

HEALTH PROFESSIONALS WEBINAR SERIES

COVID-19 Communicable Disease Control

TUESDAY, 14 JULY 2020

7:00PM QLD/NSW/ACT/VIC, 6:30PM SA/NT, 5:00PM WA





Presented by

Diana P. Rojas Alvarez MD PhD
Lecturer CDC and One Health
Division of Tropical Health and Medicine
James Cook University

Dr Steven Donohue MBBS FAFPHM
Public Health Physician / Director
Townsville Public Health Unit

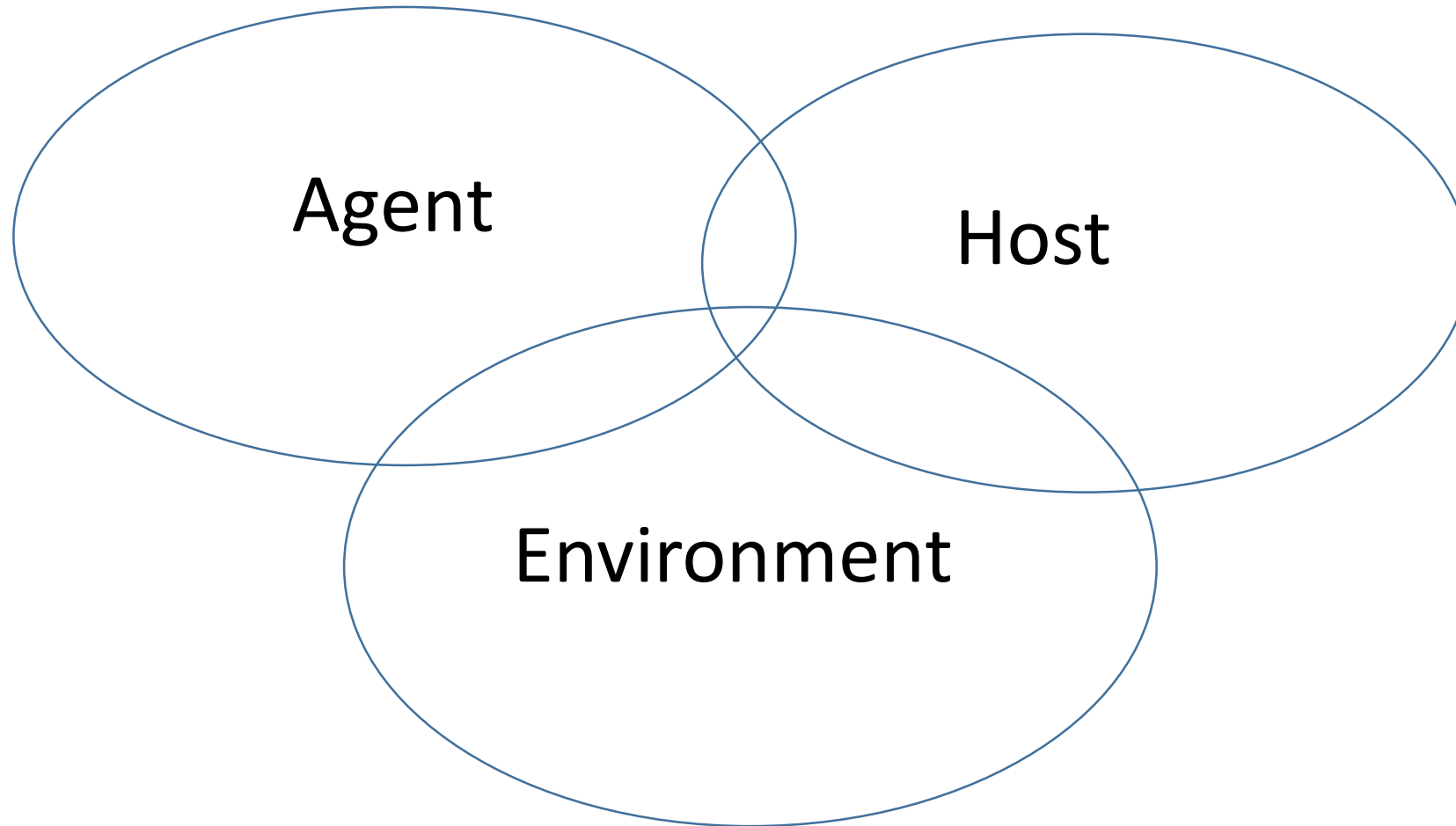


Communicable Disease Control

- Communicable diseases had their higher impact in developed cities in the nineteenth century.
- Most of the infectious disease threats have been controlled in developed settings
- 1980's: HIV
- 2000's: SARS, re-emergence of TB, AMR
- 2010's: Zika, chikungunya, measles
- 2020: SARS-CoV-2 (COVID-19).....
- Control of infectious diseases never rely on a single strategy

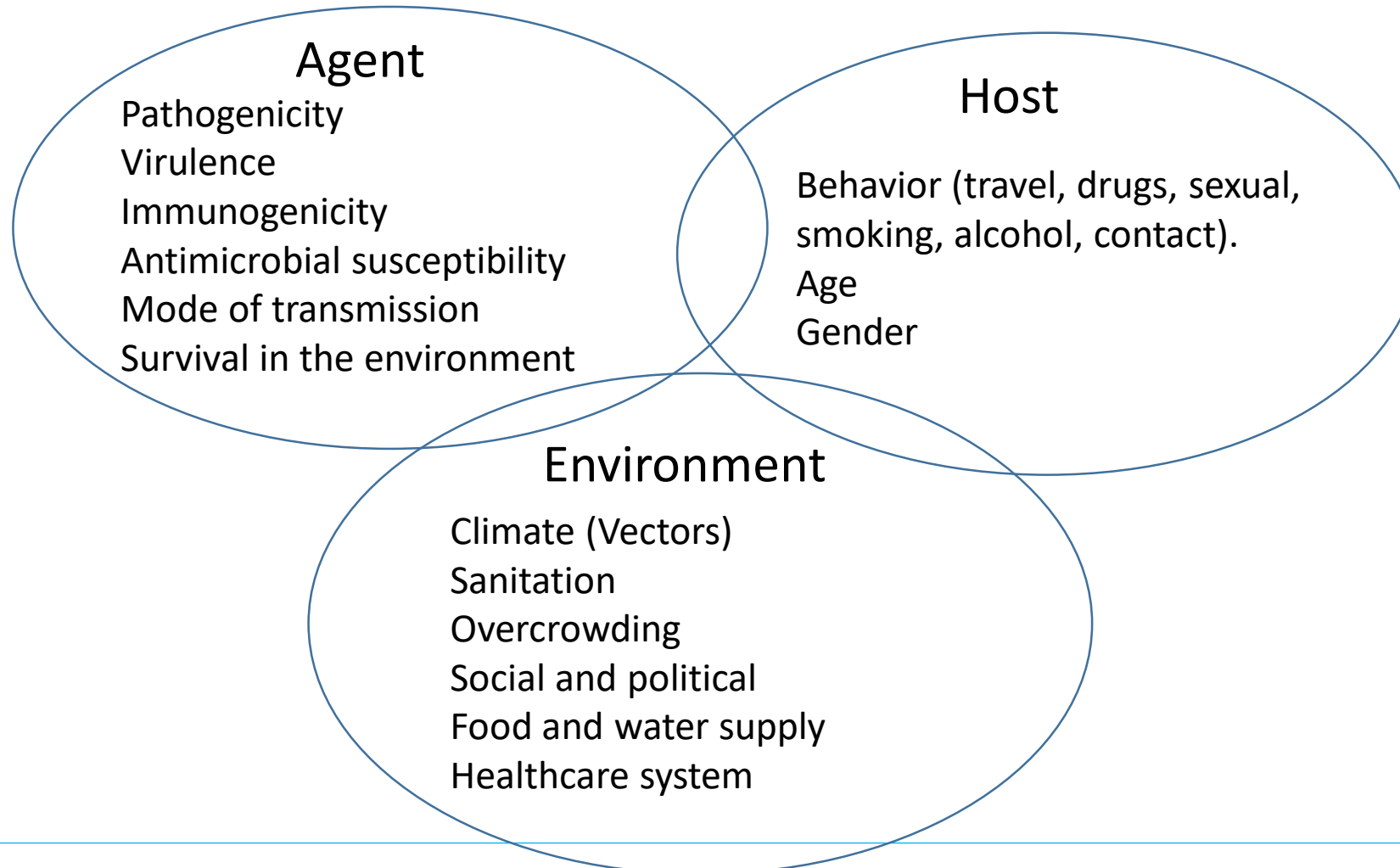


Interplay between the Agent, Host and Environment





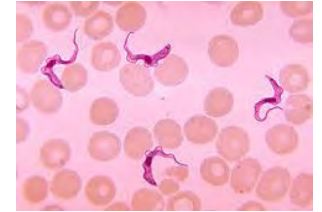
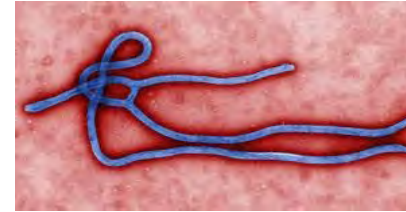
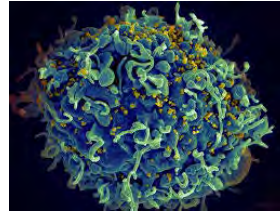
Interplay between the Agent, Host and Environment





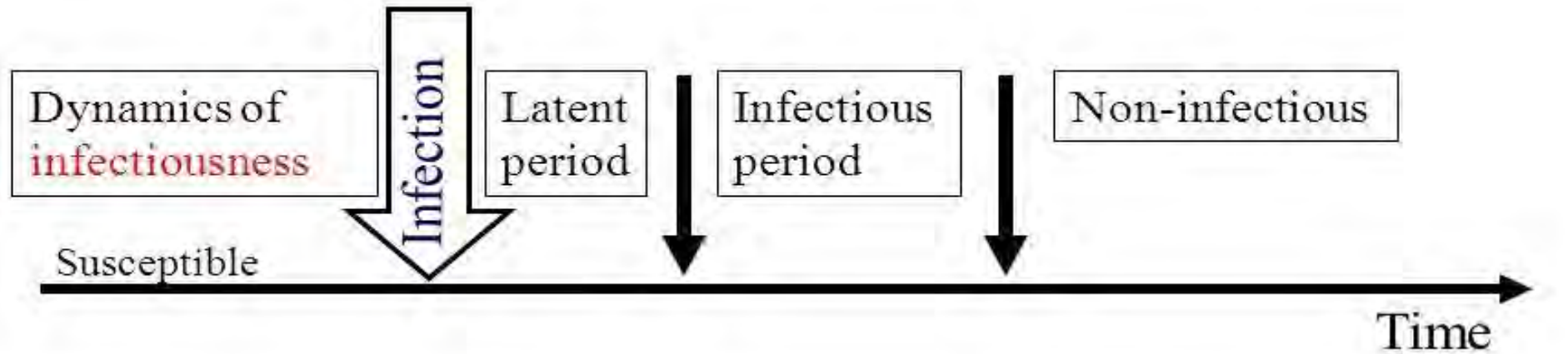
Key concepts for CDC

- Pathogens: bacteria, viruses, parasites.
- Infection Vs. disease
- Infectivity
- Pathogenicity
- Virulence
- Case fatality rate: Heavily influenced by how many mild cases are not diagnosed.
- Susceptible
- Zoonosis
- Eradication - elimination - control



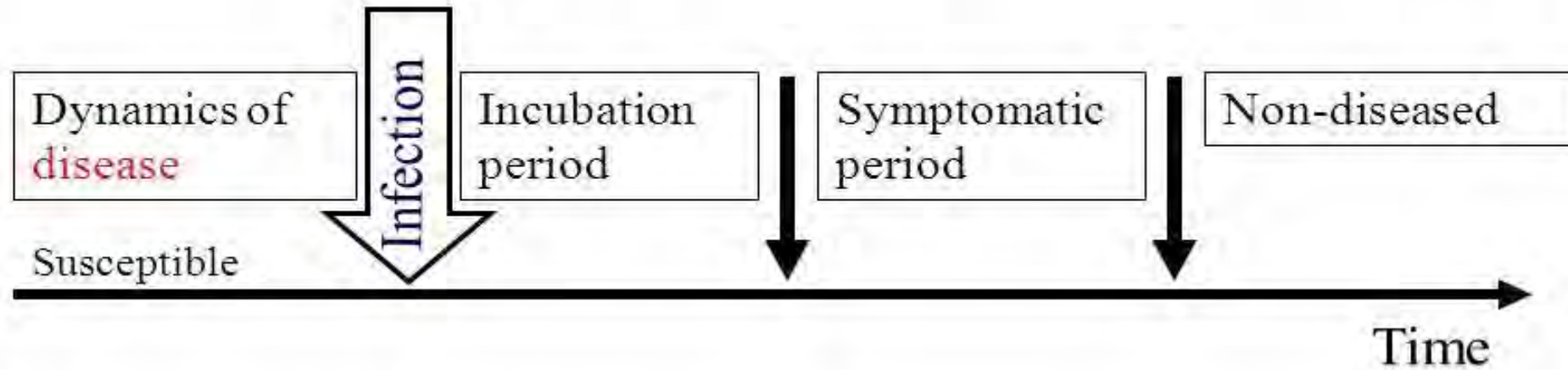


Key concepts for CDC



Susceptible

Time



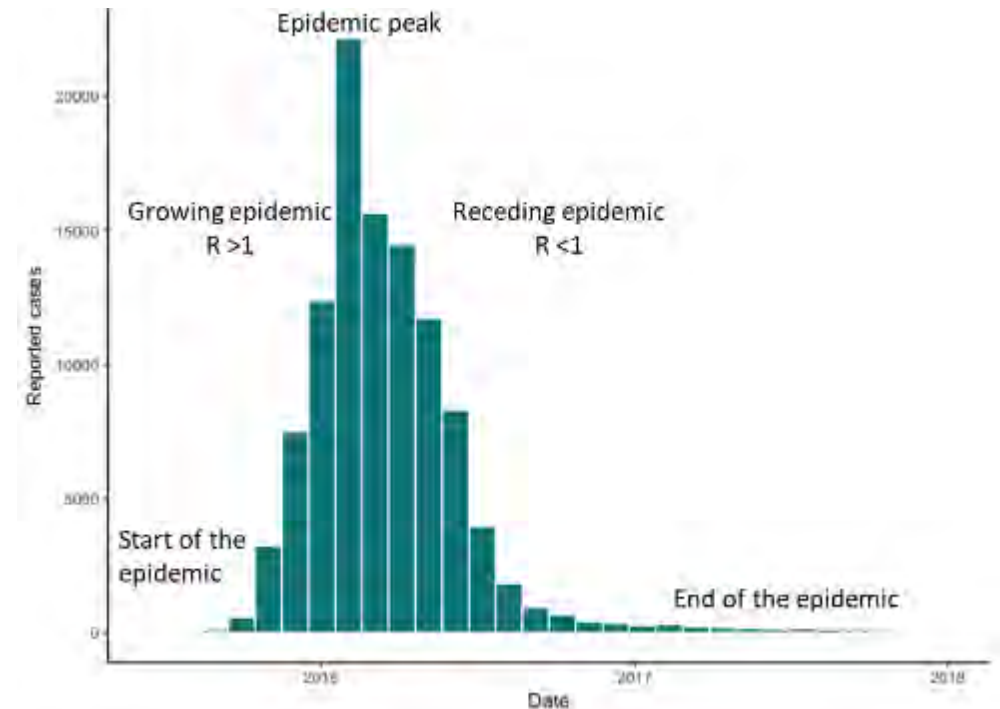
Susceptible

Time



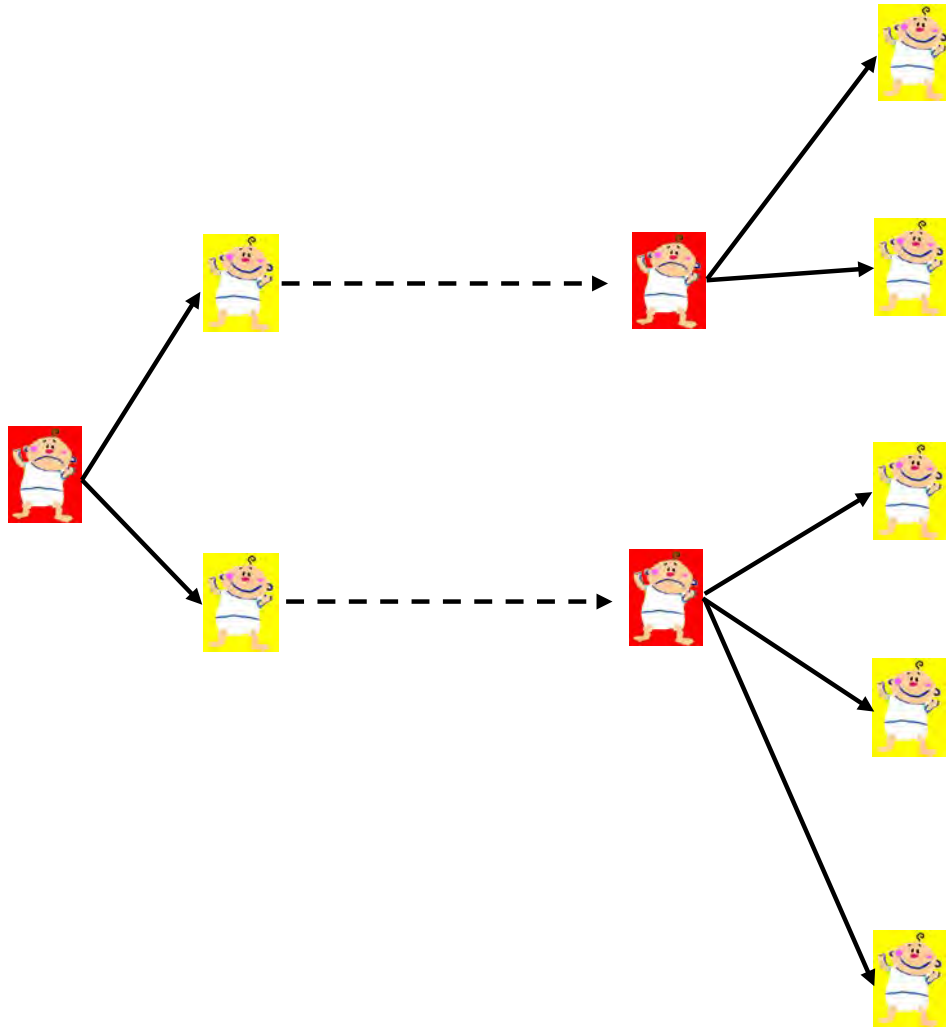
Key concepts for CDC

- Modes of transmission: Direct and indirect
- Epidemic...Pandemic....Endemic....
- Infectious disease dynamics: Study of contagion (aka modeling)
- Who gets infected, by whom, at what rates?
What are the impacts of control measures?
- Basic reproductive number (R_0)





What dictates the rate of increase of an epidemic of an infectious disease?



- At least two things affect the speed of the outbreak or epidemic
- The number of individuals infected by each infectious case.
- The time it takes between when a case is infected and when they infect other people.



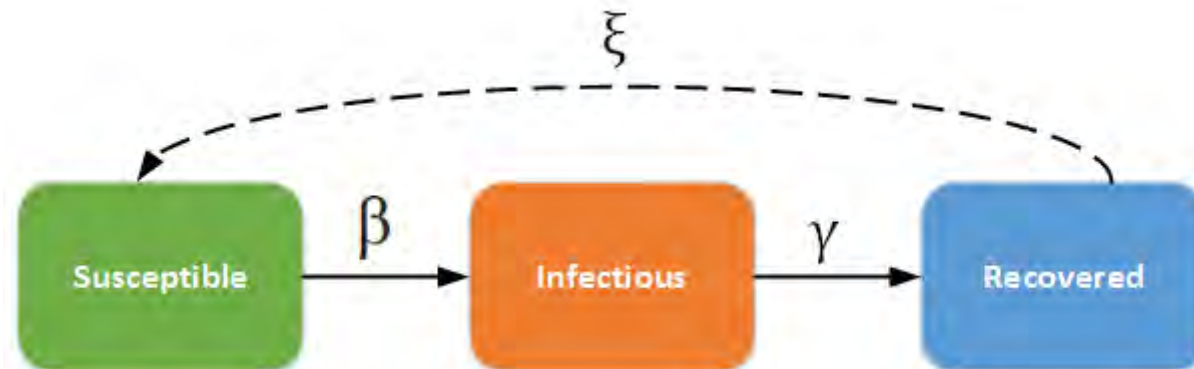
Critical vaccination fraction, herd immunity and more.....

- Need to vaccinate a large enough fraction of the population to make the $R_0 < 1$.
- The higher R_0 for a disease, the higher the proportion of the population that will have to be vaccinated to achieve herd immunity.
- The proportion of the population that needs to be vaccinated to prevent sustained spread of the infection is given by $V_f = 1 - \frac{1}{R_0}$
- Immune response to infection: Active immunity, passive immunity, herd immunity.

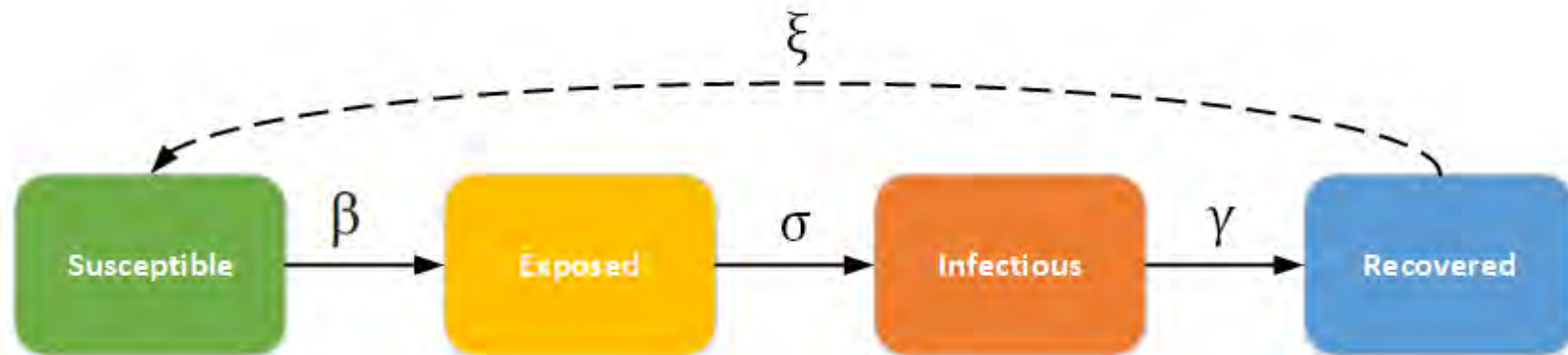


Infectious Disease Modeling

SIR model



SEIR model





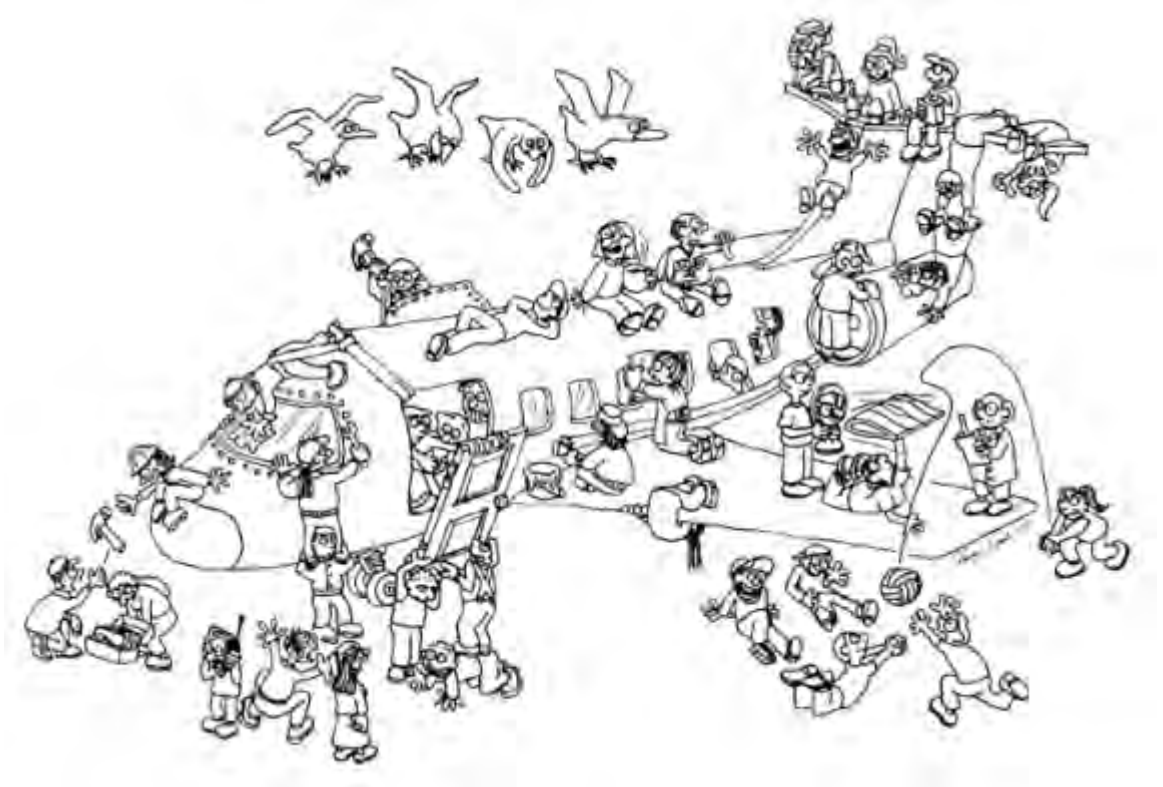
Ten steps for an Outbreak Investigation

1. Prepare to investigate
2. Verify the diagnosis and confirm the existence of an outbreak
3. Construct a working case definition
4. Find cases systematically and record information
5. Perform descriptive epidemiology
6. Generate hypotheses and re-evaluate hypotheses epidemiologically (As necessary, reconsider, refine, and re-evaluate hypotheses)
7. Compare and reconcile with laboratory and/or environmental studies
8. Implement control and prevention measures
9. Initiate or maintain surveillance
10. Communicate findings



Building a plane – while flying it

- Known vulnerability to flu-like pandemics
- Case series for infection parameters
- Susceptible and vulnerable groups
- Find diagnostics: PCR, serology..
- Case finding & surveillance
- ‘Just in time’ contact tracing capacity?
- Where do we get the staff?
- Find enough beds? PPE? Ventilators?
- Race to find treatments and vaccines



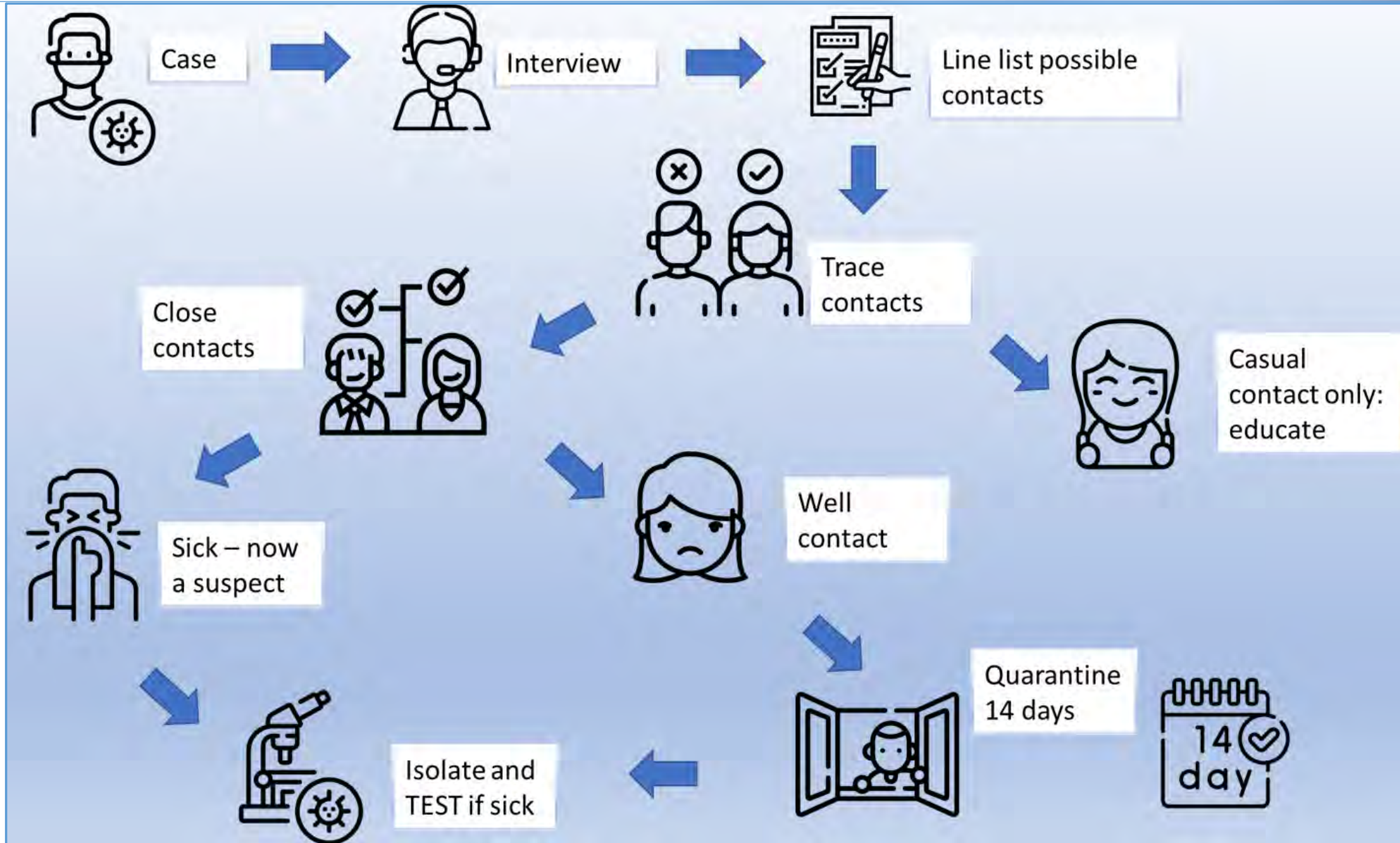


Standard measures... Desperate measures

- Syndromic ID not possible
- Testing based on risk, then symptoms...
- Case isolation and contact tracing
- Cough etiquette, hand hygiene, cleaning, PPE..
- Quarantine and border closures!
- Social distancing, restricted events, transport
- ‘Arbitrary’ rules; police ‘lockdowns’ – can they last?
- Shutting down the economy



© Chris Fairweather / Ross parry





Quarantine: forgotten and misunderstood

- Not since days of cholera and yellow fever
- Separation & waiting: one maximum incubation period
- Watch for symptoms, *then* isolate and test
- Close contacts; travellers; others...?
- Confusions: 'home-isolation' 'self-quarantine' etc
- Where to put them?
Support or coercion?
- Costs? Punishment?
- Are breakdowns responsible for 2nd wave?





Debates and Distractions

- Where from? Conspiracies, blame shifting, racism
- Novelty bias in isolated reports: super virus transmission, survival, shedding, airborne, reinfection...
- Asymptomatic transmission and 'contacts of contacts'
- Extent of airborne transmission; public masks?
- 'Single point of truth' = gagging local experts
- Neglect of social science and health promotion
- How long will people follow rules they don't understand?
- Declare victory and reopen everything





Models and Predictions: Tsunami vs Waves

- Models and assumptions; garbage in...
- Only answer the questions you ask
- Hard to factor in political decisions and timings
- Contributed to 'go hard, go early' in Australia
- Surprise that first wave actually stopped
- Imported cases were the easy part
- Suppression vs local elimination strategies
- Problem: exponential growth is fundamentally unstable
- Can we get by with 'a little bit of coronavirus'?





Economics and Sustainability

- SARS-CoV-2 is not going away
- Permanent avoidance changes (cf HIV)
- Can the economy continue without deliberate, close, indoor mixing...?
- Easing of restrictions – big money not big data
- Saving jobs vs saving lives?
Who wins, who loses?
- Explaining the right rules for sustainability
- Risk of losing what was gained by temporary suppression





Learning the Lessons

- Prepare for outbreaks – Public Health capability
- Strategic manufacturing
- Standard controls work
- Multiple layers of protection needed
- Don't wait for technical fixes: drugs, vaccines, apps...
- Changing behaviour is hard; requires social, behavioural sciences, nudges and extensive promotion
- Get the terminology and messages right
- Economic and political influences are decisive





Thank you

For more webinars in the series and to view recordings visit www.jcu.edu.au/webinars

