHB) said on Friday.

Enterobacteriaceae with acquired carbapenemases, 2015

The acquired or transferable (as opposed to chromosomally encoded) carbapenemases found in Enterobacteriaceae belong to three of the four major classes of β-lactamases: classes A, B and D.1 Class A acquired carbapenemases include the *Klebsiella pneumoniae* carbapenemases, the so-called KPCs. Class B metallo-β-lactamases (MBLs) include several types of acquired carbapenemases, the most common being the New Delhi metallo-β-lactamases (NDMs), and the IMP and VIM metallo-β-lactamases. Class D acquired carbapenemases in Enterobacteriaceae belong to the OXA-48 group of β-lactamases.

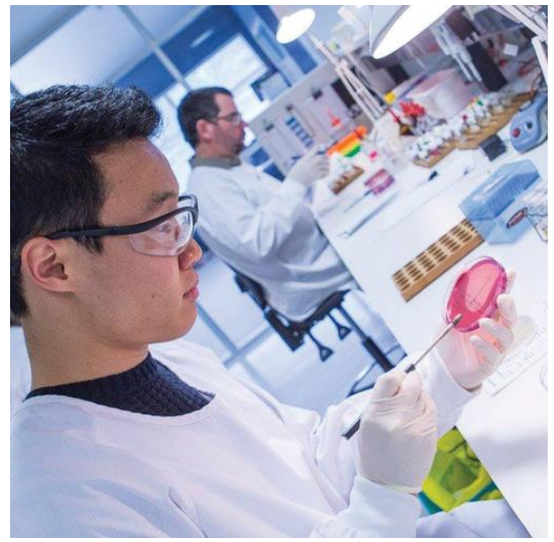
MDRTB, XDRTB

2009	2010	2011	2012	2013	2014	2015	2016
1	5	1	3	12	13	43	48

Carbapenemase-producing enterobacteriaceae 2009-2016

ESR Services

Largest team of forensic, social, radiation and infectious diseases scientists and epidemiologists in New Zealand - around 400 employees

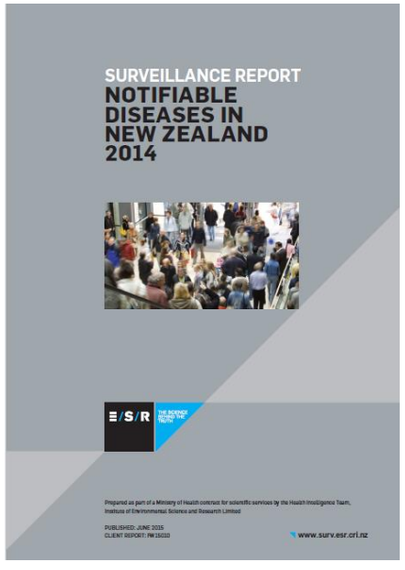


- Forensic Science
- Food Science
- Health Science
- Social Science
- Radiation Science
- Water Science
- Workplace drug testing

ESR – Health Science

ESR provides laboratory and epidemiological services and advice for the detection, identification and monitoring of bacteria and viruses that cause infectious disease and also collaborates on research projects with organisations in New Zealand and other countries.

- Disease and risk factor surveillance
- Bacteriology testing
- Virology testing
- Molecular microbiology
- NZ Culture Collection
- Outbreak investigation
- Communicable disease research



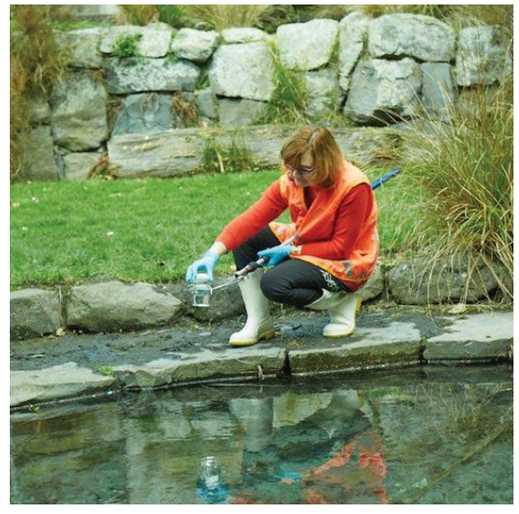
ESR – Food Science

ESR is the core food safety science provider to the Ministry for Primary Industries

- Food forensics
- Molecular typing
- Meat speciation for validation and authentication of foods
- Food virology
- Food chemistry
- Food microbiology
- Risk profiling
- Outbreak response

ESR – Water Science

ESR supports health authorities, local government and communities by supplying scientific advice and expertise on the management of drinking, recreational and wastewater.



- Groundwater quality and monitoring
- Impacts of on-site waster water discharges
- Drinking-water investigation and analysis
- Sustainable biowaste solutions
- Faecal source tracking
- Environmental risk assessments and sanitary surveys

ESR

Public Health AIDE

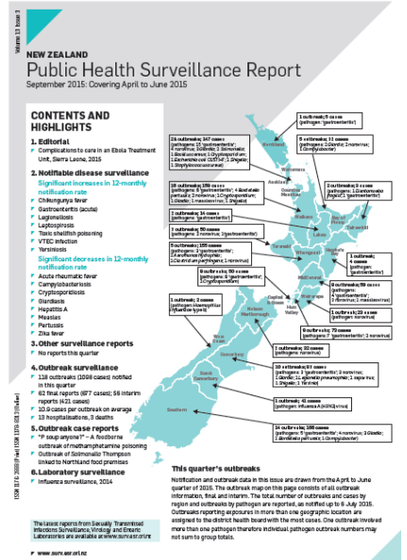
Aberrant Infectious Disease Events

Public Health Surveillance

Information for New Zealand Public Health Action

- **Monitors the epidemiology of bacterial and viral pathogens and anti-microbial resistance**
- **Microbiological reference laboratory - discovers and/or identifies new bacteria and viruses – resistance/ resistomes**
- **Provides coordination and documentation for national outbreak investigation for existing and emerging pathogens**
- **Provides aberrant infectious disease events reports**
- **Identifies, studies and monitors risk factors**
- **Undertakes reporting on emerging/re-emerging infectious diseases e.g. Zika, Ebola, Polio, measles**
- **Liaises and shares information with appropriate local and international laboratory and epidemiological organisations**
- **Supports government agency response to intentional events**
- **Provides advice on control measures**

THE NEW ZEALAND MICROBIOLOGY NETWORK


NEW ZEALAND
Public Health Surveillance Report
CONTENTS AND HIGHLIGHTS
1. Editorial
2. Notifiable disease surveillance
Significant increases in 12-monthly notification rate
Significant decreases in 12-monthly notification rate
3. Other surveillance reports
4. Outbreak surveillance
5. Outbreak case reports
6. Laboratory surveillance
This quarter's outbreaks

Notifiable Infectious Diseases Under the Health Act 1956

Section A – Infectious Diseases Notifiable to a Medical Officer of Health and Local Authority

Acute gastroenteritis **	Campylobacteriosis
Cholera	Cryptosporidiosis
Giardiasis	Hepatitis A
Legionellosis	Listeriosis
Meningoencephalitis – primary amoebic	Salmonellosis
Shigellosis	Typhoid and paratyphoid fever
Yersiniosis	

Section B – Infectious Diseases Notifiable to Medical Officer of Health

Anthrax	Arboviral diseases
Brucellosis	Creutzfeldt-Jakob disease (CJD) and other spongiform encephalopathies
Cronobacter species	Diphtheria
Haemophilus influenzae b	Hepatitis B
Hepatitis C	Hepatitis (viral) not otherwise specified
Hydatid disease	Highly Pathogenic Avian Influenza (including HPAI subtype H5N1)
Invasive pneumococcal disease	Leprosy
Leptospirosis	Malaria
Measles	Middle East Respiratory Syndrome (MERS)
Mumps	Neisseria meningitidis invasive disease
Non-seasonal influenza (capable of being transmitted between human beings)	Pertussis
Plague	Poliomyelitis
Q fever	Rabies and other lyssaviruses
Rheumatic fever	Rickettsial diseases
Rubella	Severe Acute Respiratory Syndrome (SARS)
Tetanus	Tuberculosis (all forms)
Verotoxin-producing or Shiga toxin-producing Escherichia coli Viral haemorrhagic fevers	Yellow fever

Section C- Infectious Diseases Notifiable to Medical Officer of Health without Identifying Information of Patient or Deceased Person

Acquired Immunodeficiency Syndrome (AIDS)
Gonorrhoeal infection
Human Immunodeficiency Virus (HIV) infection
Syphilis

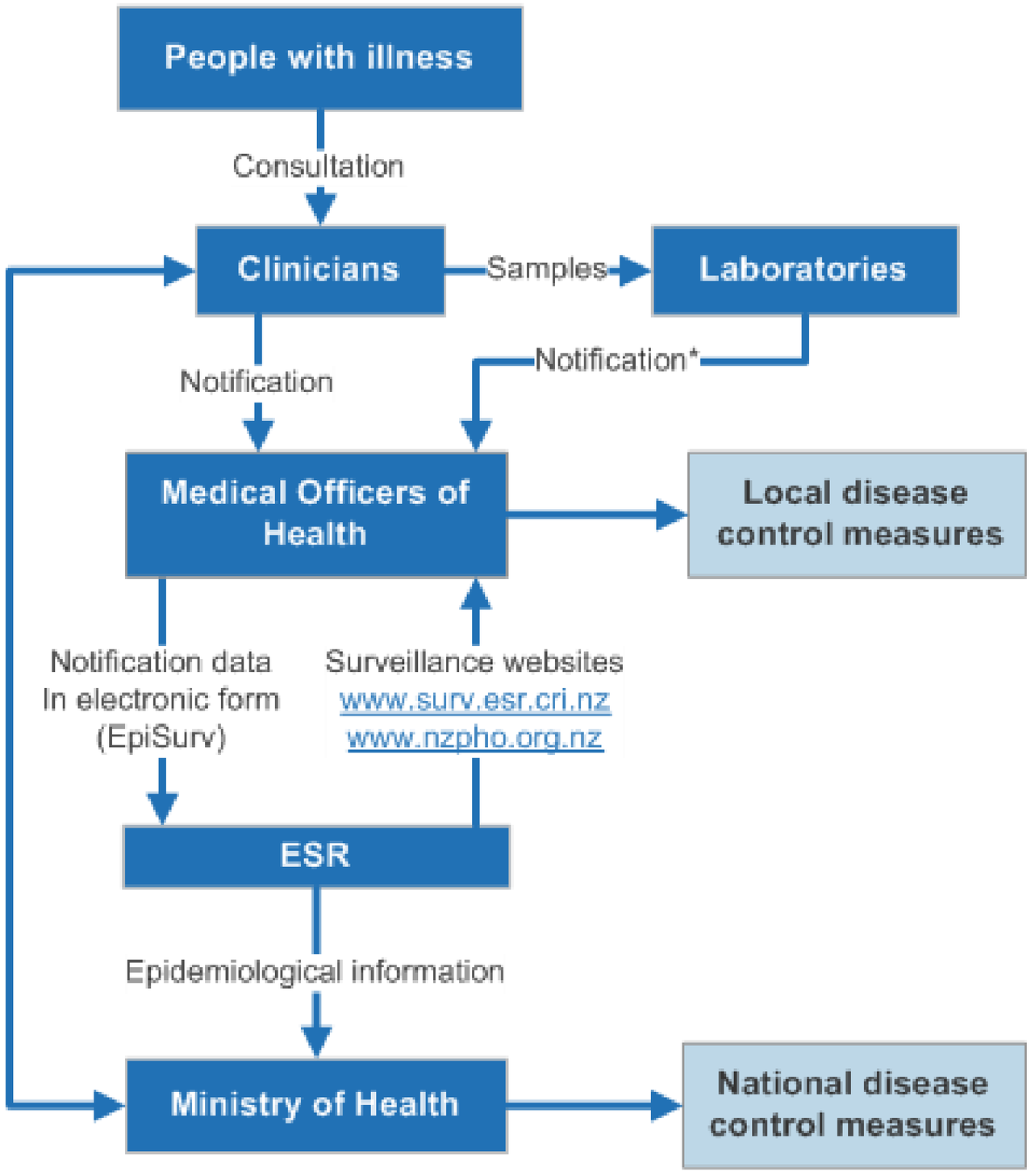
Diseases Notifiable to Medical Officer of Health (Other than Notifiable Infectious Diseases)

Notifiable to the Medical Officer of Health

Cysticercosis
Decompression sickness
Lead absorption equal to or in excess of 0.48µ mol/l (10µg/dl)***
Poisoning arising from chemical contamination of the environment
Taeniasis
Trichinosis

- * During times of increased incidence health practitioners may be requested to report, with informed consent, to their local medical officer of health cases of communicable diseases not on this list.
- ** Not every case of acute gastroenteritis is necessarily notifiable, only those where there is a suspected common source or from a person in a high risk category (for example, a food handler, an early childhood service worker) or single cases of chemical, bacterial, or toxic food poisoning such as botulism, toxic shellfish poisoning (any type) and disease caused by verotoxin or Shiga toxin- producing *Escherichia coli*.
- *** Where occupational exposure is suspected, please also notify the agency responsible for workplace health and safety through the notifiable occupational diseases system.

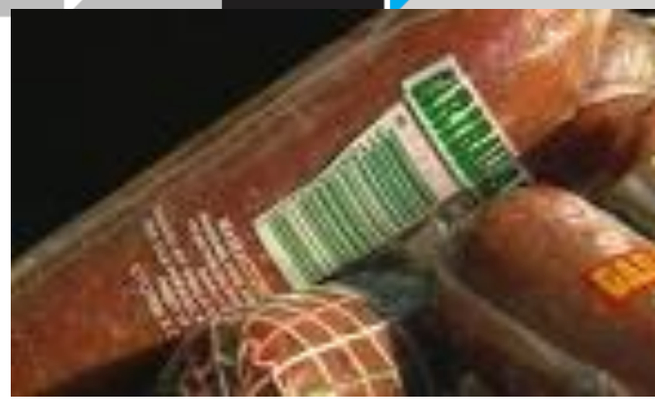
- National notifiable disease surveillance database is EpiSurv
- EpiSurv collates notifiable disease information on a real time basis from the public health services in NZ
- ESR operates the EpiSurv database on behalf of the Ministry of Health (MoH)



* From 21 December 2007

Event identification and alerting

- Surveillance systems
  - ESR reference laboratories
    - New bacteria or virus
    - Rare serotype
    - Large cluster of one type of organism
  - Routine epidemiological surveillance
  - Public Health Unit staff, clinicians, others
  - Early Aberration Reporting System



Reference: ESR Guidelines for the investigation and control of disease outbreaks – page 5

Public Health Surveillance

Information for New Zealand Public Health Action

Welcome

Friday 3rd July 2015

SITE CONTENTS

- Home
- Public Health Surveillance
- Surveillance Reports
- EpiSurv
- LabSurv
- Antimicrobial Resistance
- Virological Surveillance
- Enteric Reference Laboratory
- Environmental Health Indicators
- EARS
  - **Notifiable disease analyses**
  - Salmonella analyses
  - Background on EARS
  - Methods available in EARS

EARS Early Aberration Reporting System

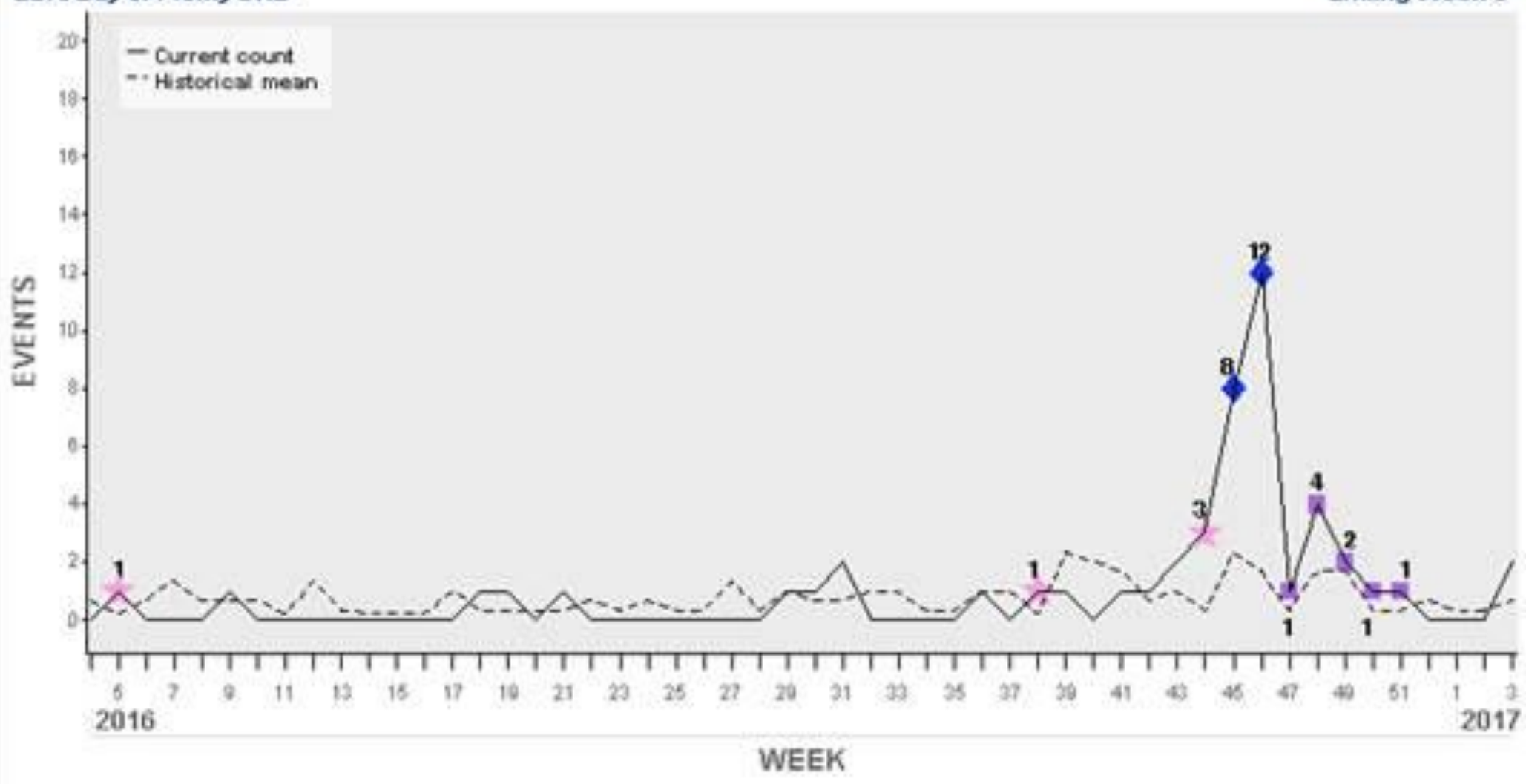
Aberration Detection Reports

by Week (Flagged Data Only)	by Disease (Flagged Data Only)	by DHB (Flagged Data Only)	Trend Graphs (All Data)
Disease	Campylobacteriosis	New Zealand	Graphic Index - by DHB
DHB	Cryptosporidiosis	Northland DHB	Graphic Index - by Disease
	Dengue fever	Waitemata DHB	
	Gastroenteritis	Auckland DHB	
	Giardiasis	Counties Manukau DHB	
	Haemophilus influenzae type b	Waikato DHB	
	Hepatitis A	Lakes DHB	
	Hepatitis B	Bay of Plenty DHB	
	Hepatitis C	Tairawhiti DHB	
	Legionellosis	Taranaki DHB	
	Leptospirosis	Hawke's Bay DHB	
	Listeriosis	Whanganui DHB	
	Malaria	MidCentral DHB	
	Measles	Hutt Valley DHB	
	Meningococcal disease	Capital and Coast DHB	
	Mumps	Wairarapa DHB	
	Paratyphoid fever	Nelson Marlborough	
	Pertussis		

EARS Early Aberration Reporting System

Yersiniosis

ESR: Bay of Plenty DHB — **Ending Week 3**



ABERRATION DETECTION FLAGS

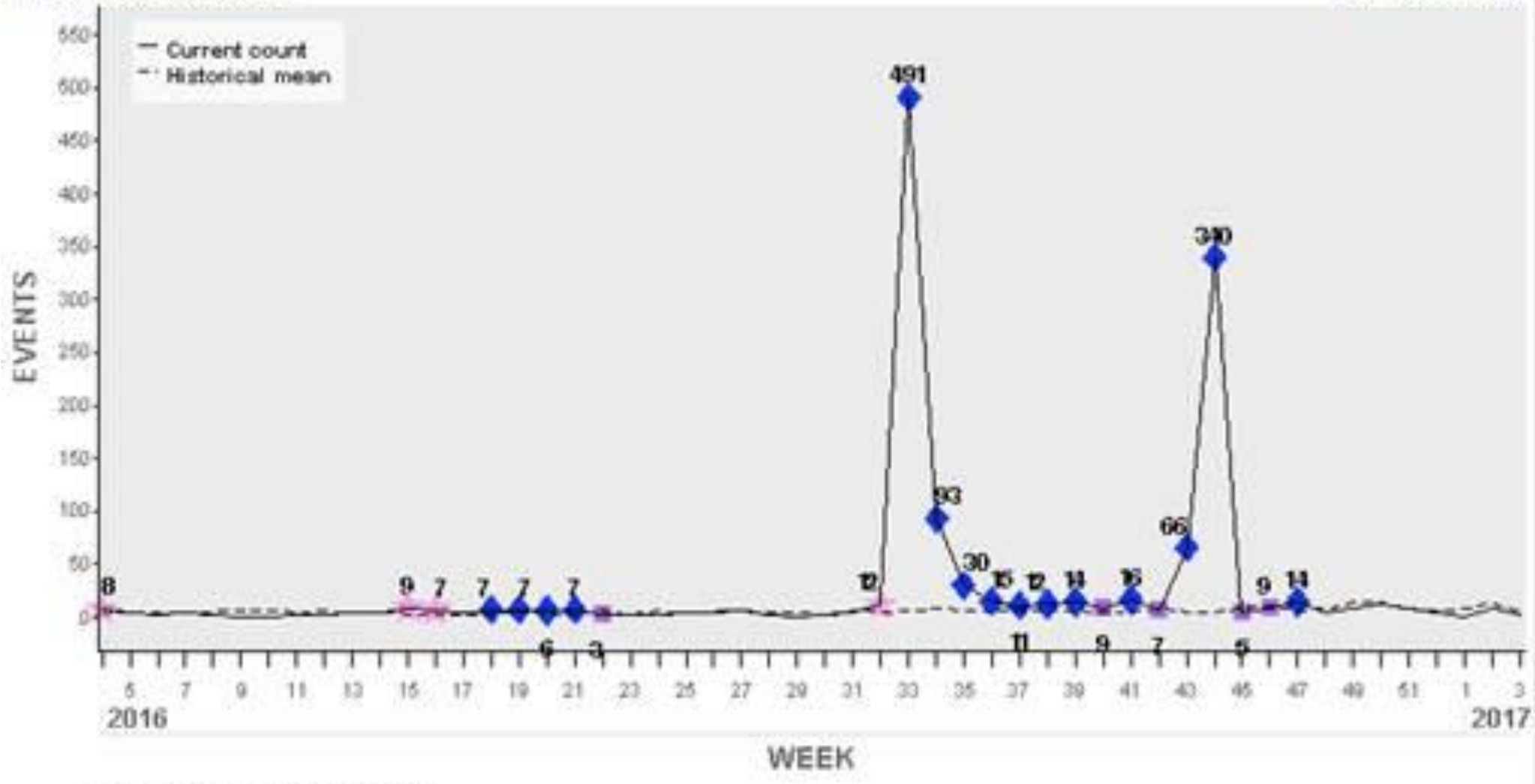
CUSUM	CUSUM + HL
Historical Limits	Manual Flag

EARS Early Aberration Reporting System

Campylobacteriosis

ESR: Hawke's Bay DHB

Ending Week 3



ABERRATION DETECTION FLAGS

CUSUM
CUSUM + HL
Historical Limits
Manual Flag

Hawke's Bay Region Google Trends Dashboard

- **Google Trends** provides normalized data on geospatial and temporal patterns in search volumes for user-specified terms based on Google Search

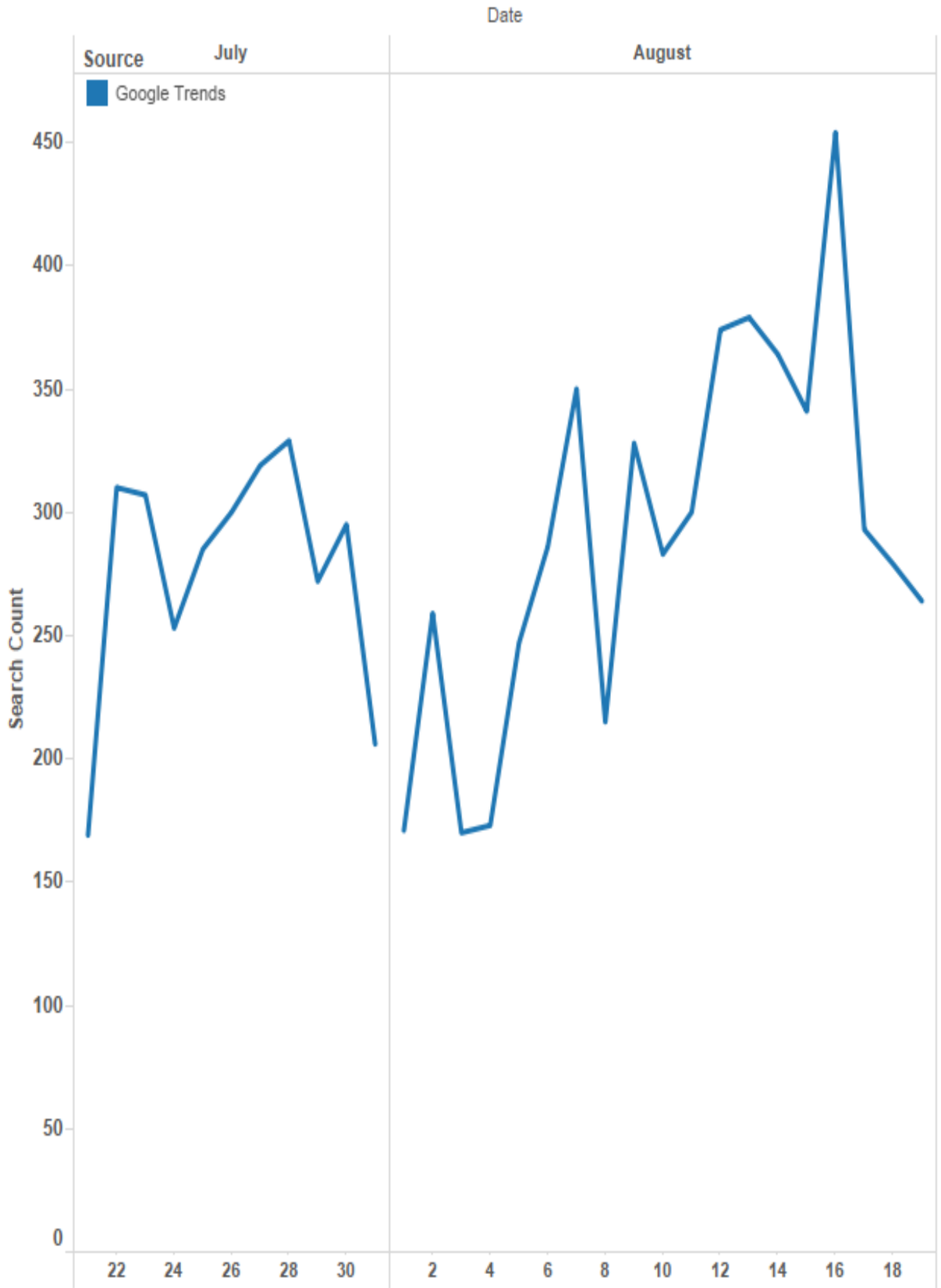
- Collected Google Trends daily data for Hawke’s Bay region for certain key words

- Time period of data collection -> 21st July to 21st August 2016

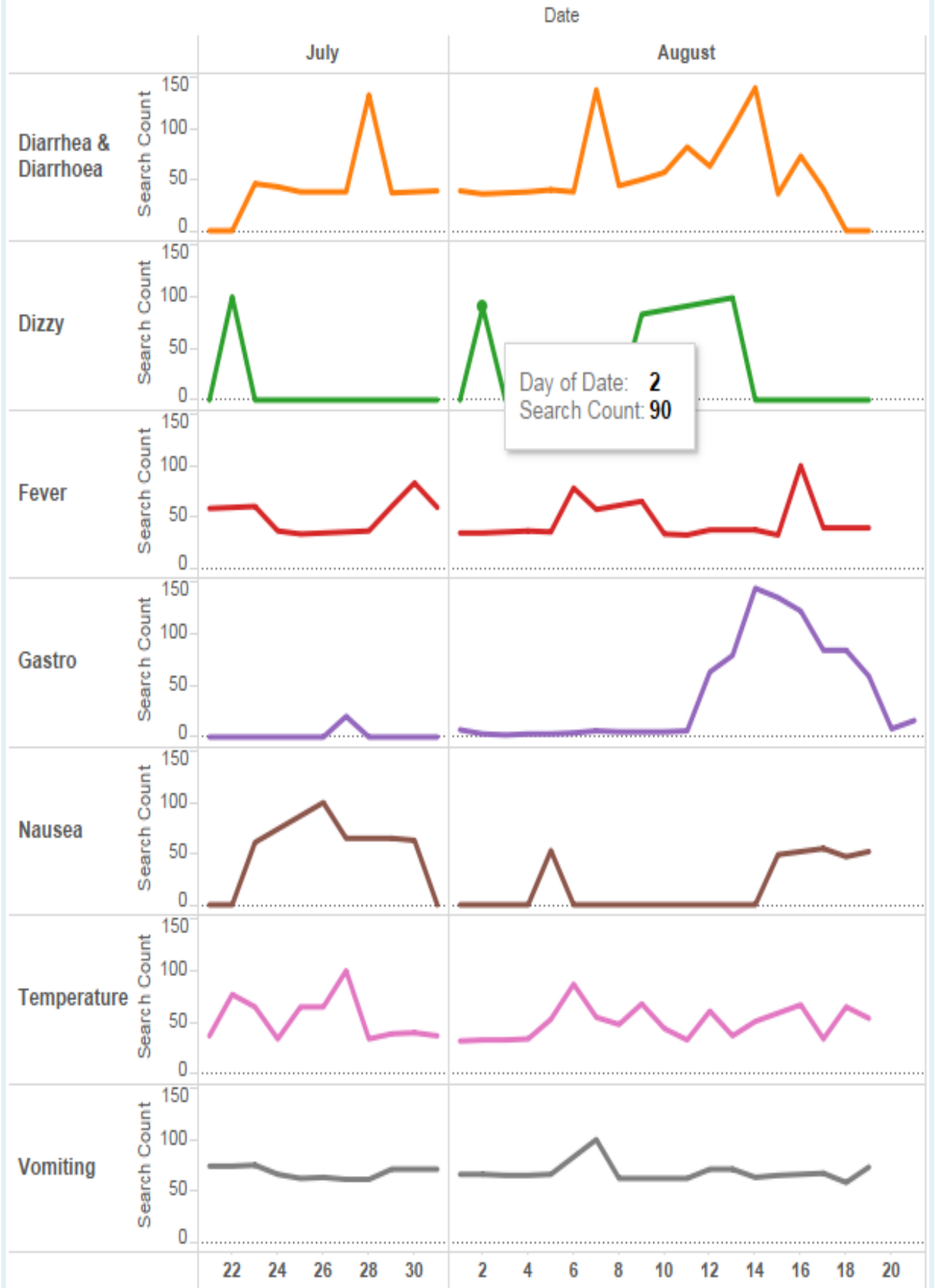
- Developed an interactive dashboard

Hawke's Bay Region Google Trends Dashboards (1-08-2016 to 21-08-2016)

Time Series Total Search Count



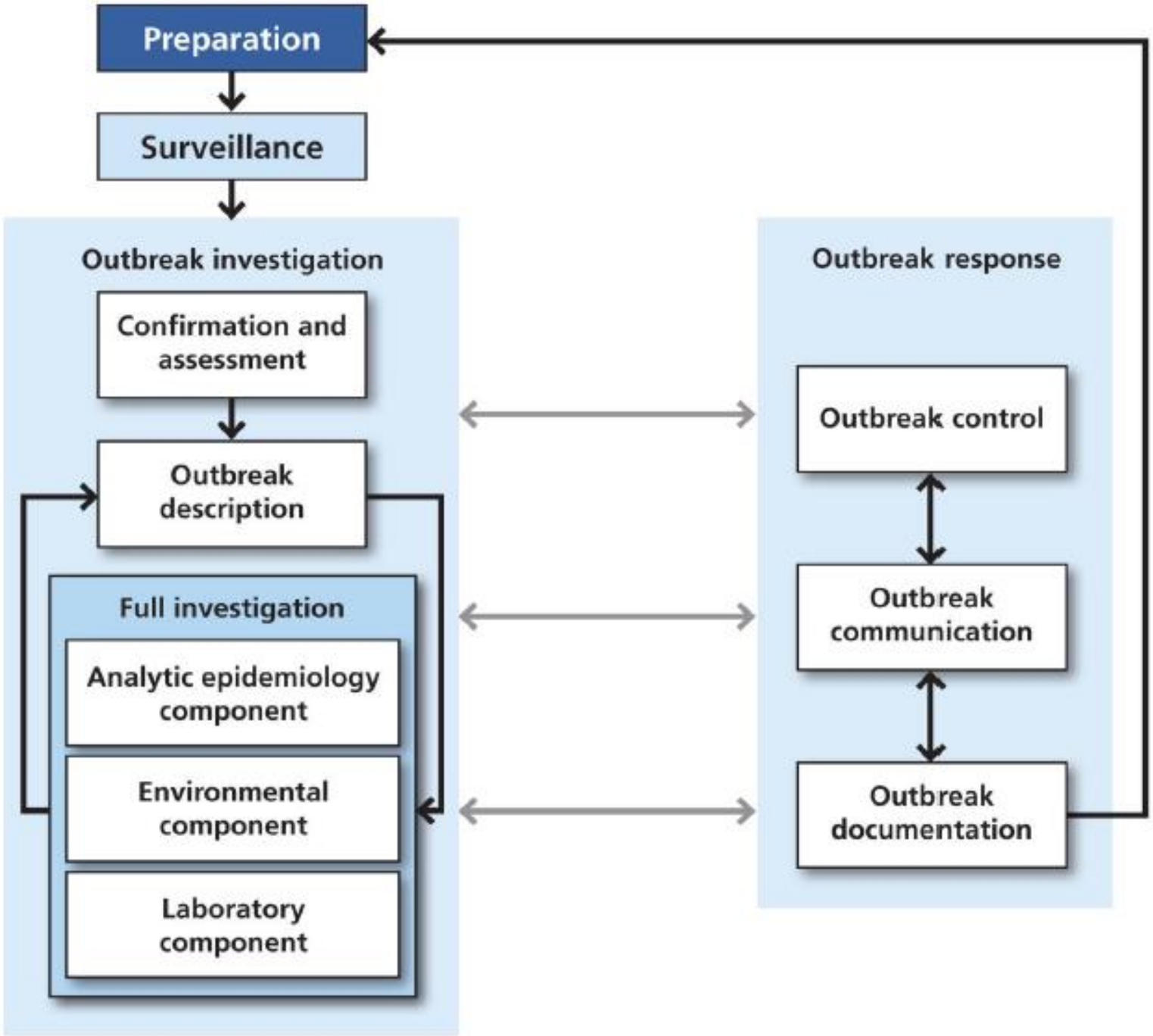
Time Series Search Key Words



Key Word

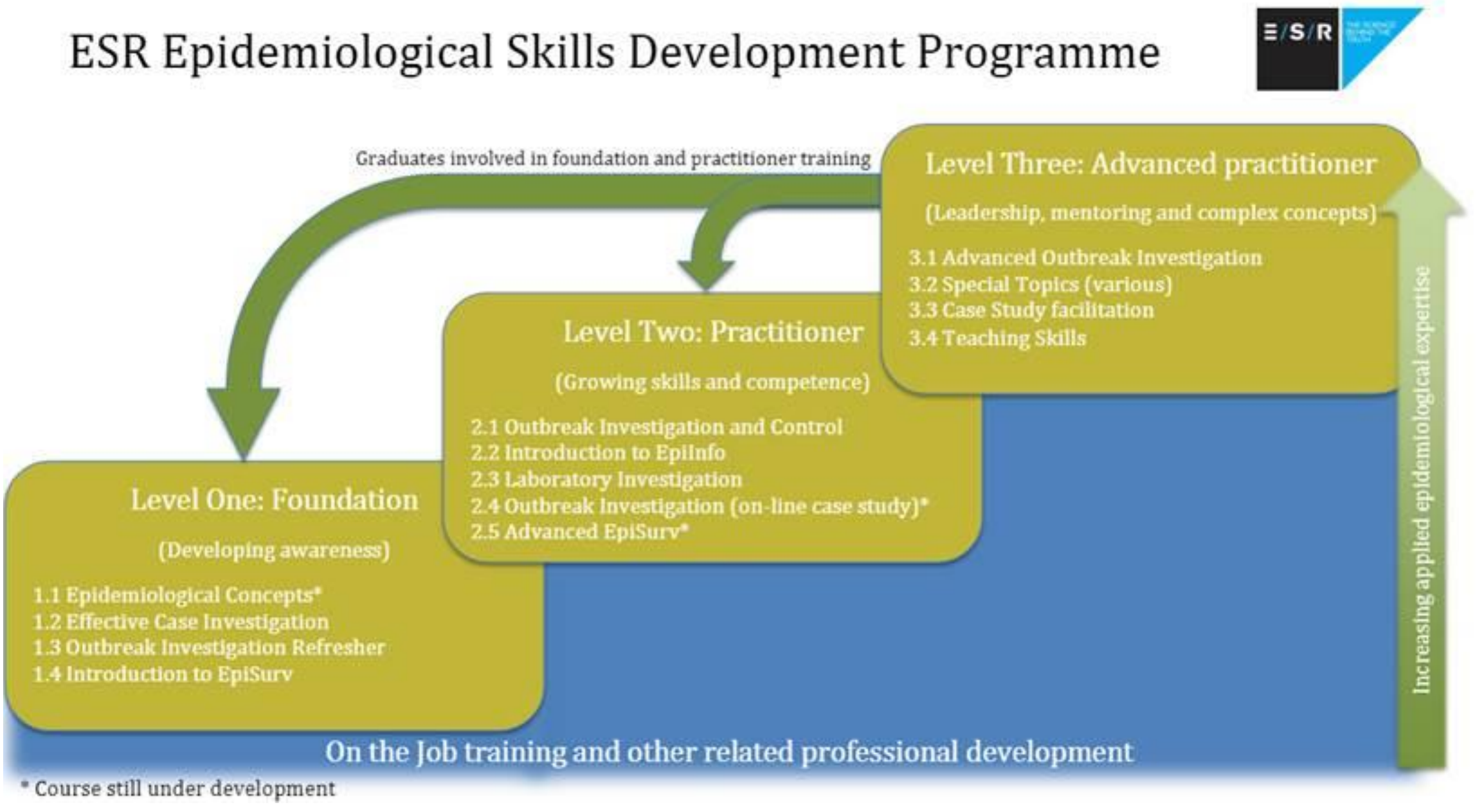
- Dizzy
- Diarrhoea
- Fever
- Gastro
- Nausea
- Temperature
- Vomiting

Outbreak management framework



(Reference: ESR Guidelines for the investigation and control of disease outbreaks)

Epidemiological Skills Development Programme overview



Looking to the future

- Risk prediction and evaluation
  - Syndromic surveillance
  - Mining social media
- Successful collaborations across organisations and disciplines in the moment
  - Compatible and consistent systems and processes
  - Common definitions e.g. clinical microbiology laboratory case definitions (LCDs)
  - Enhanced communication pathways – traditional and broader partners e.g. primary and intensive care

Acknowledgements

- Shevaun Paine, Senior Analyst
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- Robert Press, Strategic Account Manager

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