Measles and rubella: a clinical refresher

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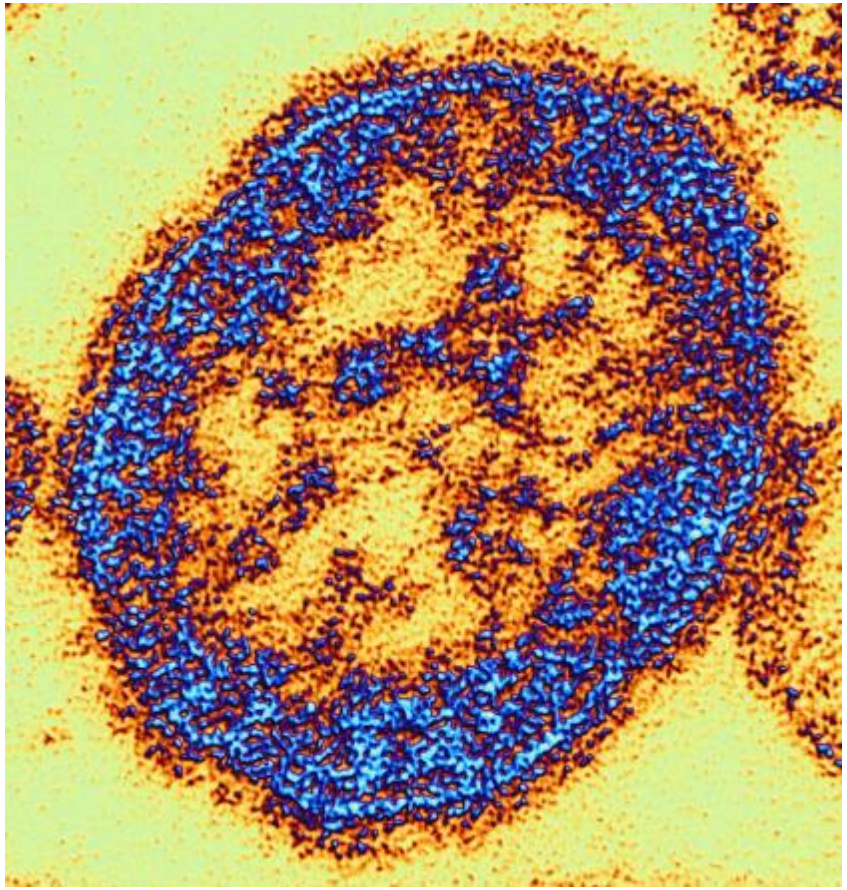
Overview

- **Rubella and congenital rubella syndrome**
  - Clinical presentation
  - Notification
  - Support and referral for CRS
- **Measles**
  - Some virology
  - A case of fever-rash….
    - Thinking with the clinician
  - A second case of fever-rash
    - Thinking with the infection-prevention and control practitioner
  - A 3rd-4th-5th etc case of measles
    - Thinking with the public health practitioner
  - Measles prevention, elimination and eradication



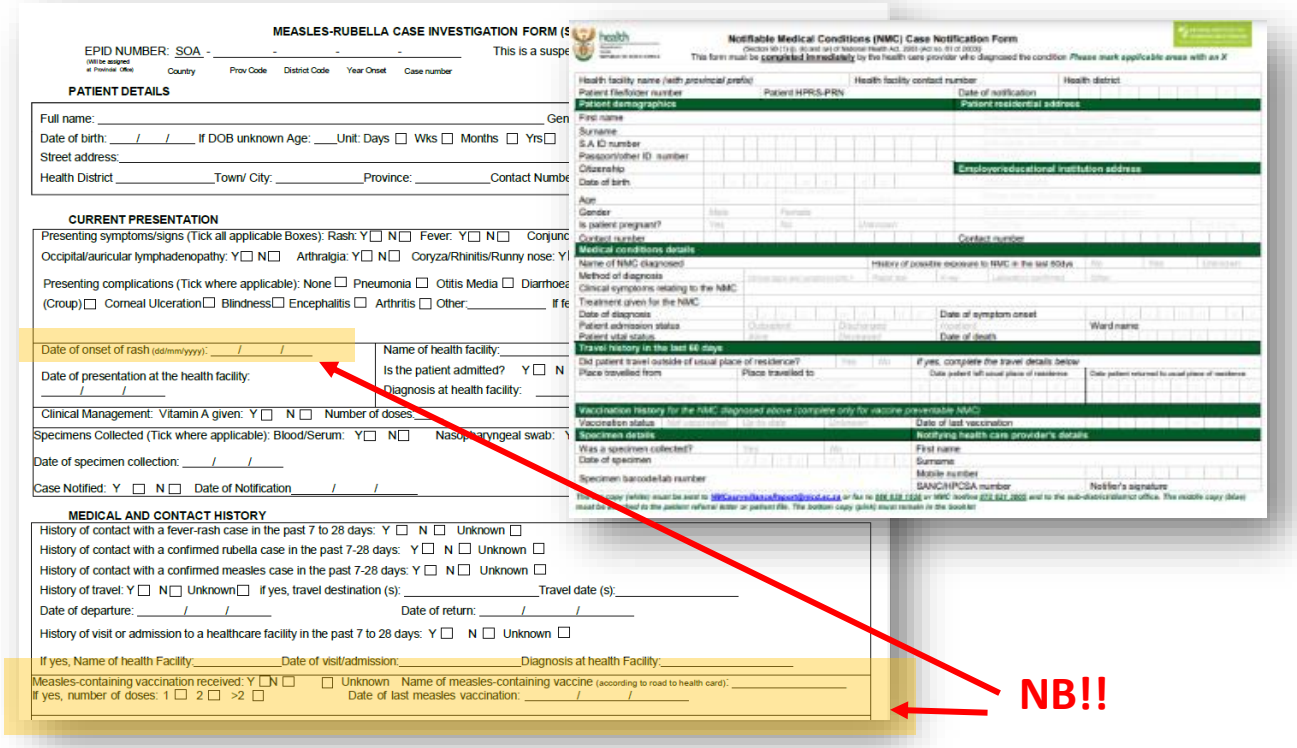
Rubella and CRS – clinical presentation

- Acute rubella
  - A significant proportion of infections (25-50%) are asymptomatic
  - Incubation period 14-21 days
  - Prodromal illness 1-5 days before rash (usually lymphadenopathy)
  - Rash – pinpoint macular erythematous sometimes itchy, beginning on face, progressing to trunk, extremities within 24 hours. Lasts for 3 days
  - Self-limiting with spontaneous recovery

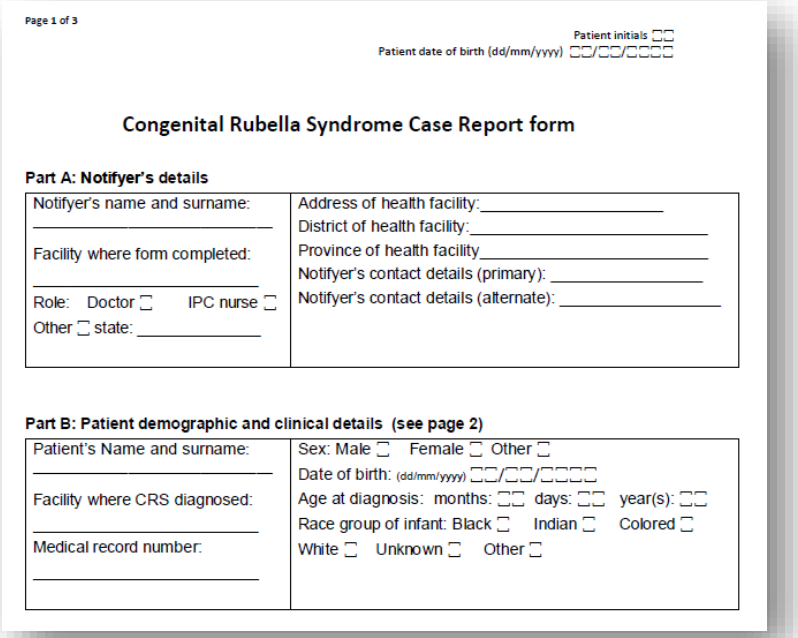
- Congenital rubella syndrome
  - Classic triad – cataracts, congenital heart defects, sensorineural deafness
  - Ophthalmic abnormalities
    - 40% of cases have some abnormality
    - 25% have cataracts, bilateral in 50%
    - Other abnormalities include pigmentary retinopathy ('salt and pepper'), glaucoma, chorioretinitis, microphythalmia
  - Cardiac defects
    - Patent ductus arteriosis- 20%
    - Peripheral pulmonary artery stenosis – 12%
    - Pulmonary artery hypoplasia, pulmonary or aortic valvular stenosis, co-arctation of the ao t, ve de
  - Hearin % c bilater

Rubella and CRS – case definition and notification

- Acute rubella
  - Notify on clinical suspicion (category 1)
  - Use the NMC app
  - Submit a completed ‘Measles-rubella’ case investigation form with blood for IgM testing.



- Congenital rubella syndrome
  - Notify on clinical suspicion (Category 1)
  - Use the CRS Case investigation form
  - Submit blood/urine for serology and PCR to NICD



Rubella and CRS – Clinical care and management

- Acute rubella
  - Complications
    - Arthritis/arthralgia 60-70% of adolescents and adult women 1 week after rash, usually 3-4 days, may persist
    - Rarely (1 in 6,000) post infectious encephalitis may occur
  - Clinical management
    - Symptomatic only.
    - Persistent headache with altered mental status – refer for lumbar puncture to rule out
  - Infection prevention and control
    - No need for quarantine or school closure
      - Incubation period is 14-21 days
      - Virus excretion commences 7 days before rash – so contacts who are susceptible are likely already infected before the index case is diagnosed.
    - Pregnant women who are in their first trimester and are contacts of a confirmed case
      - SHOULD NOT receive vaccine
      - Should have rubella serology for IgG taken immediately
      - Should be referred for specialist assessment at ANC

- Congenital rubella syndrome
  - Complications
    - A debilitating condition, but many survive
  - Clinical management
    - High index of suspicion for diagnosis with early referral for specialist paediatric care
    - Basic assessment
      - Ophthalmic assessment with early surgery for cataracts
      - Hearing assessment – with support for family
      - Cardiology assessment – with appropriate and timely surgical intervention
    - Ongoing monitoring
      - Close observation for milestones with early referral for care
      - Psychosocial support for family


3: At school in 1948

School class of deaf children and their teacher in 1948, with four of the subjects described in this review (used with the kind permission of the owners of the photograph).

To evaluate the natural history of congenital rubella, 50 of the original cohort of patients reported by Gregg were reviewed, 25 years later, at the Children's Medical Research Foundation, Royal Alexandra Hospital for Children.[11] These subjects had been born in Australia between 1939 and 1944: 48 were deaf, 26 had cataracts or retinopathy, 14 had cardiac defects, five were mentally handicapped, and one had diabetes mellitus type 2.[12] This cohort of patients was followed up again in 1991, when most were 50 years old (seven had died). Forty had a full clinical assessment; five had clinical diabetes mellitus type 2.[13]

We report here the results of the 60-year review in 2000–2001, when the cohort members were 60 years old; 40 were still alive (Box 2).

HISTORY

Gregg's congenital rubella patients 60 years later

Jill M Forrest, Fiona M Turnbull, Gary F Sholler, Richard E Hawker, Frank J Martin, Trevor T Doran and Margaret A Burgess

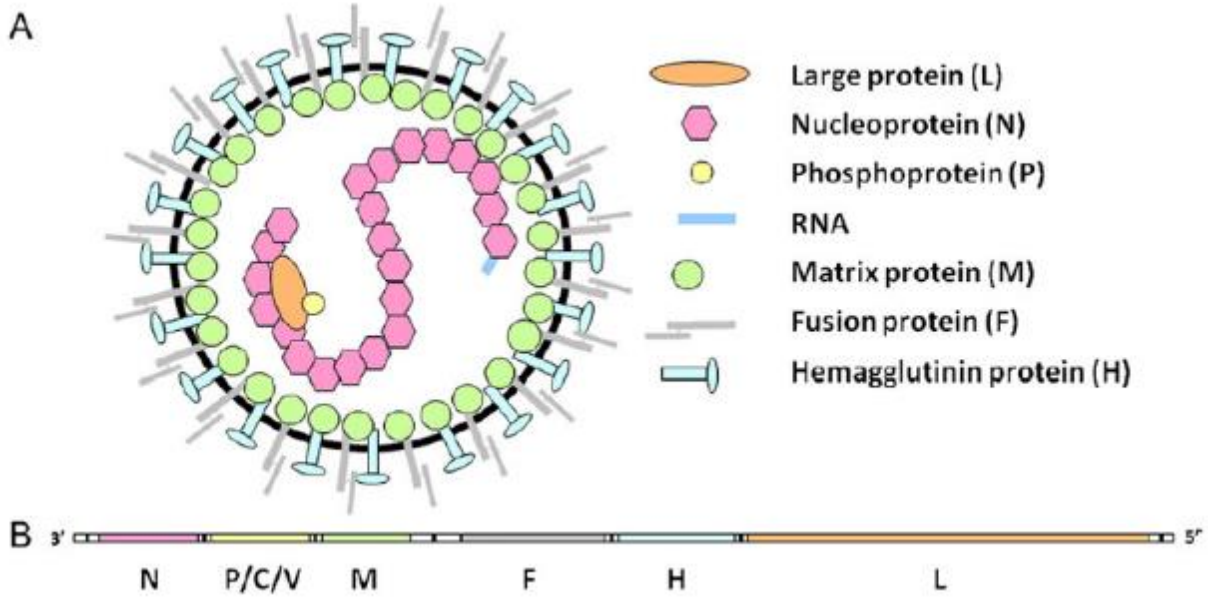
At the University of Sydney medical students attend lectures in the Norman Gregg Theatre, but few know it was Gregg who identified the causal relationship between rubella in women during pregnancy and congenital defects in their offspring. (see Box 1).

ABSTRACT

Background: In 1941, a Sydney ophthalmologist, Norman McAlister Gregg, correctly identified the link between congenital cataracts in infants and maternal rubella early in pregnancy. Fifty of Gregg's subjects with congenital rubella, born in 1939–1944, were reviewed in 1967 and again in 1991. We reviewed this cohort in 2000–2001, 60 years after their intrauterine infection.

Some measles virology

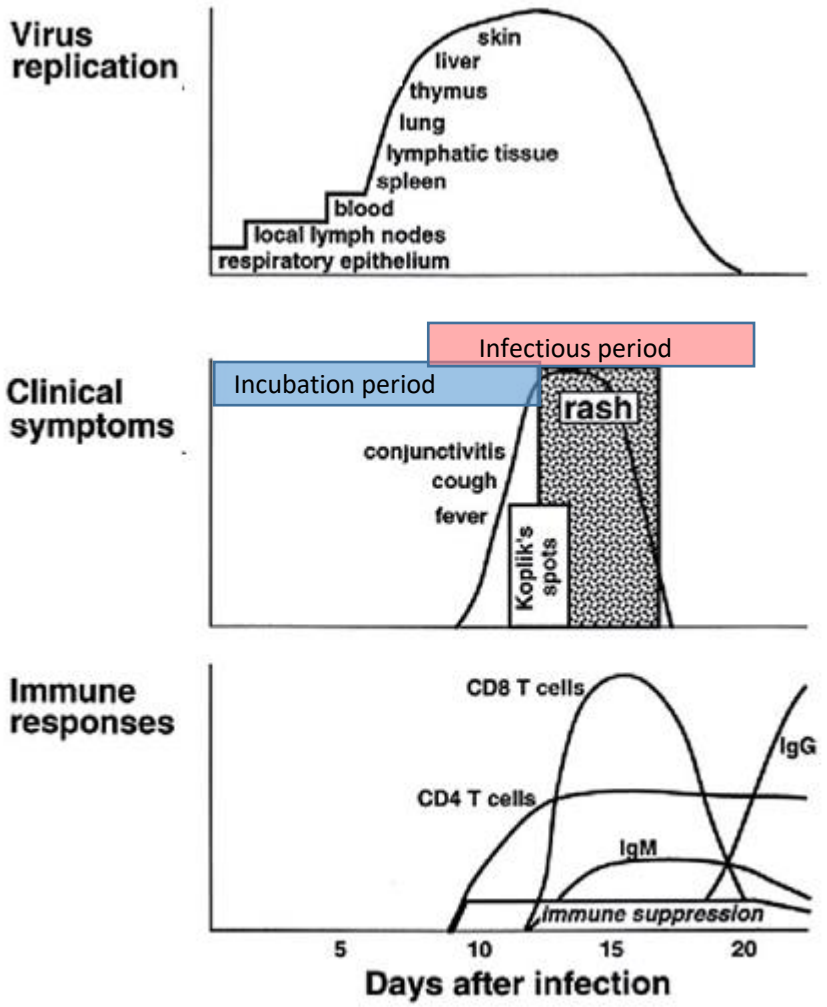
- Measles virus
  - Negative stranded, pleomorphic RNA virus (15,894 nucleotides)
    - Six structural proteins (H, F, M, N, L)
    - 2 non-structural proteins (P gene, transcribed into C and V proteins)
  - One serotype
    - 8 clades (A-H) with 23 recognized genotypes
    - Typing – 450 nucleotides of the N protein
  - Genetically stable with very little variation
  - No animal hosts but monkeys can be infected



Bankamp et al. Genetic Characterization of Measles Vaccine Strains. JID 2011; 204:S533-548

Some measles virology

- Measles virus
  - Haemagglutinin molecule attaches to three human proteins
    - CD150 /SLAM Signaling lymphocyte activation molecule (SLAM) on T and B lymphocytes, and all antigen presenting cells
    - CD46 (widely distributed in human tissues)
    - CD147 – extracellular matrix metalloproteinase inducer on epithelial cells including in respiratory tract.
- Pathogenesis
  - Enters respiratory tract
  - Multiplies in lymphoid tissues
  - Primary viraemia with dissemination to all tissues including respiratory tract
  - Incubation period 9-14 days
  - Infectious period 4 days before onset of rash, til 2-4 days after rash.
  - Rash signals formation of neutralising antibodies and clinical improvement



Adapted from WHO Immunological basis of Immunity to measles vaccine 2014

A case of fever and rash....

- Infant AM, 14 month infant
  - Presented on 24 November 2021 to the ED of a district hospital in Western Cape Province
  - Recently arrived from DRC (within last 28 days)
  - History
    - Developed fever, conjunctivitis, cough and rash
    - Rash started on 24 November (day of presentation)
  - Measles suspected, and specimens of blood and urine were submitted to NICD for testing

A case of fever and rash....
....thinking with the clinician

- History and clinical examination
  - Classically begins with malaise, and respiratory symptoms including cough & coryza, together with fever anorexia, conjunctivitis.
  - Rash
    - Erythematous, maculopapular, may become confluent
    - starts on face, progresses to extremities including palms and soles
    - Heals with desquamation (except palms and soles)
  - Worst symptoms on day 1-2 of rash
- Complications
  - Diarrhoea
  - Pneumonia
    - Often clinically inapparent, but when present, may be severe
  - Otitis media
    - Often in younger infants
  - Encephalitis (1 in 1000 cases)
    - Presents with headache, altered LOC, seizures
  - Mortality
    - Rates vary, but up to 20% in malnourished infants <1 year of age.

A case of fever and rash….
….thinking with the clinician

- Measles rash

Tod et al. Dermatological manifestations of measles infection observed in the 2009-2011 Western Cape epidemic. http://www.samj.org.za/index.php/samj/article/view/5342/4126

- Koplik's spots

https://www.cdc.gov/measles/symptoms/photos.html

A case of fever and rash....
....thinking with the clinician

- Differential diagnosis
  - Rubella, scarlet fever, HHV6, HHV7, meningococcaemia,

https://www.nejm.org/doi/full/10.1056/nejmicm1303608

https://www.gponline.com/infectious-diseases-scarlet-fever/infections-and-infestations/infections-and-infestations/article/1324924

https://step2.medbullets.com/pediatrics/120584/roseola-infantum

https://www.sciencedirect.com/science/article/abs/pii/S0738081X19301476

  - parvovirus B19, cytomegalovirus,

Drago F,. Future Microbiol. 2017 Feb;12:171-193. doi: 10.2217/fmb-2016-0147.

Find full text for free at https://pubmed.ncbi.nlm.nih.gov/27838923/

A case of fever and rash....
....thinking with the clinician

- Differential diagnosis should not include Mpox
  - Mpox

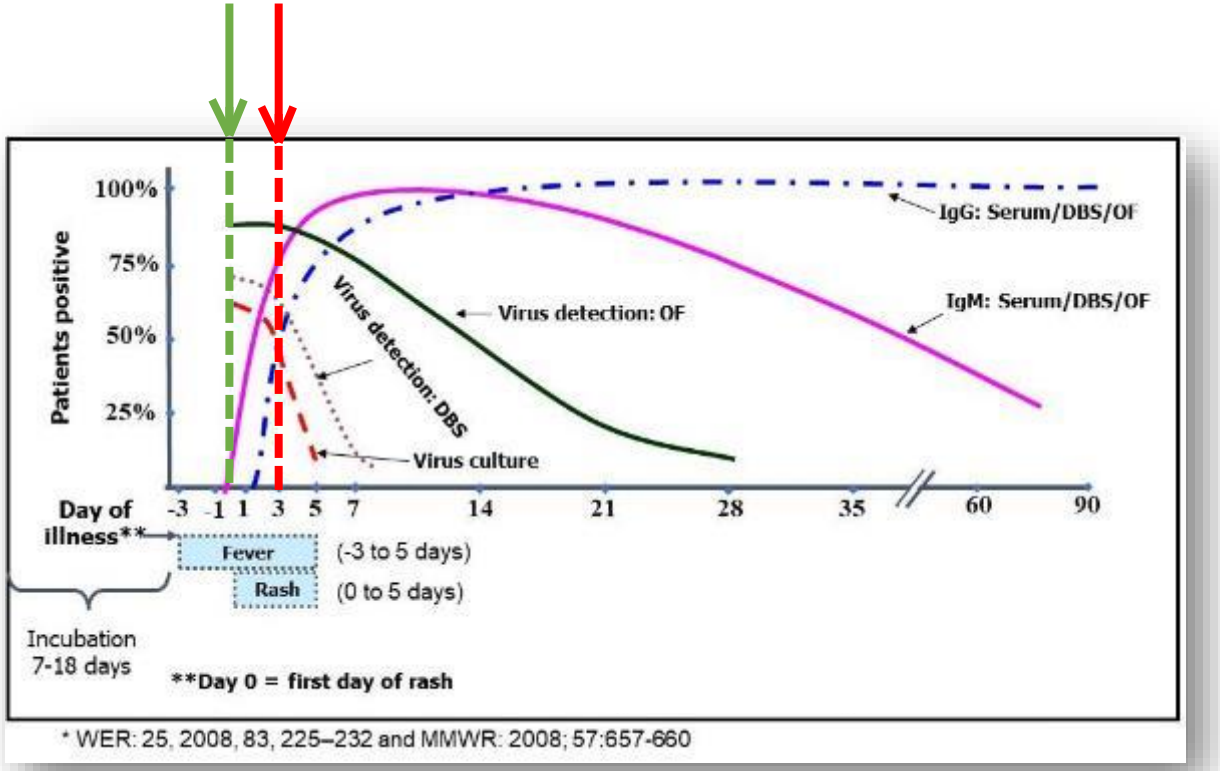
Key Characteristics for Identifying Mpox

- Lesions are well circumscribed, deep seated, and often develop umbilication (resembles a dot on the top of the lesion)
- Lesions are relatively the same size and same stage of development on a single site of the body (ex: pustules on face or vesicles on legs)
- Fever before rash
- Lymphadenopathy common
- Disseminated rash is centrifugal (more lesions on extremities, face)
- Lesions on palms, soles
- Lesions are often described as painful until the healing phase when they become itchy (crusts)

https://www.cdc.gov/poxvirus/monkeypox/clinicians/clinical-recognition.html

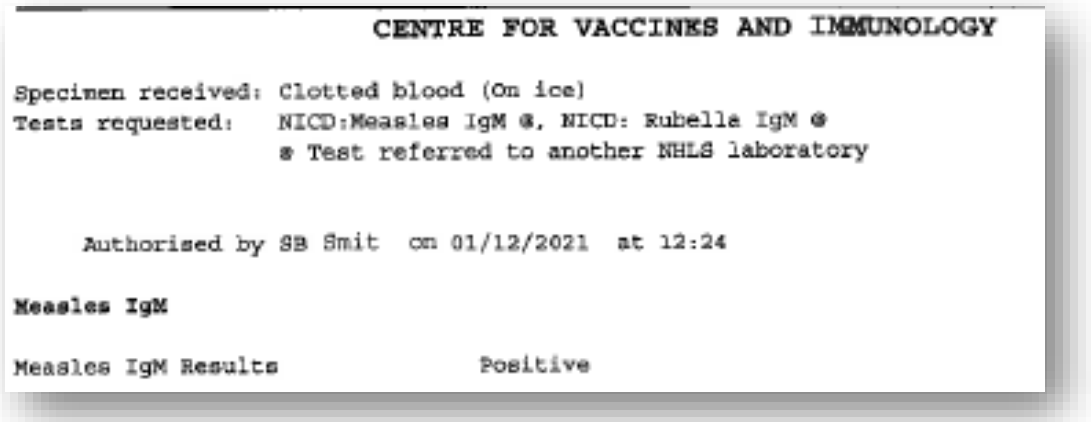
A case of fever and rash....
....thinking with the clinician

- Laboratory diagnosis
  - Types of tests
    - Serology (antibodies)
    - PCR (detection of measles RNA)
  - Interpretation of both tests depends on
    - Type of sample and type of test done
    - Timing of collection of the sample relative to rash onset
  - Tests taken before or on day of rash- (green line)
    - PCR likely to be positive
    - IgM may be negative
  - Tests taken after rash onset (red line)
    - PCR likely to be negative
    - IgM usually positive



A case of fever and rash….

- Infant AM, 14 month infant
- Blood results returned 4 days later
  - PCR positive on urine
  - Sequencing
    - B3 genome/lineage,
    - Identical to strains circulating in DRC, Zambia, 2015-2019



CENTRE FOR VACCINES AND IMMUNOLOGY

Specimen received: Clotted blood (On ice)
Tests requested: NICD:Measles IgM @, NICD: Rubella IgM @
@ Test referred to another NHLS laboratory

Authorised by SB Smit on 01/12/2021 at 12:24

Measles IgM

Measles IgM Results Positive

A case of fever and rash....
....thinking with the clinician

- Treatment
  - Symptomatic
    - Treat fever with paracetamol
    - Manage dehydration
  - Supportive
    - Vitamin A to prevent complications
  - Prevent complications
    - Treat secondary infections with antibiotics
    - Prophylactic antibiotics not shown to be effective

MEDICINE TREATMENT

All children < 5 years of age with measles should be given an extra dose of vitamin A, unless the last dose was received within a month:

- Vitamin A (retinol), oral, as a single dose.

Age range	Dose units	Capsule 100 000 IU	Capsule 200 000 IU
Infants 6–11 months	100 000	1 capsule	–
Children 12 months–5 years	200 000	2 capsules	1 capsule

In children < 5 years of age, give the 1st dose immediately. If the child is sent home, the caregiver should be given a 2nd dose to take home, which should be given the following day.

Administration of a vitamin A capsule

- Cut the narrow end of the capsule with scissors.
- Open the child's mouth by gently squeezing the cheeks.
- Squeeze the drops from the capsule directly into the back of the child's mouth. If a child spits up most of the vitamin A liquid immediately, give one more dose.

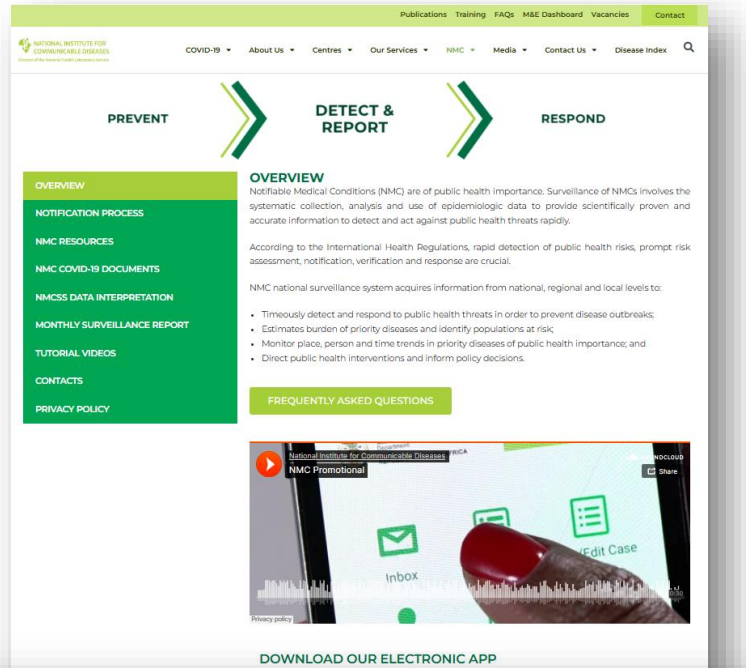
Standard treatment guidelines and Essential Medicines List for South Africa, PHC level, 2020

A case of fever and rash….
….thinking with the clinician

- Whom should you be cautious with and refer?
  - Age: All adults, children < 6 months
  - Measles in immunocompromised host, or TB co-infection
  - Where complications are present including
    - Respiratory distress, pneumonia,
    - Dehydration
    - Neurological complications

What can I do following detection of a suspected measles case?

- Provide appropriate supportive and preventative care
- Be familiar with case definitions for suspected measles and rubella cases
  - (fever, rash + 1 of conjunctivitis, coryza and cough).
- Notify all suspected cases to provincial surveillance officer
- Complete the case investigation forms and submit blood with throat swab or urine to NICD for testing
- Conduct ring vaccination of under-5 and unvaccinated contacts
- Assess vaccination status, explore reasons for non-receipt of vaccine and address uncertainties



Suspected case definition	Probable case definition	Confirmed case definition
Any person in whom a clinician suspects measles infection **OR** any person with fever and maculopapular rash (i.e. non-vesicular) and one of cough, coryza (i.e. runny nose) or conjunctivitis (i.e. red eyes).	Suspected measles case with epi link to a known measles case	A laboratory-confirmed measles case is any person with clinically compatible measles and a measles-specific IgM result in any specimen **or** a positive measles PCR test on a throat swab. . A clinically compatible case according to the WHO is a case that meets the clinical case definition with no blood specimen submitted, or without an epidemiological link to a confirmed case.

https://www.nicd.ac.za/assets/files/EPI%20Surveillance%20Manual_15Dec2015.pdf
https://apps.who.int/iris/handle/10665/70047

Current measles outbreak – epidemiology and response

- Provide appropriate supportive and preventative care
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NMCsurveillancereport@nicd.ac.za

NMC hotline 072 621 3805.

Notifiable Medical Conditions (NMC) Case Notification Form

This form must be completed immediately by the health care provider who diagnosed the condition. *Please mark applicable areas with an X*

Health facility name (with provincial prefix) | Health facility contact number | Health district

Patient file/folder number | Patient HPRS PRN | Date of notification

Patient demographics | **Patient residential address**

First name
Surname
S.A ID number
Passport/other ID number
Citizenship
Date of birth
Age
Gender — Male | Female
Is patient pregnant? — Yes | No | Unknown
Contact number

Employer/educational institution address

Contact number

Medical conditions details

Name of NMC diagnosed | History of possible exposure to NMC in the last 60dys — No | Yes | Unknown
Method of diagnosis — Clinical | Lab test | X-ray | Laboratory confirmed | Other
Clinical symptoms relating to the NMC
Treatment given for the NMC
Date of diagnosis | Date of symptom onset
Patient admission status — Outpatient | Discharged | Inpatient | Ward name
Patient vital status — Alive | Deceased | Date of death

Travel history in the last 60 days

Did patient travel outside of usual place of residence? — Yes | No | *If yes, complete the travel details below*
Place travelled from | Place travelled to | Date patient left usual place of residence | Date patient returned to usual place of residence

Vaccination history *for the NMC diagnosed above (complete only for vaccine preventable NMC)*

Vaccination status — Not vaccinated | Up to date | Unknown | Date of last vaccination

Specimen details | **Notifying health care provider's details**

Was a specimen collected? — Yes | No | First name
Date of specimen | Surname
Specimen barcode/lab number | Mobile number
SANC/HPCSA number | Notifier's signature

The top copy (white) must be sent to NMCsurveillancereport@nicd.ac.za or fax to 086 639 1656 or NMC hotline 072 621 3805 and to the sub-district/district office. The middle copy (blue) must be attached to the patient referral letter or patient file. The bottom copy (pink) must remain in the booklet

https://apps.who.int/iris/handle/10665/70047

https://www.nicd.ac.za/assets/files/EPI%20Surveillance%20Manual_15Dec2015.pdf

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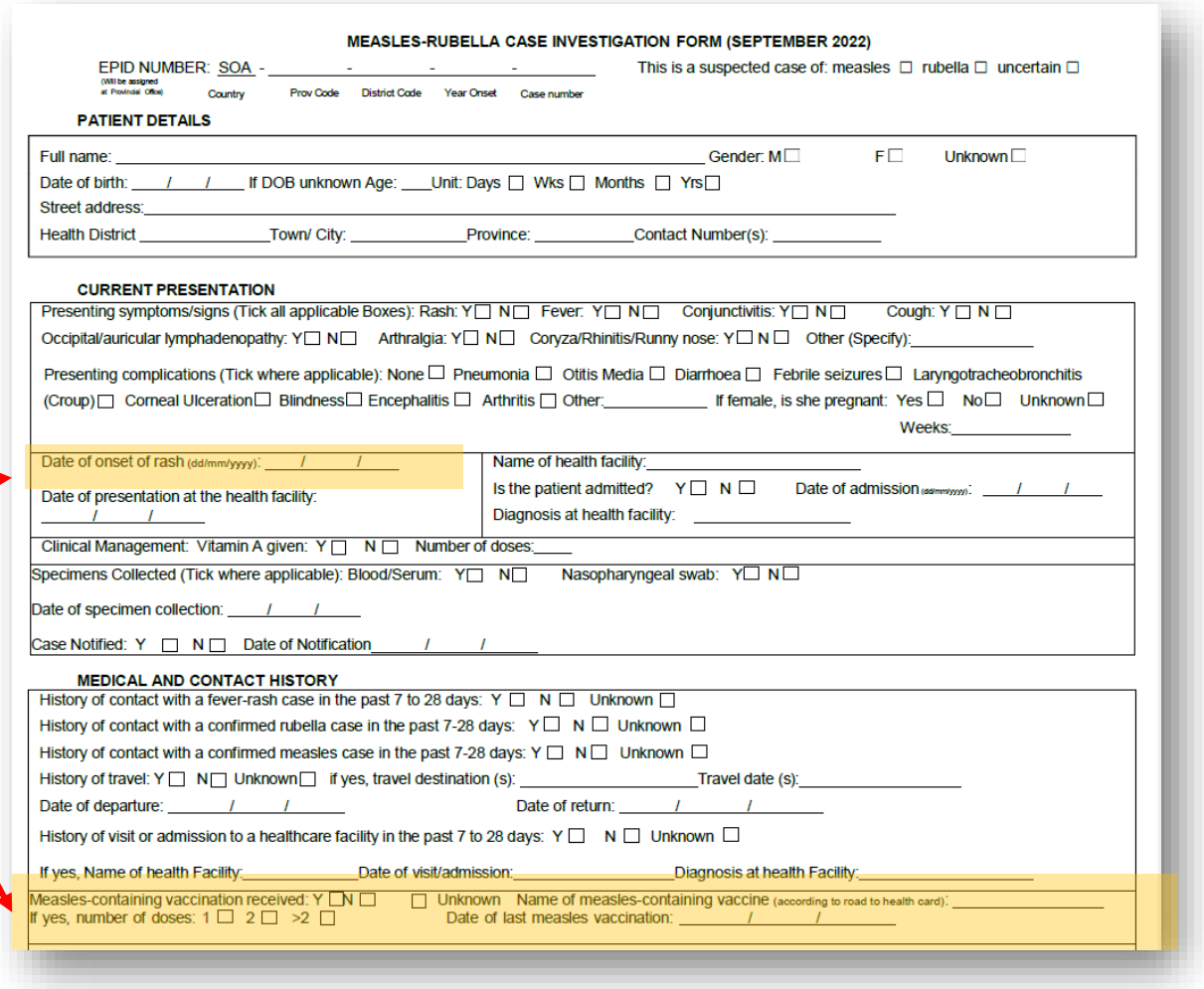
NB!!



MEASLES-RUBELLA CASE INVESTIGATION FORM (SEPTEMBER 2022)

EPID NUMBER: SOA - ____ - ____ - ____ - ____ (Will be assigned at Provincial Office) Country Prov Code District Code Year Onset Case number

This is a suspected case of: measles ☐ rubella ☐ uncertain ☐

PATIENT DETAILS

Full name: ____ Gender: M☐ F☐ Unknown☐

Date of birth: ___/___/___ If DOB unknown Age: ___Unit: Days ☐ Wks ☐ Months ☐ Yrs☐

Street address: ____

Health District ____Town/ City: ____Province: ____Contact Number(s): ____

CURRENT PRESENTATION

Presenting symptoms/signs (Tick all applicable Boxes): Rash: Y☐ N☐ Fever: Y☐ N☐ Conjunctivitis: Y☐ N☐ Cough: Y ☐ N ☐

Occipital/auricular lymphadenopathy: Y☐ N☐ Arthralgia: Y☐ N☐ Coryza/Rhinitis/Runny nose: Y☐ N☐ Other (Specify):____

Presenting complications (Tick where applicable): None ☐ Pneumonia ☐ Otitis Media ☐ Diarrhoea ☐ Febrile seizures ☐ Laryngotracheobronchitis (Croup)☐ Corneal Ulceration☐ Blindness☐ Encephalitis ☐ Arthritis ☐ Other:____ If female, is she pregnant: Yes ☐ No☐ Unknown☐ Weeks:____

Date of onset of rash (dd/mm/yyyy): ___/___/___

Date of presentation at the health facility: ___/___/___

Name of health facility: ____

Is the patient admitted? Y☐ N ☐ Date of admission (dd/mm/yyyy): ___/___/___

Diagnosis at health facility: ____

Clinical Management: Vitamin A given: Y ☐ N ☐ Number of doses:____

Specimens Collected (Tick where applicable): Blood/Serum: Y☐ N☐ Nasopharyngeal swab: Y☐ N☐

Date of specimen collection: ___/___/___

Case Notified: Y ☐ N ☐ Date of Notification ___/___/___

MEDICAL AND CONTACT HISTORY

History of contact with a fever-rash case in the past 7 to 28 days: Y ☐ N ☐ Unknown ☐

History of contact with a confirmed rubella case in the past 7-28 days: Y ☐ N ☐ Unknown ☐

History of contact with a confirmed measles case in the past 7-28 days: Y ☐ N ☐ Unknown ☐

History of travel: Y ☐ N☐ Unknown☐ if yes, travel destination (s): ____Travel date (s):____

Date of departure: ___/___/___ Date of return: ___/___/___

History of visit or admission to a healthcare facility in the past 7 to 28 days: Y ☐ N ☐ Unknown ☐

If yes, Name of health Facility:____Date of visit/admission:____Diagnosis at health Facility:____

Measles-containing vaccination received: Y ☐N ☐ ☐ Unknown Name of measles-containing vaccine (according to road to health card): ____

If yes, number of doses: 1 ☐ 2 ☐ >2 ☐ Date of last measles vaccination: ___/___/___

https://www.nicd.ac.za/diseases-a-z-index/measles/
https://www.nicd.ac.za/wp-content/uploads/2019/04/Final-draft_Updated-Measles-CIF_020817_NVM.pdf

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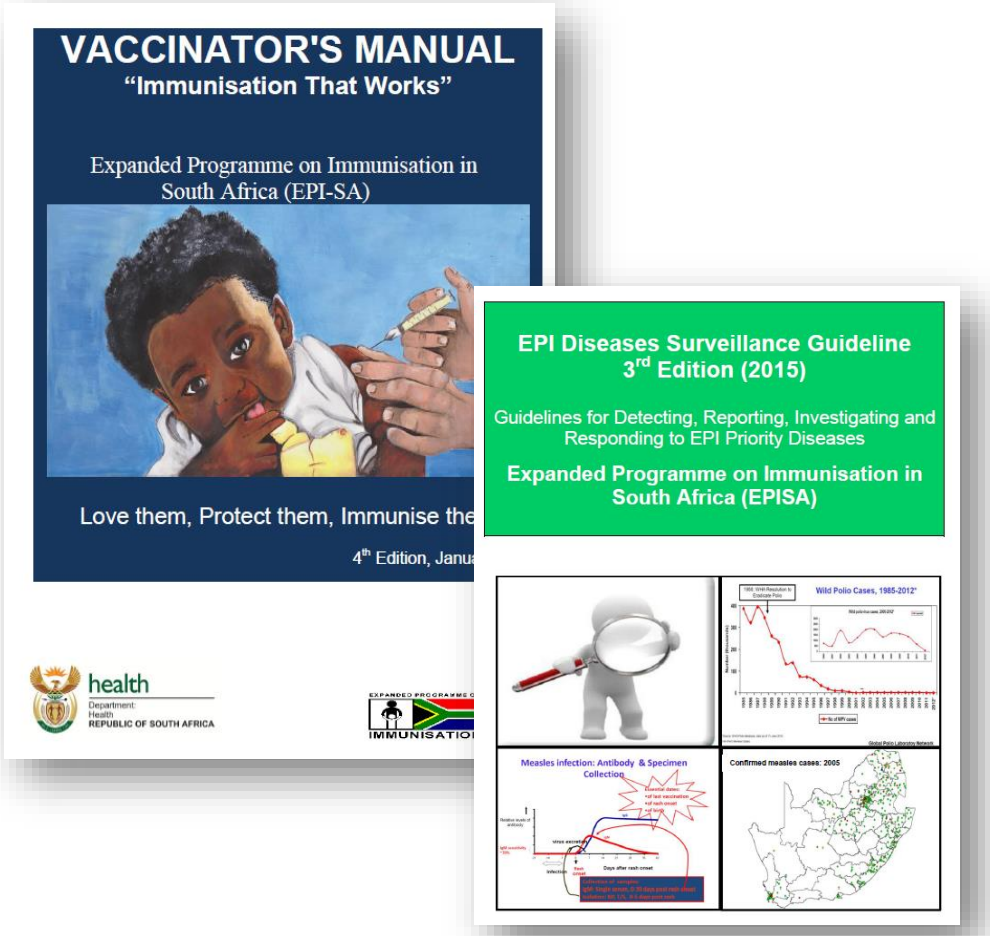

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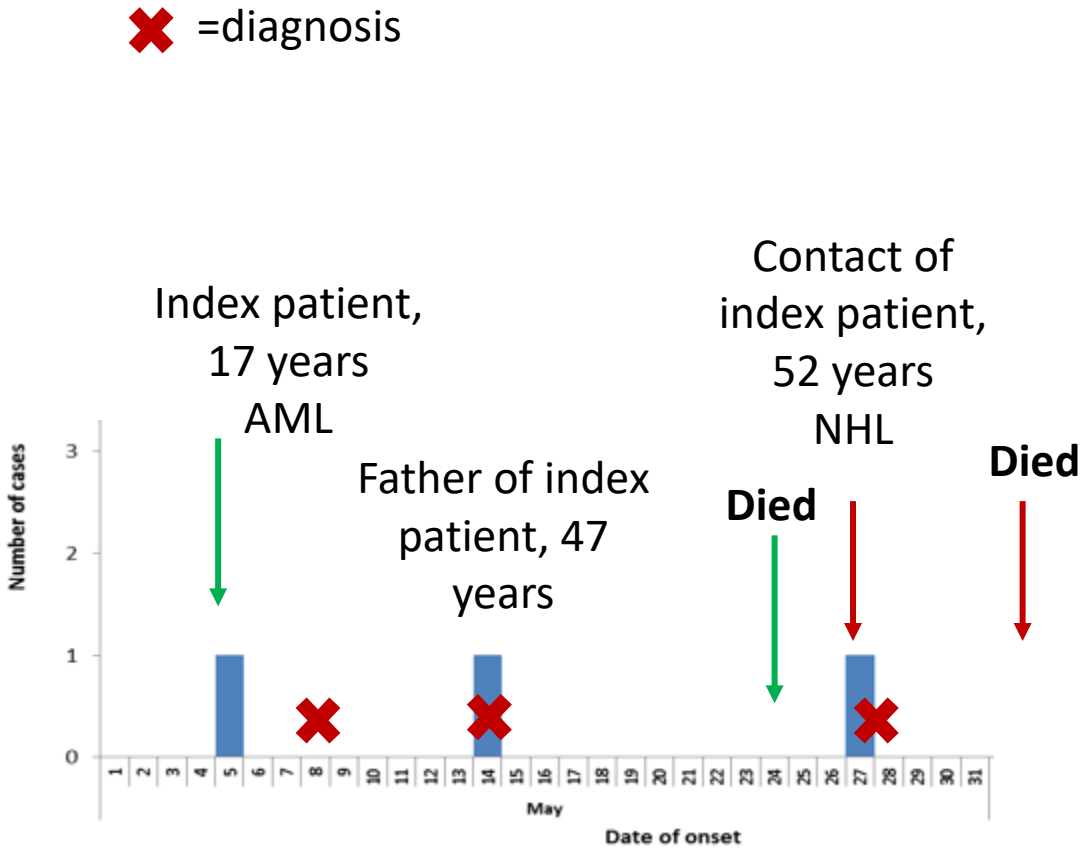
- Supporting vaccine confidence amongst hesitant parents by adopting a non-judgemental, gentle approach
  - Understand parents context, social struggles
  - Assess parental meaning systems
    - How do people understand the world, and the origin/source of health?
    - Who are the persons/institutions that people trust for health advice?
    - What factors/events would support a person's uptake of vaccination?
  - Accept that forms of rationalizing do not always align with biomedical approaches
  - Understand parental decision-making
    - A desire to protect their child's health
    - A need to be a part of decision making processes
    - Need to belong and feel included among peers
    - To be confident that expert systems have their own interests at heart
    - To have their priorities recognised.
  - A dialogue-based approach with intention of understanding, identifying common ground and developing of alliances

A second case of fever and rash....

- 17 year old female
  - Admitted to a private hospital 13 April for chemotherapy.
  - Commenced with rash 14th April
  - By 5 May condition deteriorated with a pneumonitis.
  - 8th May diagnosis=measles
  - Died on 24 May
- 47 year old male
  - Diagnosed with measles by Gp on 14 May 2015. No known contacts.
- 52 year old male
  - Admitted on 17 May, deteriorated with respiratory symptoms on 31 May. Rash developed on 27 May.
  - Died on 2 June

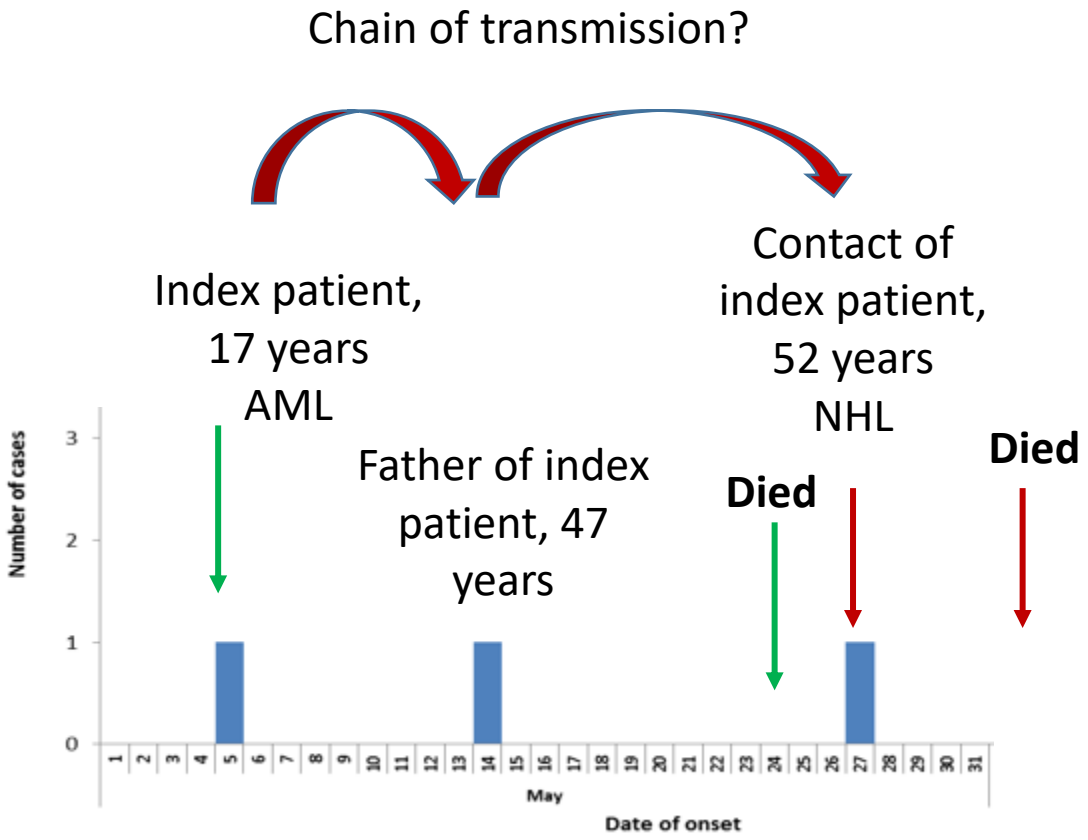


Epidemiology curve showing cases of measles at a private hospital, 2015

A second case of fever and rash....

- Hospital actions taken
  - Isolation of patients (prior to diagnosis, on account of oncology diagnoses)
  - Airborne/droplet precautions
  - Screening of staff vaccination records and offering of measles vaccination

- What was not reported
  - An oncologist (not patient's doctor) had been ill and off work, and his wife had been diagnosed with pneumonitis.
  - The oncologist had become ill after returning from eastern europe
  - Genotyping revealed an eastern European measles strain.



Epidemiology curve showing cases of measles at a private hospital, 2015

A second case of fever and rash….
….thinking with the IPC practitioner

- Who is at risk in the emergency department and hospital?
  - All who are not vaccinated even those not directly in contact (airborne transmission)
  - Waning immunity in adulthood does occur.
  - Second infections or measles post-vaccination is very rare, but has been documented

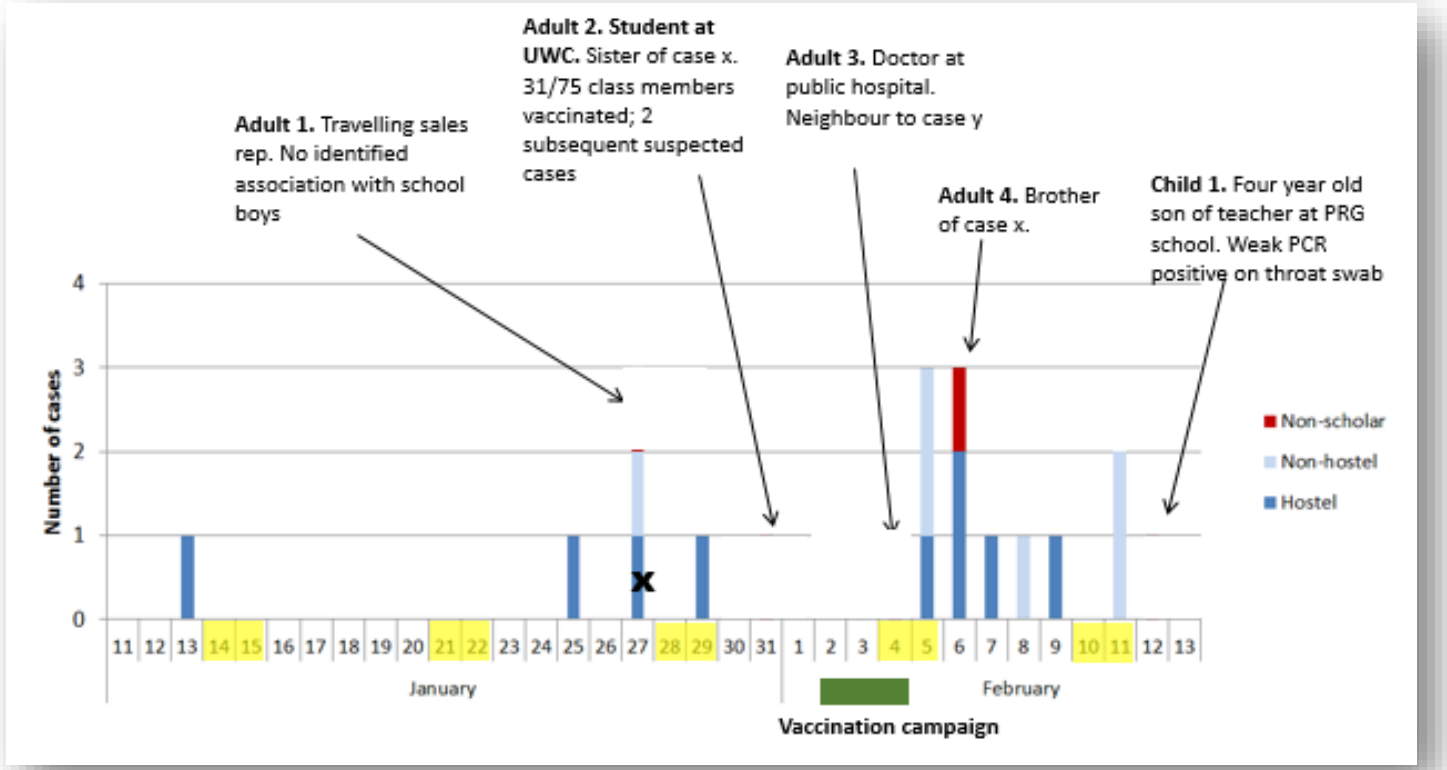
- What should be done re IPC?
  - Routine cleaning and disinfection
  - Ensure good ventilation
  - Contact tracing and review of ED patients
  - Review vaccination records of staff
    - Boost or revaccinate (no adverse effects if given multiple times)

- Who needs post-exposure prophylaxis?
  - Vaccine may be given within 3-6 days of exposure to unvaccinated persons
  - Infants under 6 months of age may be vaccinated (but should still receive usual EPI vaccines)
  - Immunoglobulin may be given to all with defective CMI who cannot receive the vaccine
    - Persons with AIDS (even if previously vaccinated)
    - Oncology patients with defective CMI
    - Persons receiving immunosuppressive therapy at doses >20mg/kg
  - Immunoglobulin may be given to pregnant women who cannot receive vaccine

https://www.nicd.ac.za/diseases-a-z-index/measles/

A third…4th 5th 6th case of fever and rash….

- 17 year old male resident in a boarding house at a school in City of Cape Town
- 10 days later, 4 more cases of measles amongst boarding house members….

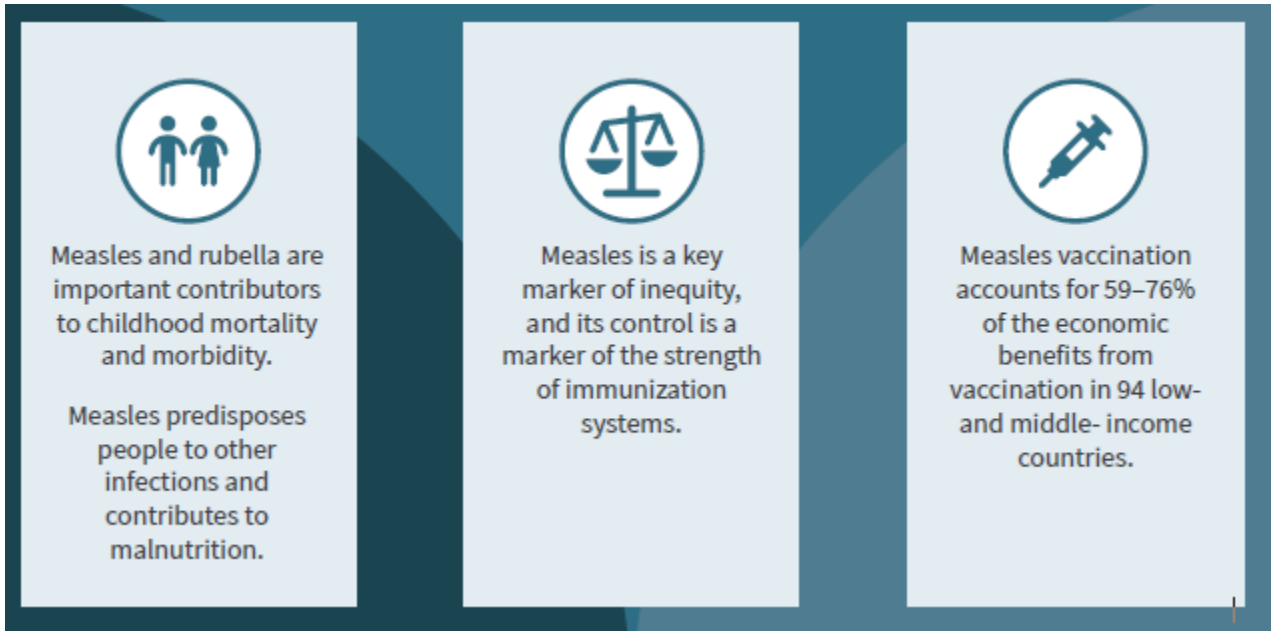


A case of fever and rash….
….thinking with the public health official

- What is the significance of this suspected case?
  - Measles has a very high effective reproductive number (Rt)
    - R0=11 ie 11 secondary cases in an unvaccinated population
    - Therefore high vaccination coverage (>95%) is required to prevent outbreaks
  - Modelling indicates that when size of unvaccinated population equals birth cohort, outbreaks are inevitable following introduction into community
    - RSA average vaccination coverage c.70-80%
    - It will take 4-5 years before outbreak will occur in RSA (25% of 1million birth cohort)
  - Outbreaks can be averted with early detection, ring vaccination and if necessary, district vaccination

Measles prevention, elimination and eradication

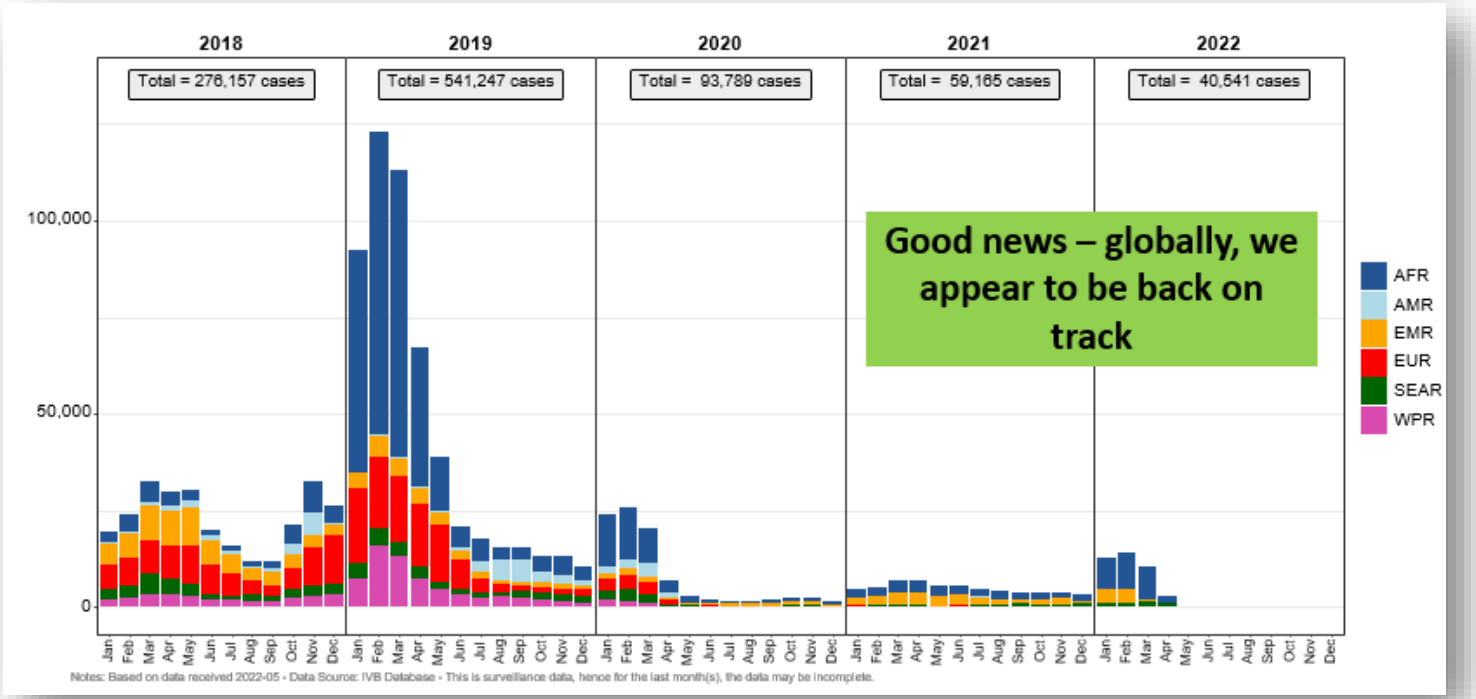
- WHO measles and rubella elimination strategy
  - ‘A world free of measles and rubella’ by 2030



Measles prevention, elimination and eradication

- WHO measles and rubella elimination strategy
  - ‘A world free of measles and rubella’
  - The world was on track – declining incidence of measles, increasing vaccination coverage until a resurgence in 2015-7

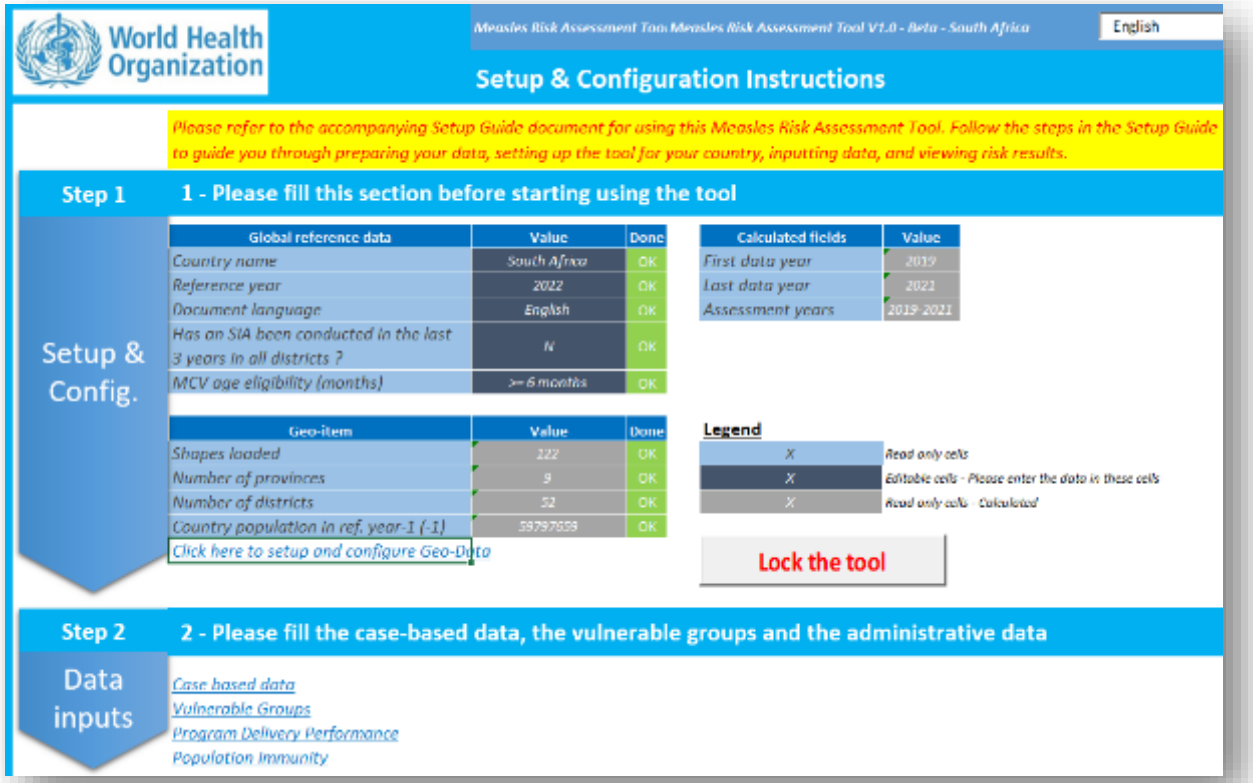
- What happened?
  - Growing vaccine hesitancy
  - Global transmission through air-travel and trade
  - COVID-19 related disruptions of routine and supplementary immunization campaigns may have impacted elimination efforts
  - Legacy low vaccination coverage in older age groups and re-introduction of the virus



Slide courtesy S. Smit CVI, NICD

Measles prevention, elimination and eradication

- WHO measles risk assessment tool
  - To help national programmes to identify areas not meeting measles programmatic targets, and based on the findings, guide and strengthen measles elimination program activities and reduce the risk of outbreaks
- Uses data to categorise risk as very high, high, medium, low
- 4 categories of data
  - Population immunity (40)
  - Surveillance quality (20)
  - Program performance (16)
  - Threat assessment (24)
- Results are scored and maps generated by region



https://www.who.int/teams/immunization-vaccines-and-biologicals/immunization-analysis-and-insights/surveillance/measles-programmatic-risk-assessment-tool#:~:text=The%20World%20Health%20Organization%20(WHO,reduce%20the%20risk%20of%20outbreaks.

Measles prevention, elimination and eradication

- WHO measles risk assessment tool
  - Required data

Data	Details
Administrative vaccine coverage data (for each district)	1. MCV1, for years 1, 2, 3 2. MCV2 (if introduced), for years 1, 2, 3 3. DPT1 or Penta1, for year 3
Measles Supplementary Immunization Activity (SIA) campaign data (for each district), if any SIA was conducted in the past 3 years	1. Coverage (for each district) 2. Target age group for SIA 3. Year in which SIA was conducted
Measles case-based surveillance data	For years 1, 2, 3
Total population (for each district)	For years 1, 2, 3
Geographic area (in km^2)	Year 3, for each district
Shape file of country	For year 3, at the district level

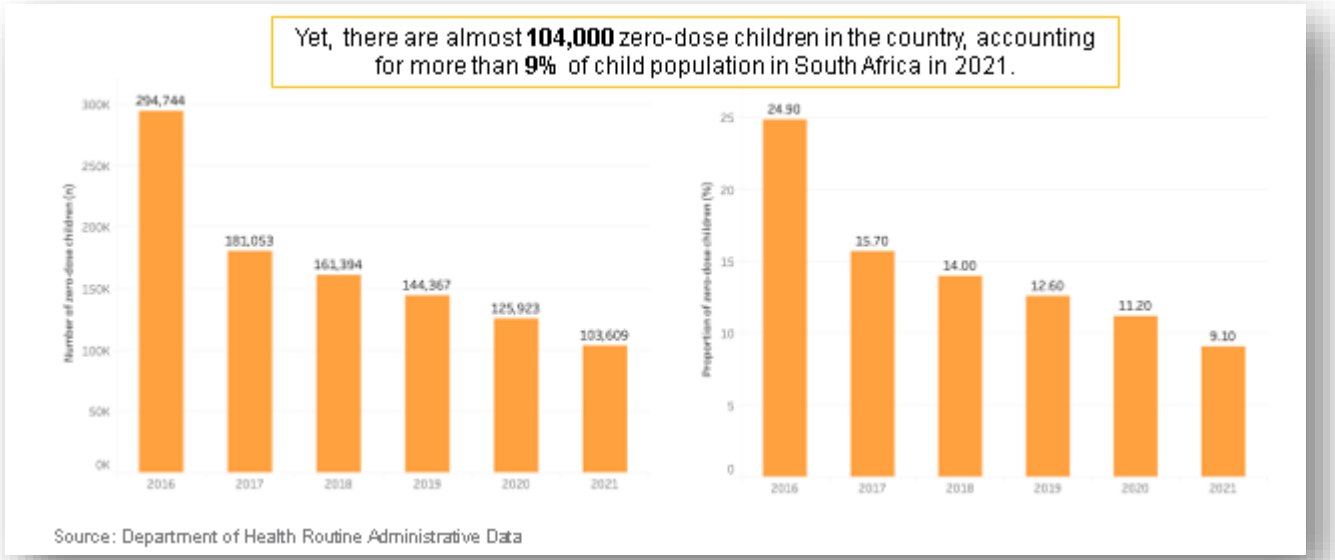
- Vulnerable groups
  - Presence of migrant population / internally displaced population/ slums / tribal communities
  - Resistant to vaccination (ie. religious, cultural issues, etc.)
  - Security and safety concerns
  - Frequented by calamities / disasters
  - Poor access to health services due to terrain / transportation issues
  - Lack of local political support
  - Presence of high-traffic transportation hubs/major roads or bordering large urban areas (within and across countries)
  - Presence of areas with mass gatherings (i.e. trade/commerce, fairs, markets, sporting events, high density of tourists)

https://www.who.int/teams/immunization-vaccines-and-biologicals/immunization-analysis-and-insights/surveillance/measles-programmatic-risk-assessment-tool#:~:text=The%20World%20Health%20Organization%20(WHO,reduce%20the%20risk%20of%20outbreaks.

Measles prevention, elimination and eradication

- Zero-dose children
  - Whilst vaccination coverage data indicates the proportions of children who receive vaccines, it is clusters of unvaccinated children that drive outbreaks
  - Identification of clusters of unvaccinated, and particularly zero-dose children is important.
  - These clusters may even occur in districts with high vaccination coverage
  - Identification of ‘zero-dose’ children is a new focus of GAVI and other vaccine advocacy groups

Zero-dose children in South Africa, 2016-2021

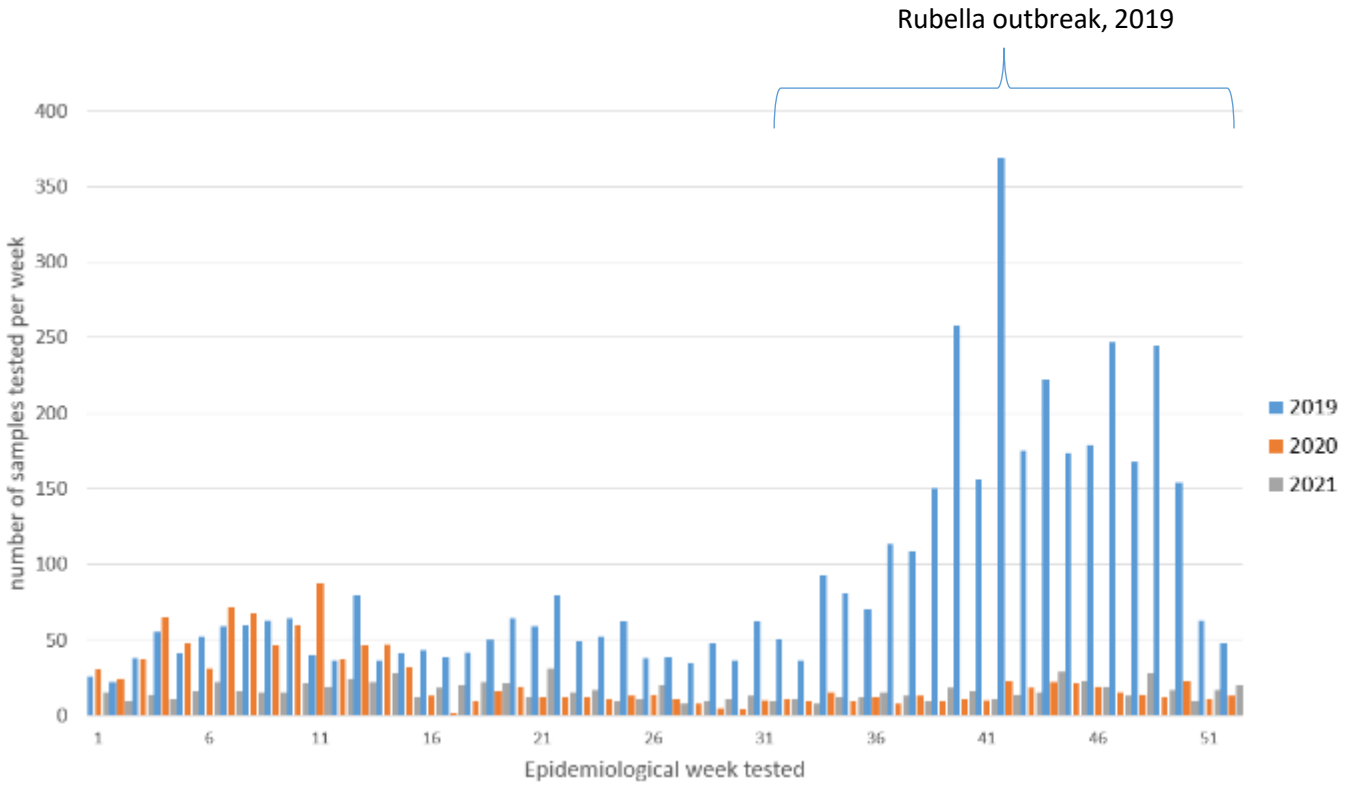


Zero Dose Children from South Africa as identified by UNICEF. Slide courtesy Mercy Kamupira, UNICEF

Measles prevention, elimination and eradication

- South African context:
  - Fever-rash surveillance cases have diminished markedly 2019-2021
  - Non-pharmaceutical measures for COVID also reduced transmission of all respiratory pathogens.

Cases of fever-rash submitted for testing to NICD, 2019-2021



Data courtesy S. Smit, S Malfeld, CVI, NICD

Measles prevention, elimination and eradication

- Mainstay of prevention is vaccination and early detection
- Low vaccination coverage is reason for current outbreak

Vaccination coverage for MCV1 (6 months) and MCV2 (12 months), 2020-2021

	MCV1		MCV2	
	Dec-20	Dec-21	Dec-20	Dec-21
ECP	75	72,9	68,4	66,8
FSP	78,3	72,4	76,5	68,7
GP	74,2	70,7	66,9	65,5
KZN	88,9	87,9	81,2	79,8
LP	34,9	84,9	77,5	84,8
MP	88,5	101,6	78,1	86,9
NCP	53,4	60,4	54,4	59,8
NWP	66,8	67,4	63,3	63,4
WCP	75,6	65,1	71,4	66,7
RSA	73,7	78,1	72,7	72,8

Low vaccination coverage

Table 3 Surveillance adequacy per province during 2015–2020

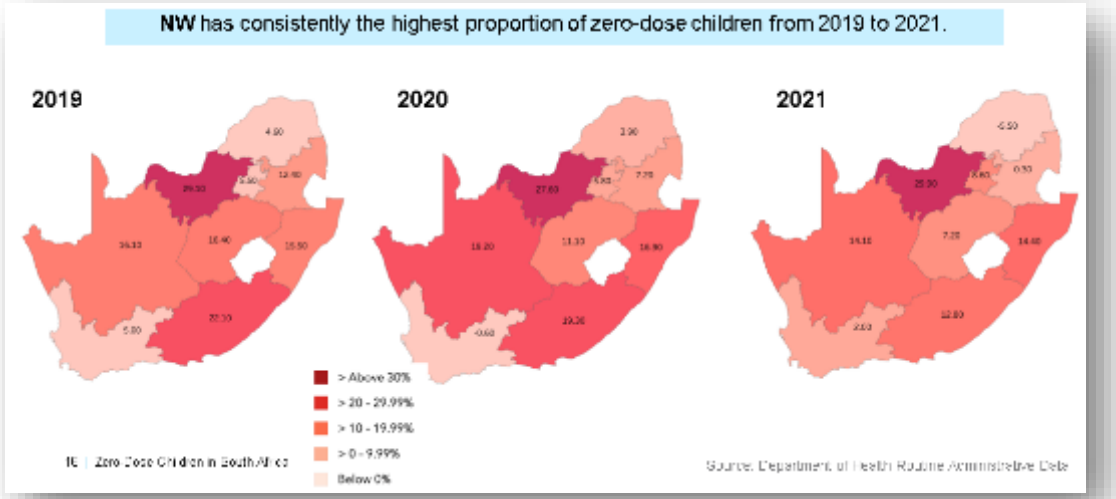
Province	2020
Eastern Cape	2.0
Free State	2.3
Gauteng	2.0
KwaZulu-Natal	1.4
Limpopo	1.0
Mpumalanga	3.4
North West	2.8
Northern Cape	3.9
Western Cape	2.9
South Africa	**2.1**

Non-measles febrile rash surveillance per 100,000 population in each province.

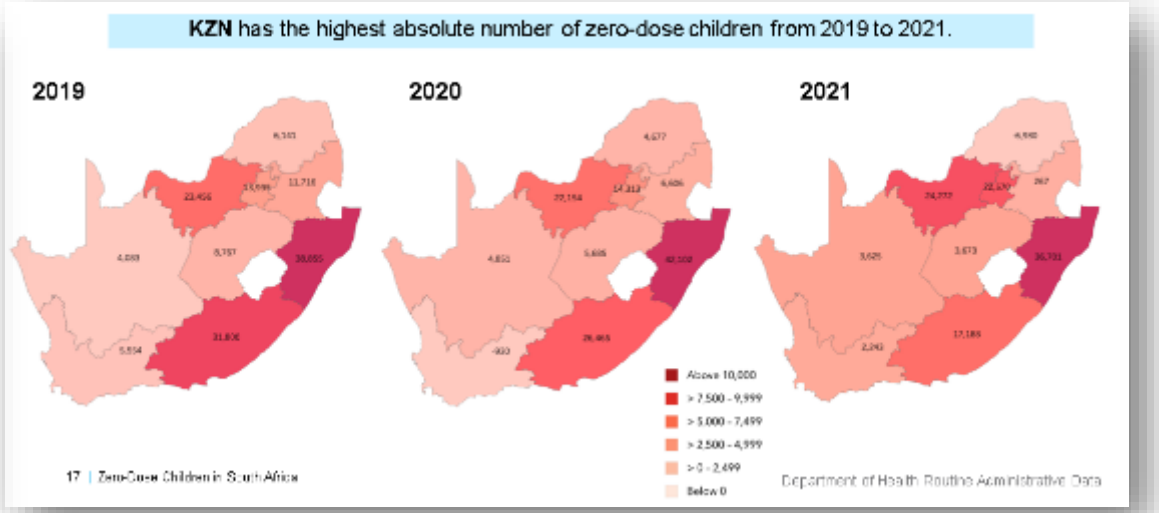
Weak surveillance indicators

Measles prevention, elimination and eradication

- Provincial distribution of zero-dose children in RSA provinces, 2019-2021



PROPORTION



ABSOLUTE NUMBERS

Zero Dose Children from South Africa as identified by UNICEF. Slide courtesy Mercy Kamupira, UNICEF

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