UK Health Security Agency

Communicable Disease & Epidemiological methods

Suzi Coles and Adrian Wensley

UK Health Security Agency

Learning Objectives

- By the end of this session you should be able to:
- Gain an understanding the principle functions of UKHSA Regional Health Protection Teams
- List the common notifiable disease under the Health Protection Regulations
- What Health Protection Teams do and why….

Yorkshire & the Humber Health Protection Team

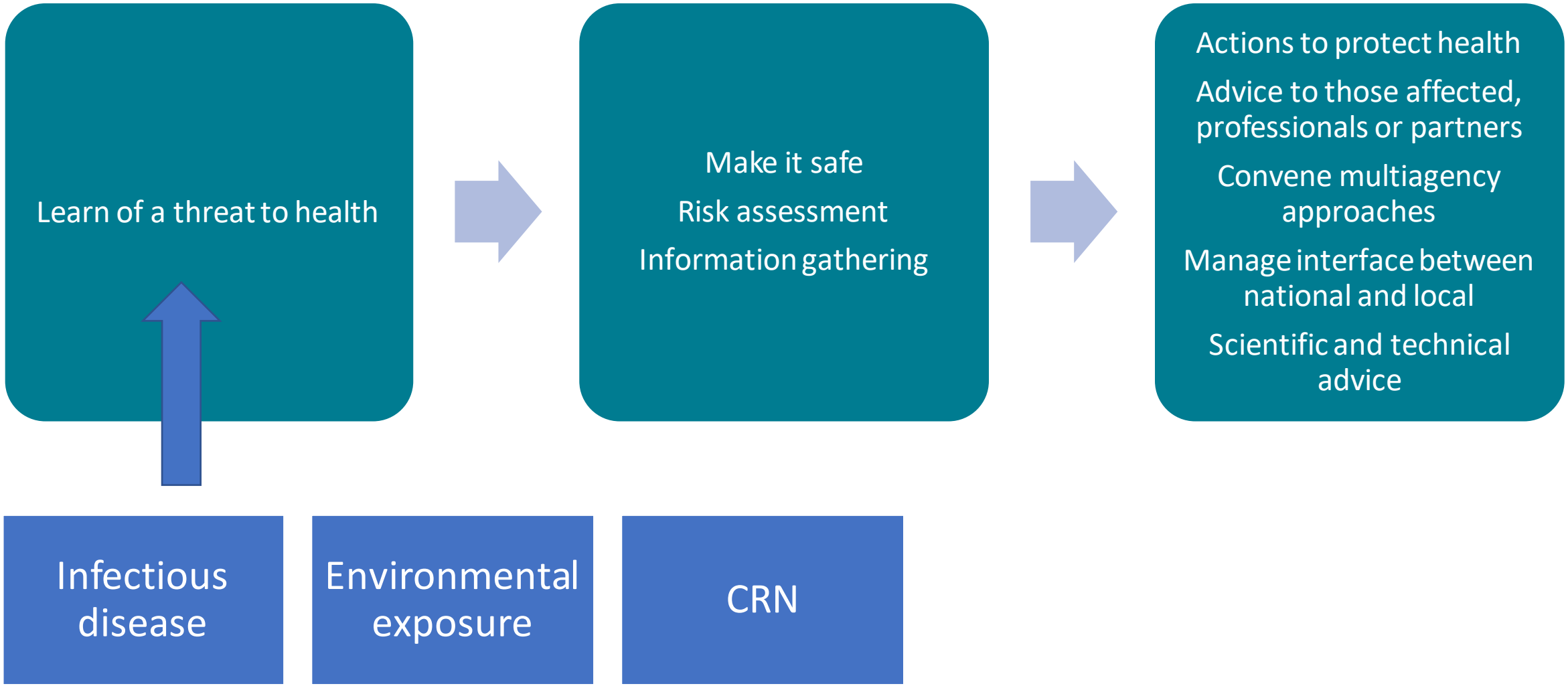
What do we do?

- Protect and improve the nation's health and wellbeing, and reduce health inequalities.
- Provide evidence based PH advice
- Local & national arrangements for health protection concerns and emergencies
- Support LA's, CCG, DPH, other health professionals

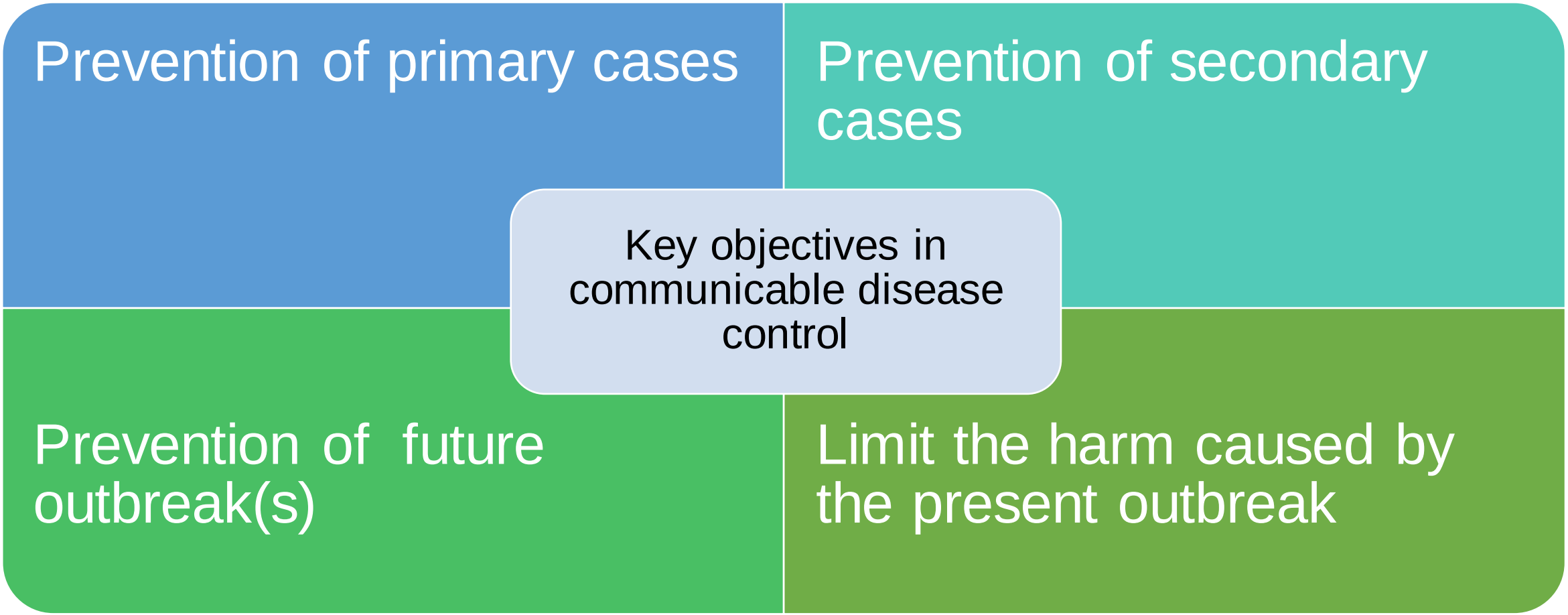
Health Protection Teams

- Health protection teams are based within UKHSA Regional Teams
- Provide specialist support to prevent and reduce the impact of infectious diseases, chemical and radiation hazards, and major emergencies.
- Activities include:
- Local disease surveillance, regional microbiology and virology
- Maintaining alert systems
- Investigating and managing health protection incidents and outbreaks
- Delivering and monitoring national action plans for infectious diseases at local level
- Response to chemical and environmental hazards
- Food Water and Environmental Lab - process food samples and environmental swabs

How do we do it?



Why do we do it?



Health Protection Regulations

- https://www.legislation.gov.uk/uksi/2020/350/made
- https://www.gov.uk/guidance/notifiable-diseases-and-causative-organisms-how-to-report

Diseases notifiable to local authority proper officers under the Health Protection (Notification) Regulations 2010:

- Acute encephalitis
- Acute infectious hepatitis
- Acute meningitis
- Acute poliomyelitis
- Anthrax
- Botulism
- Brucellosis
- Cholera
- COVID-19
- Diphtheria
- Enteric fever (typhoid or paratyphoid fever)
- Food poisoning
- Haemolytic uraemic syndrome (HUS)
- Infectious bloody diarrhoea
- Invasive group A streptococcal disease
- Legionnaires' disease
- Leprosy
- Malaria
- Measles
- Meningococcal septicaemia
- Mumps
- Plague
- Rabies
- Rubella
- Severe Acute Respiratory Syndrome (SARS)
- Scarlet fever
- Smallpox
- Tetanus
- Tuberculosis
- Typhus
- Viral haemorrhagic fever (VHF)
- Whooping cough
- Yellow fever

How do we know?
Clinical Surveillance: NOIDS

- Duty to notify suspected disease, infection or contamination in patients and or anyone who has died.

- Duty of all registered medical practitioners to notify 'Proper Officer' of local authority (i.e UKHSA HPT). Labs also notify us.

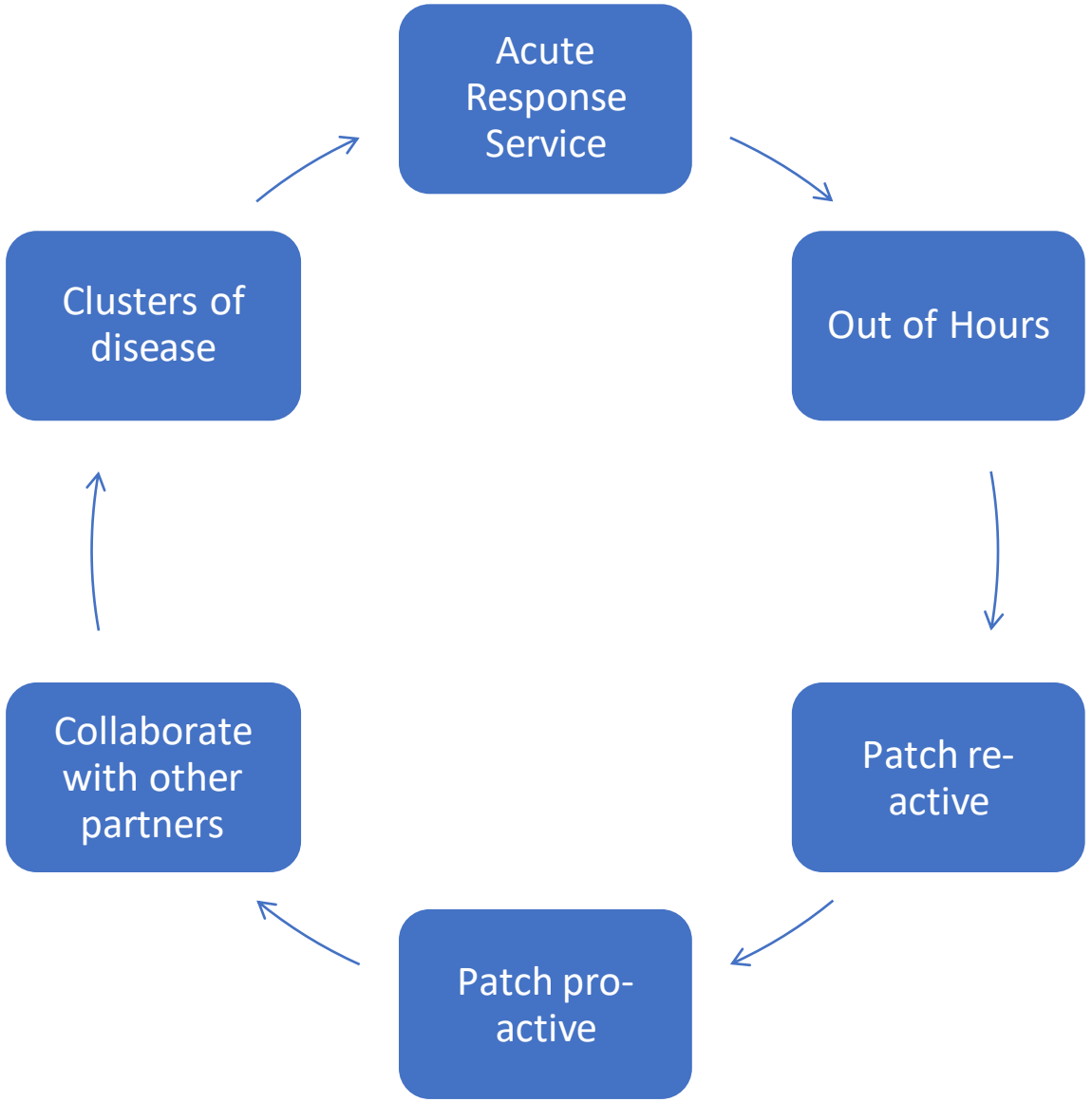
- Notifiable diseases
- Infection which could present (or have presented) significant harm to human health
- Contamination which could present (or have presented) significant harm to human health

- Contamination may be chemical, biological or radiological
- On the basis of *reasonable clinical suspicion*

“Urgent Reporting”

- Meningococci (Meningitis and Sepsis)
- Legionella
- E coli O157
- Typhoid/paratyphoid
- iGAS
- Presumptive Hib
- Cholera
- Non-*Sonnei Shigella*
- Rare infections at microbiologists discretion
- Any situation of immediate public health concern

A Day in the Life of a Health Protection Practitioner/ Consultant



High Profile Examples

- Ebola
- MERS CoV
- Monkeypox
- Measles Outbreaks and MMR Catch- Up Campaign
- Pertussis Vaccination Programme in Pregnancy
- E.Coli O157 and Salmonella Outbreaks
- Look-back exercises for Hepatitis C
- Polonium 210 Incident Buncefield Oil Depot Fire
- Pandemic Influenza
- Salisbury incident
- Meningococcal ACWY vaccination

More day to day examples

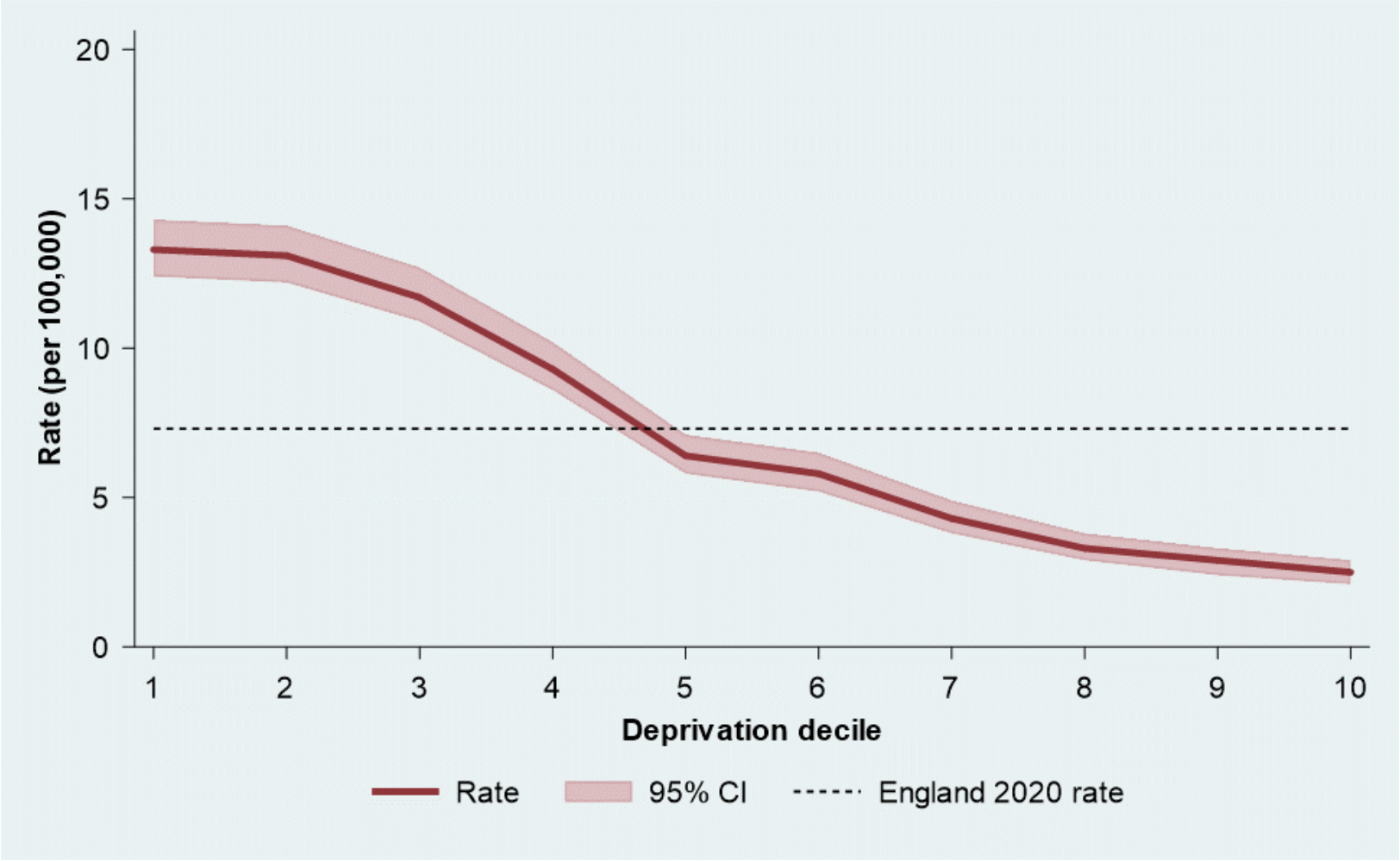
- COVID outbreak in a prison
- A case of a new variant of COVID
- Cases of Meningococcal meningitis in a university halls
- Cases, clusters and outbreaks of E Coli 0157 linked to a farm or dairy
- Invasive group A streptococcus cases
- A flu outbreak in a care home
- Cases and clusters of legionella infection in the same area but no clear link
- Potential cases of measles in a child
- Someone exposed to a dead bird with avian influenza
- A chemical release
- A fire in a large factory

Person Time and Place

- Communicable diseases affect individuals and people differently
- Will depend on that individuals exposure and immunity

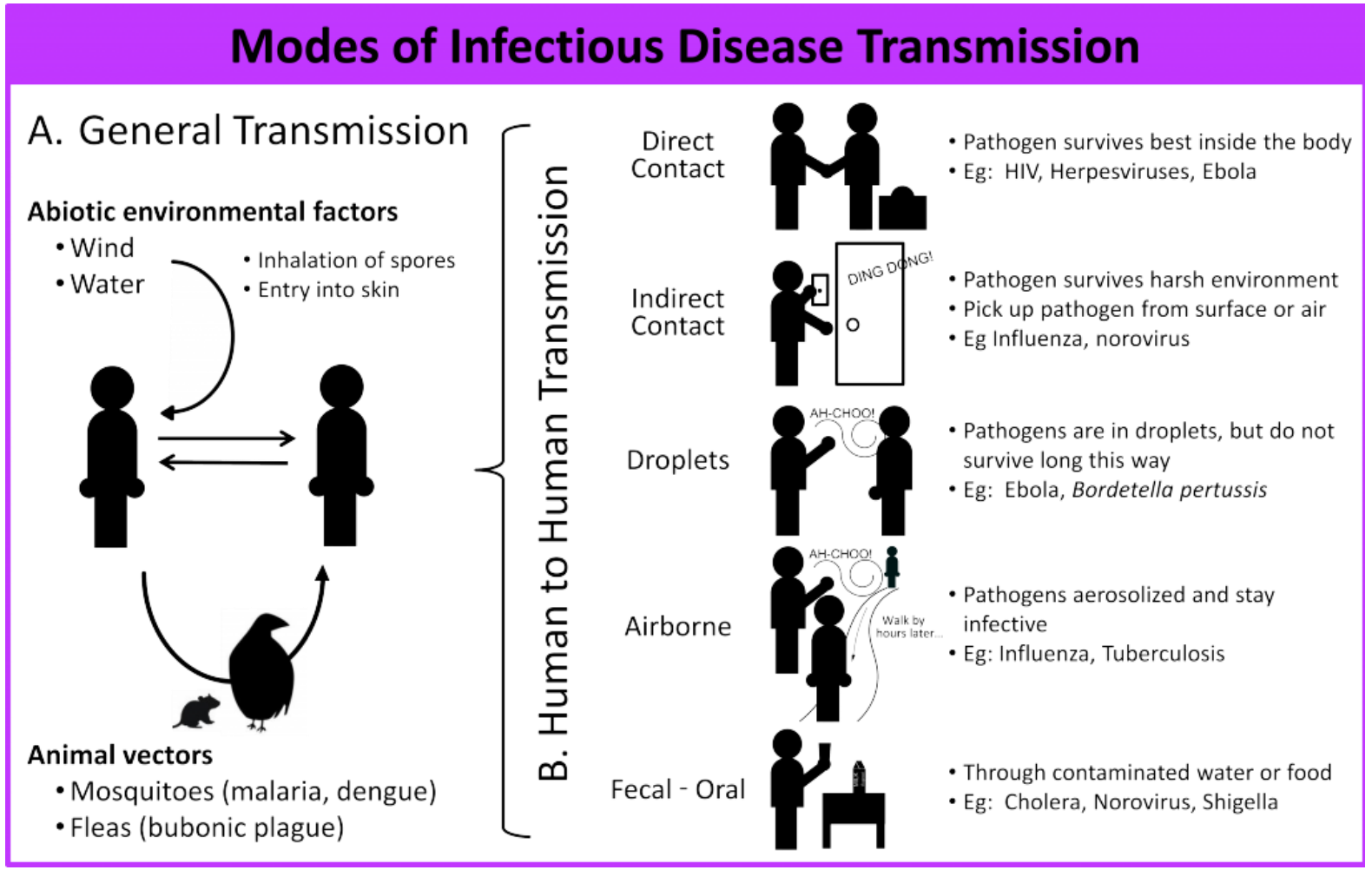
- For example
- Measles – highly effective vaccine
- Hepatitis A – often asymptomatic in children and then passed to adults
- TB – likely to most adversely affect those in underserved populations

Rate of TB by deprivation decile, England, 2020



Source: Enhanced Tuberculosis Surveillance system (ETS), Office for National Statistics (ONS) Data extracted: March 2021 Prepared by: TB Unit, National Infection Service, UKHSA

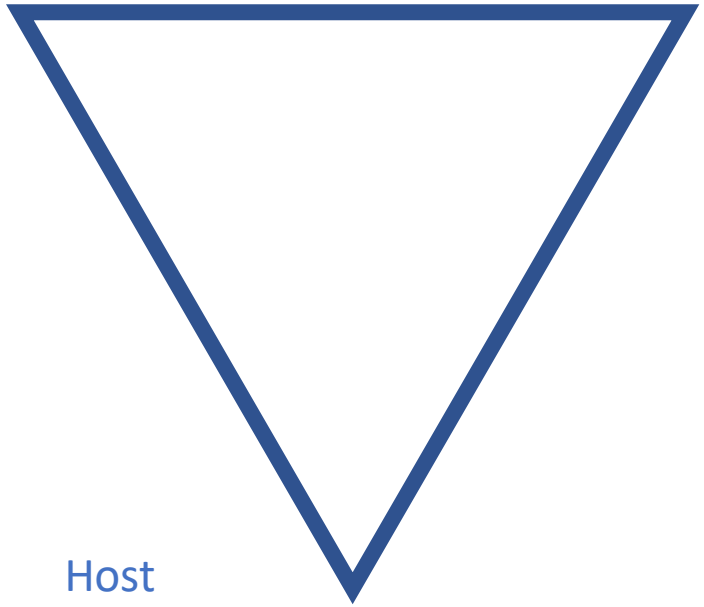
Types of transmission



Factors affecting transmission

Agent

- Infectivity
- Pathogenicity
- Virulence
- Immunogenicity
- Antigenic stability
- Survival



Environment

- Weather
- Housing
- Geography
- Occupation
- Air quality
- Food/water

Host

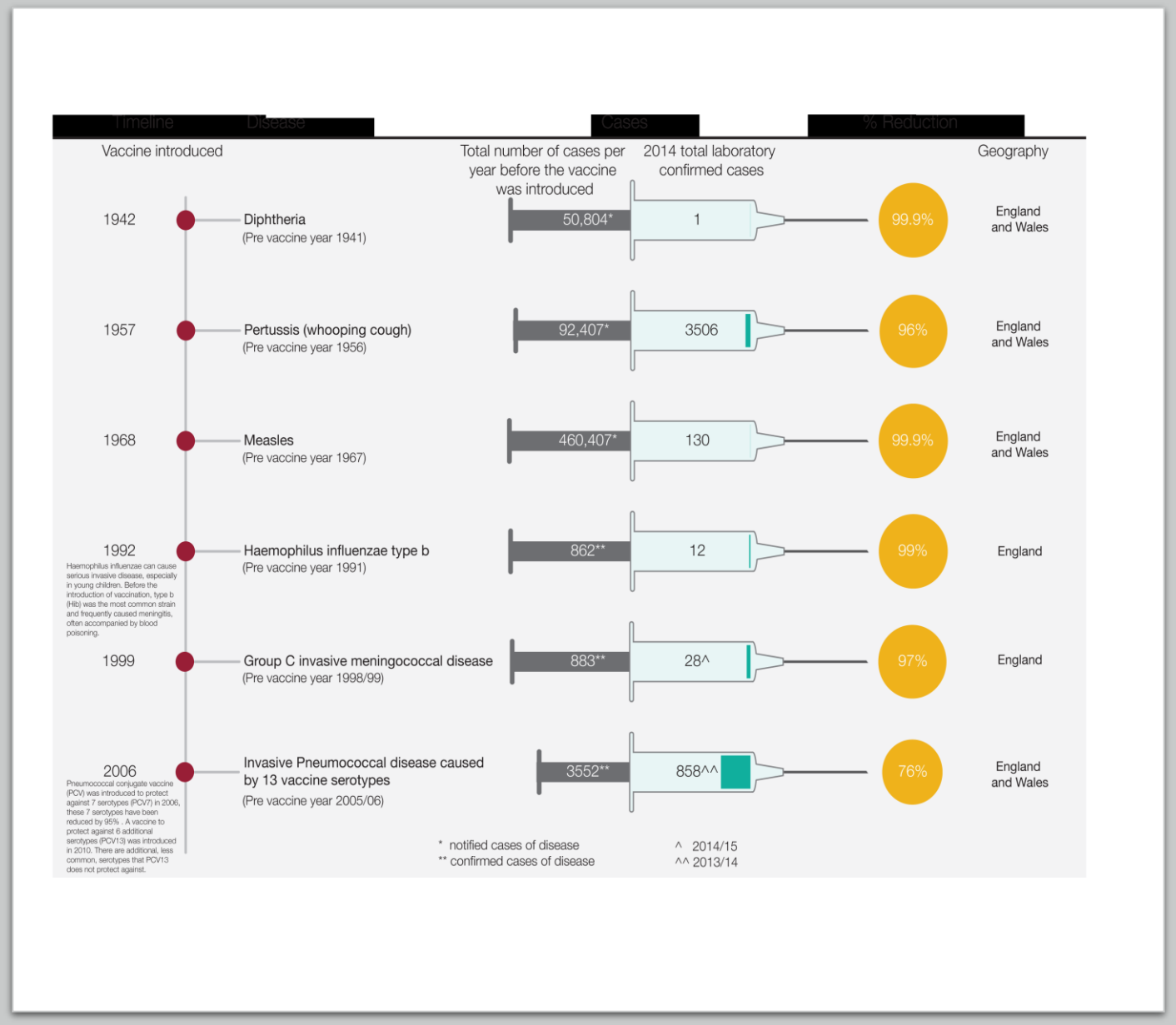
- Age
- Sex
- Genotype
- Behaviour
- Health status
- Immune status

Risk Factors…

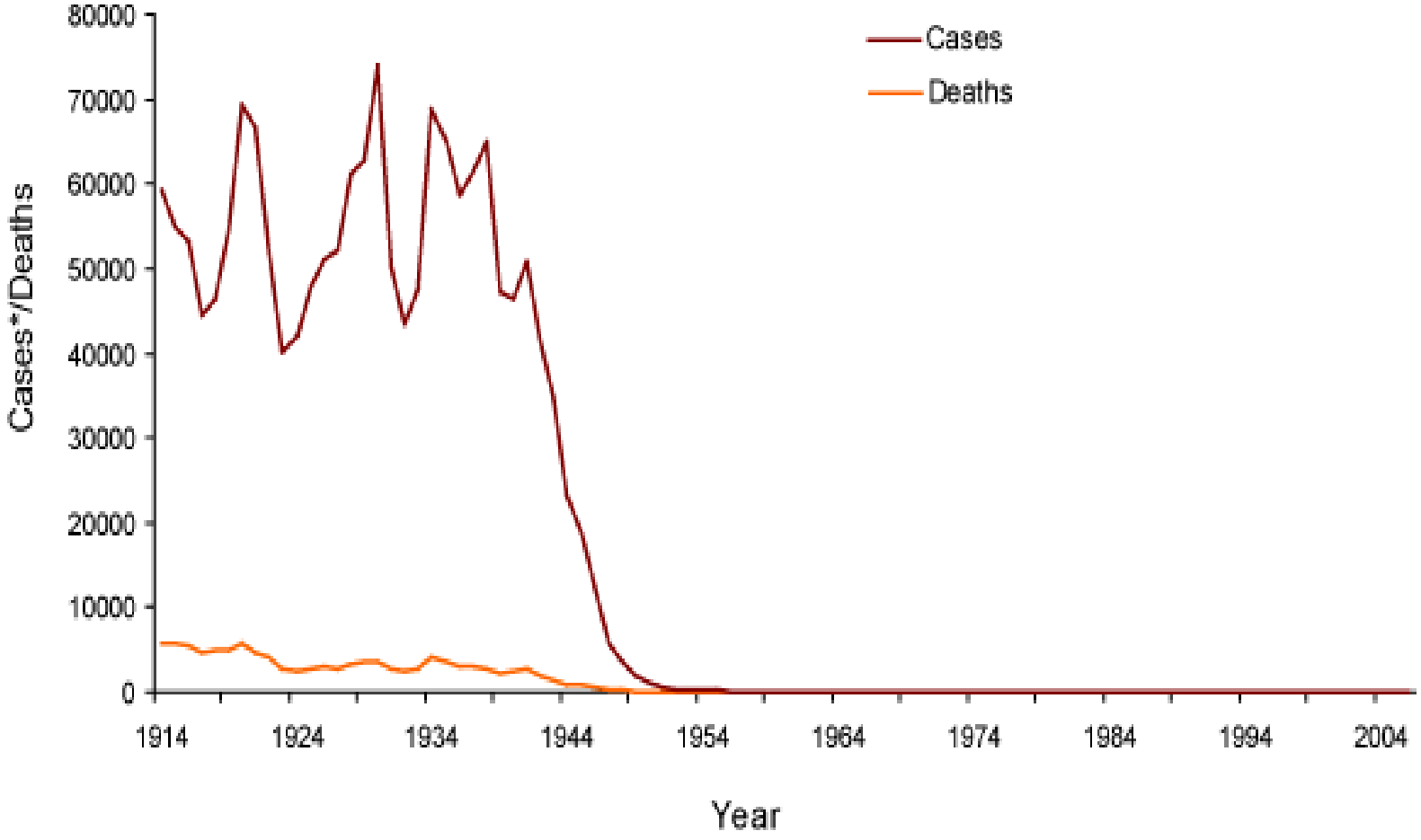
Handwashing…..

Vaccination

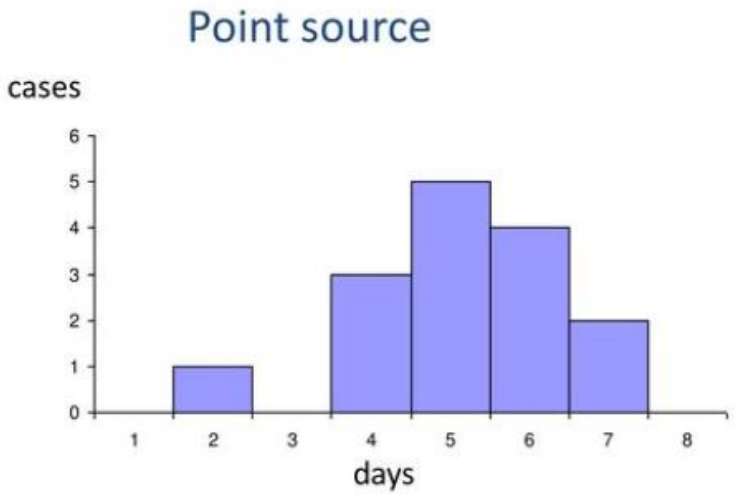
- Single most effective public health innervation beyond clean water
- Uptake affected by more than an available vaccine

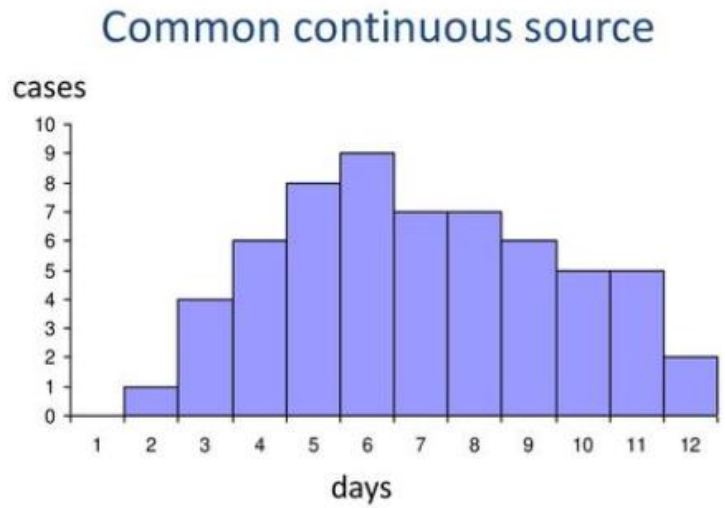


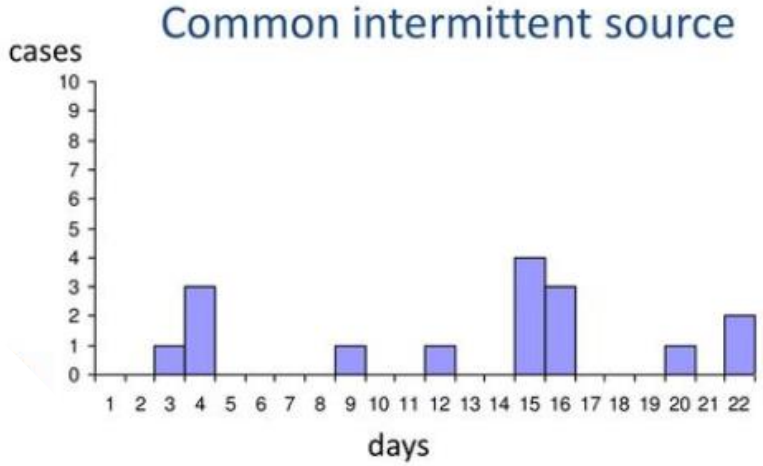
Diphtheria cases* and deaths, England and Wales, 1914 - 2009

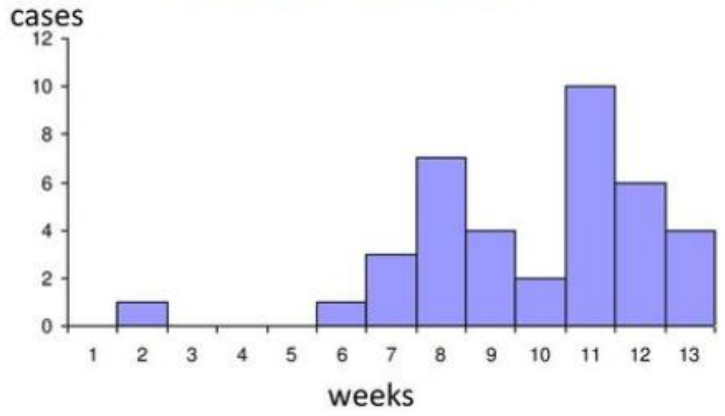


Patterns of transmission



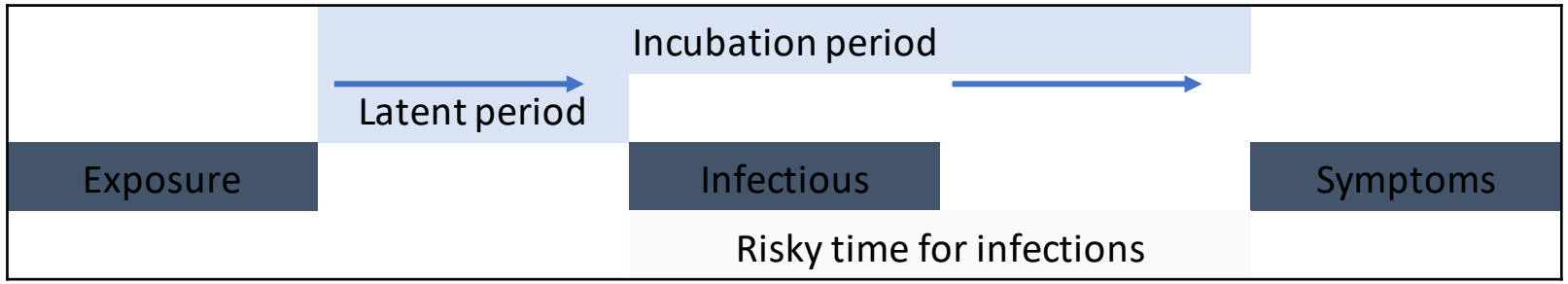






Key terms

- **Primary case:** Person to bring the infection into the population
- **Secondary case:** People infected by the primary case
- **Index case:** First person *discovered* to have the infection
- **Attack rate:** percentage of the at-risk population who become a case
- **Secondary attack rate:** percentage of contacts who become a case
- **R_0:** Basic reproductive number – the average number of secondary cases a typical infectious individuals will cause in a completely susceptible population
- **Incubation period:** Time from exposure to symptom onset
- **Latent period:** Time from exposure to infectiousness
- **Infectious period:** Time in which a person is infectious



Confirm the diagnosis

- **Syndrome and symptoms**
- What symptoms?
- Who is affected?
- Discuss with clinicians

- **Microbiology**
- Confirmatory tests

Define a case

- A case definition for **this** outbreak

- **Person**
- **Clinical**
- **Place**
- **Time**

- Confirmed / probable / possible

Find cases

- Contact tracing
- Asking people in the setting

- Routine surveillance
- Stimulated surveillance
- Active surveillance

- **What do you want to know about each case?**

Information for Action

- Systematic, ongoing collection of health data
- Analysis
- Interpretation
- Dissemination
- Utilisation

- Should always link to public health practice