Unprecedented times: Communicable disease control in the early 21st century

Dr Suzanne McEvoy
Metropolitan Communicable Disease Control (MCDC)
This is a story in 3 parts

Everything old is new: the resurgence of the Great Imitator

Sharing the air: finding the vulnerable in a highly-vaccinated population

2020 vision: learnings from the SARS-CoV-2 pandemic
Overview

• Practical aspects of communicable disease control and outbreak management using recent examples
• Tried and true traditional measures
• Pandemic-accelerated innovations in outbreak control
• The context within which communicable disease control occurs
• Politics, economics, health, social determinants
Syphilis

Everything old is new:
the resurgence of the Great Imitator

There is a syphilis outbreak in Perth
Add syphilis serology to STI screening
Screen for syphilis at least THREE times in pregnancy

Test
Treat
Trace
Why do you need to know about syphilis?

- Syphilis is rising in many parts of the world
- It is the Great Imitator – so can be missed
- Test lesions: syphilis PCR (dry swab)
- It can be treated: long-acting penicillin IMI
- Rx to avoid long term sequelae or congenital syphilis (woman of reproductive age)
What is syphilis?

• Highly contagious sexually transmitted infection
• *Treponema pallidum*
• Painless* sore on the genitals, rectum or oral cavity (chancre)
• Transmitted through direct contact
• Incubation period: 10 days to 3 months
• Infectious for up to 2 years after infection
• Re-infection can occur
Stages of syphilis

Primary syphilis
- 9-90 days, av 30 days
- Chancre (ulcer) at site of sexual contact (can be oral)
- Uveitis, cranial nerve palsies
- Infectious
Stages of syphilis

Secondary/Early latent (Up to 2y)

- Flu-like illness/systemic symptoms
- Rashes (trunk, palm, soles), patchy alopecia
- Ophthalmic, neurological and oral presentations can occur
- Infectious
Stages of syphilis

**Tertiary syphilis** (2y+)
- Non-infectious
- Can occur if person remains untreated (~1/3rd of cases)
- Neurosyphilis (dementia, psychiatric manifestations)
- Cardiac sequelae
Congenital syphilis

- At birth, hepatosplenomegaly, thrombocytopenia and anaemia, periostitis
- ‘Snuffly’, Failure to thrive
- Congenital anomalies including blindness, deafness, skeletal and dental abnormalities, neurodevelopmental delay
Epidemiology of syphilis in an Australian metropolitan setting
Infectious syphilis in Perth

- Primarily MSM
- Homeless
- WCBA
- Pregnant women
- Aboriginal people
- CALD
- IVDU/meth use
Infectious syphilis by month, 2015 to 2021

<table>
<thead>
<tr>
<th>Year</th>
<th>Notifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>117</td>
</tr>
<tr>
<td>2016</td>
<td>272</td>
</tr>
<tr>
<td>2017</td>
<td>245</td>
</tr>
<tr>
<td>2018</td>
<td>318</td>
</tr>
<tr>
<td>2019</td>
<td>344</td>
</tr>
<tr>
<td>2020</td>
<td>474</td>
</tr>
<tr>
<td>2021</td>
<td>496</td>
</tr>
</tbody>
</table>

During COVID first wave
### Key and at risk groups for infectious syphilis, 2015 - 2021

<table>
<thead>
<tr>
<th>Year of Onset</th>
<th>Pregnant</th>
<th>Homeless</th>
<th>Indigenous</th>
<th>Women of Childbearing Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>8</td>
<td>11</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>2016</td>
<td>17</td>
<td>26</td>
<td>31</td>
<td>41</td>
</tr>
<tr>
<td>2017</td>
<td>23</td>
<td>27</td>
<td>64</td>
<td>89</td>
</tr>
<tr>
<td>2018</td>
<td>11</td>
<td>11</td>
<td>70</td>
<td>41</td>
</tr>
<tr>
<td>2019</td>
<td>8</td>
<td>21</td>
<td>64</td>
<td>21</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td></td>
<td></td>
<td>130</td>
</tr>
<tr>
<td>2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The chart above illustrates the number of notifications for different groups over the years 2015 to 2021. The categories include pregnant women, homeless individuals, Indigenous individuals, and women of childbearing age. The highest number of notifications is observed among women of childbearing age in 2021, with 130 cases reported.
Syphilis outbreak in Perth declared by Chief Health Officer, 7/2020

Metropolitan Syphilis Outbreak Response Team (MSORT) started

4 working groups

- Antenatal / Postnatal (3-point testing)
- Prevention, Education and Community Engagement
- Surveillance and Reporting
- STIGMA

Meetings for priority groups: pregnant women and homeless
• Workforce development
• Education
• Outreach (ACCHOs, Homeless Healthcare, Street Doctor, CALD organisations, DOJ, DOC, etc.)
• Collaboration with health services in primary and community health and hospitals
• Multidisciplinary: doctors, nurses, social workers, Aboriginal health professionals, allied health, health promotion
• Testing, treatment and contact tracing
• New syphilis electronic public health management system which also serves as a metro syphilis register

► improved reporting
Testing tips and interpreting syphilis serology

- Syphilis PCR: Swab lesions (add syphilis, HSV, HZV)
- Syphilis serology: Treponemal antibodies, Rapid Plasma Reagin (RPR)
- Interpreting results depends on
  - Sexual history, symptoms and clinical signs AND
  - Treponemal test results (TPPA, TPHA, EIA, IgM and IgG, FTA Abs, point of care (POC) tests AND
  - RPR result (marker of activity, treatment response, re-infection) AND
  - Previous syphilis serology results (if available) AND
  - History of treatment (if available)
- RPR – serofast state (persistent low titre)
- How to Interpret Syphilis Test Results in Australia (syphilisoutbreaktraining.com.au)
Case study
Woman of childbearing age

Presented to GP

- Painful palatal ulceration
- Persistent (weeks)

GP referred patient to a specialist clinic

- Biopsy
- Results: spirochaetal organisms seen
- “in the correct clinical context Treponema pallidum could be considered and appropriate serology testing arranged”
- No syphilis serology taken
Patient presented to ED with an unrelated complaint
ED consultant reviewed all recent results
Contacted ID physician about the histopathology result

Three months later

- Infectious syphilis confirmed
- Treatment with benzathine penicillin 2.4MU IMI arranged
Issues

Delayed diagnosis

Delayed treatment

Risks

• Pregnancy
• Long term health issues
• Infectious to other sexual contacts
• Delayed contact tracing

Syphilis can hide in plain sight
Summary

Syphilis is rising in many parts of the world

Social determinants matter

Outbreak response in a resource-limited setting

Outbreak control relies on micro (case and contacts) and macro aspects (stakeholder engagement, education, CHO support)

Innovations in outbreak control – electronic data collection – public health management, surveillance, monitoring risk groups, etc.
Measles

Sharing the air:
Finding the vulnerable in a highly-vaccinated population
Why is measles important to diagnose rapidly?

It’s highly communicable – spreads rapidly ($R_0$ 12-18)

Opportunity to prevent further cases if notified early (isolate, quarantine, MMR, NHIG – the original TTIQ)

It’s serious

- 33% of cases were hospitalised (10-year review)
- Pneumonia was the most common complication
- Most hospitalisations in young-middle aged adults (20-44 years) and children <1 year
- Large cohort inadequately protected (0 or 1 dose of measles-containing vaccine only)
Vaccination schedule over time

• Single dose of funded measles vaccine
  • 1970-1972: Introduced in Aust (jurisdiction dependent), 12-23 months

• Addition of second dose to schedule
  • 1993/4: School-based catch up for 10-14yo
  • 1998: Change to 4-5yo w one-off catch up of 5-12yo
  • 2013: 18m (MMRV)

• Gaps
  • Anyone born since 1965 who has not had 2 doses of measles-containing vaccine
  • Cohorts: 1965-1980 no or one dose only
    1981-1998 one or two doses
    1999-2018 immunisation rate ~90% at 5 years, 1 in 10 susceptible
  • Immunocompromised individuals, <1y, born overseas

Measles globally

There have been recent large outbreaks worldwide

- NZ (~2000 cases in 2019)
- Throughout Europe (>70 deaths in 2017/18, >80k cases)
  - Where vaccine status was known, 93%-95% were unvaccinated (82%-87%) or under-vaccinated (1 MMR 8%-11%); Source: ECDC
- Large tracts of Asia (Vietnam, Philippines, Bali)
- Ongoing through Africa
- Resurgence in the Americas (Ex Venezuela, spot outbreaks in US)

With international travel resuming, incursions into Australia are likely
Perth measles outbreak fears after unvaccinated families exposed

Updated 21 Dec 2016, 2:12pm

Perth measles outbreak worsens as three more cases confirmed after visit by infected NZ tourist

By Aisha O'Flaherty
Posted 3 Oct 2019, 4:03pm

A race against the clock to tackle the worst measles outbreak in WA this century

By James Carmody
Updated about 6 hours ago

ABC News Online 25/10/2019

Measles outbreak: Cases confirmed among Northbridge backpackers

STAFF WRITERS, PerthNow
July 21, 2016 7:14pm

Measles cases in babies alarm doctors

Cathy O'Leary, Medical Editor

 الداخلية 28 January 2017 12:31AM
Outbreak scenario
Eve of a long weekend, Sept 2019

• Surprisingly, not too busy. In my handover to on-call Dr, I wrote, ‘I hope it stays quiet for you.’ Little did we know…

• Saturday
  • Meningococcal case
  • ?Measles (not)

• Sunday
  • ?Measles (confirmed – prelim neg – isolation lifted, but pos)
  • Measles (confirmed)

• Monday
  • ?Measles (confirmed)
  • ?Measles (confirmed)
  • Measles (confirmed)
  • ?Measles (confirmed)
  • ?Measles (not)
A week earlier…

• Late Friday, CDC was informed by MOH NZ of a case of measles who had been in Perth while infectious (10/9 – 15/9)

• Saturday: WA DOH released a media statement about the measles case
What transpired…

• 16 secondary cases
  • 7 related to a sporting grand final (Exp: 14/9)
  • 6 from the suburb the index stayed in (10/9-15/9)
  • 2 related to his return travel to NZ (Exp: 15/9)
  • 1 case in a relative

• 6m-43y
  • Vaccination status: 3 too young, 9 unvaccinated at time of exposure, 2 had 1 MMR each, 2 unknown
### Infectious period of secondary cases

<table>
<thead>
<tr>
<th>Sex</th>
<th>Sep-19</th>
<th>Oct-19</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MON 23</td>
<td>24</td>
</tr>
<tr>
<td>M</td>
<td>DN MCDC</td>
<td>S</td>
</tr>
<tr>
<td>F</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>F</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>M</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>F</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>F</td>
<td>?S</td>
<td>?R</td>
</tr>
<tr>
<td>F</td>
<td>?S</td>
<td>R</td>
</tr>
<tr>
<td>F</td>
<td>S</td>
<td>?S</td>
</tr>
<tr>
<td>M</td>
<td>S</td>
<td>?S</td>
</tr>
<tr>
<td>M</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>F</td>
<td>S</td>
<td>R</td>
</tr>
</tbody>
</table>

### Key

- **E**: Exposure
- **S**: Onset of symptoms
- **R**: Onset of rash
- **DN**: Date notified to CDC
- **DN MCDC**: Date notified to MCDC
- **PH intervention possible (i.e. 72h MMR, NHIG 6 days)**
- **Isolated for remaining infectious period**

**Summary**: 15 cases of measles in 1 week, with 2 cases (1 unrelated) in the Long W/E, 6 cases, and 4 cases. 3 cases not specified.
Tertiary cases

• 6 tertiary cases from 4 secondary cases
  • 2 exposed in hospital (25/9), 1 had 1 MMR, other unknown
  • 3 from non-vaccinating families (with HH-like exposure)
  • 1 person exposed at a party, vaccination status unknown
### Tertiary cases: Infectious periods

<table>
<thead>
<tr>
<th>Sex</th>
<th>FRI 4</th>
<th>SAT 5</th>
<th>6 MON 7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>FRI 11</th>
<th>12</th>
<th>13</th>
<th>MON 14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>SAT 19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M</td>
<td></td>
<td></td>
<td>DN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td>MCDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>?S</td>
<td></td>
<td></td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key**

- **E**: Exposure
- **S**: Onset of symptoms
- **R**: Onset of rash
- **DN**: Date notified to CDC
- **DN MCDC**: Date notified to MCDC
- **PH intervention possible (i.e., 72h MMR, NHIG 6 days)**
- **Isolated for remaining infectious period**

Concurrently, another 5 measles cases in Perth

*Perhaps a taster for what was to come a few short months later…*
Measles epicurve

MCDC informed

14 cases become symptomatic in 1 week

Reporting of confirmed cases starts Queens Birthday Weekend

No. of cases

Date of onset of prodrome

Index Case
Secondary Case
Tertiary Case
Travel Related Case
Travel Related Secondary Case

14 cases become symptomatic in 1 week

Index
Leaves Perth
CDC informed by NZ

Index Case informed by NZ

Reporting of confirmed cases starts Queens Birthday Weekend
Outbreak response

• Incident command
• Operations for metro cases (follow up: Calls, MMR, NHIG, info)
• Working with the laboratories, including results, domiciliary collections
• Liaison with workplaces, public places, airport, schools, CCCs
• Keeping Executive informed
• Hospitals/General Practice
• Communications/Media
• Logistics and surge capacity
Impacts

• ‘000s of contacts, MMR use, NHIG (high risk)
• Exposures in over 100 individual locations, incl:
  • 7 hospitals
  • 14 general practices: many frequented several times
  • Workplaces (incl. mine site and corrective services)
  • Schools, childcare centres
  • Perth Airport, multiple shopping centres, cafes
• Resources: public health, frontline clinical services, laboratory, comms/media
• Testing, notification, isolation, quarantining
Sharing the air in a Metro ED. Floor Plan shown

- Negative Pressure room
- Area 1
- Area 2
- Area 3
- Triage exam room
- Triage area
- Waiting room
- Feeds Area
- Main entrance
- Bunk 19
- Bunk 21
- Bunk 23
Summary

- Measles will make a return now that international borders have been relaxed
- The pandemic has adversely affected the delivery of immunisation programs in many countries, so incursions into Australia are to be expected
- Mitigate risk by encouraging inadequately vaccinated adults to seek a MMR vaccine prior to overseas travel
- Operationalising national guidelines for local conditions: established communications process with e.g. laboratories, ride share/taxis, airport, hospital EDs
COVID-19

2020 vision: learnings from the SARS-CoV-2 pandemic
Little did we know…
Traditional measures

- Surveillance
- Testing
- Contact tracing (pen, paper, phone & fax)
- Isolation and quarantine
- Vaccination
- Border control
- Physical distancing
- Restrictions – activities and/or movement
- Density limits
- Widespread mask use

Commonly used in day-to-day communicable disease control

Infrequently used in day-to-day communicable disease control
Challenges

- Size of public health workforce/BCP
- Establishing new processes
  - Local Standard Operating Procedures
  - Case reporting & management
  - Contact tracing
  - Patient monitoring at home (lack of Telehealth, lack of home visiting services)
  - Testing / testing criteria (lagged)
  - Clearance
- Cases in persons of culturally-diverse backgrounds
- Purchasing and procurement (PPE, ventilators, etc.)
- Health–information sharing/Comms
Innovation during a pandemic

- Contact tracing using electronic relational databases
- Dashboards and monitoring
- Streamlined electronic laboratory feeds
- Monitoring immunisation coverage (AIR)
- Monitoring quarantine and isolation using G2G
- QR codes (digital tracing, automated messaging)
- Transition to Telehealth
- Managing COVID-19 at home (pulse oximetry)
Innovation during a pandemic

Testing
• Establish testing processes (incl. domiciliary) and real-time electronic reporting
• Rapid increase in testing capacity
• Rapid diagnostic testing: PCR, RAT
• Value of whole genome sequencing

Control: vaccines - mRNA vaccines

Advances in treatment
• Antivirals and monoclonal antibodies
• Proning in ICU

Understanding of airborne transmission

Inform ventilation of buildings to reduce risk

Use of modelling to inform public health settings during a pandemic
Legislation

- Use of emergency management and public health acts
- Directions/Mandates:
  - Travel restrictions, public health and social measures (capacity limits, mask use), vaccination mandates (incl proof), testing, quarantine and isolation
- Emergency management acts
  - Generally designed for acute responses to disasters
  - Traditional PPRR model
  - Progression through phases more timely
- In WA, State of Emergency declaration signed 15 March 2020, and extended ever since
Equity and access

• Matter at all times but especially in a pandemic
  • CALD and indigenous populations
  • Aged care
  • Vulnerable populations with underlying health conditions
  • Persons experiencing homelessness
  • Frontline workers

• Inequity demonstrated abroad and in Australia
  • COB overseas 6.8 deaths per 100,000 versus 2.3 deaths among Australian-born (ASR) [ME 29.3]
  • Lowest SEIFA quintile over 3 times more likely to die than highest quintile

COVID-19 Mortality in Australia | Australian Bureau of Statistics (abs.gov.au) Data to 31/01/2022
COVID-19 lessons

• Human health influences economic health
• Costs, benefits and unintended consequences need to be carefully assessed
• Importance of good leadership and multidisciplinary teams
• Effective communication strategy, experts, trust
• Building community support and purpose, concern for our community (social cohesion)
• Protocols needed but flexibility, rapidly changing circumstances (VOCs – omicron) require system agility
Any questions?