



Associate Professor Nikki Turner

Academic General Practitioner

University of Auckland

University of Otago (Wellington Campus)

Sunday, August 11, 2019

(Plenary)

9:30 - 9:50 An Insight into Global Disease Eradication by Vaccination



Global disease eradication through vaccination

Nikki Turner

GP, Director Immunisation Advisory Centre University of Auckland

Chair of WHO, Measles Rubella SAGE Working Group

Aug 2019

- Eradication: Example
- What it takes?
- Polio...are we there yet
- Measles and rubella



ERADICATION

“Reduction of the worldwide incidence of a disease to zero as a result of deliberate efforts, obviating the necessity for further control measures”

Conditions that make it scientifically feasible to eradicate a disease

- Epidemiologic vulnerability.
 - does not spread easily
 - there is a natural cyclical decline in prevalence
 - there is a naturally induced immunity
 - it is easily diagnosed
 - the duration of any relapse potential is short
- Availability of an effective and practical intervention.
 - vaccine
 - other primary preventive measure
 - curative treatment
 - a means of eliminating vectors.

Ideally, the intervention should be effective, safe, inexpensive, long-lasting, and easily deployed.

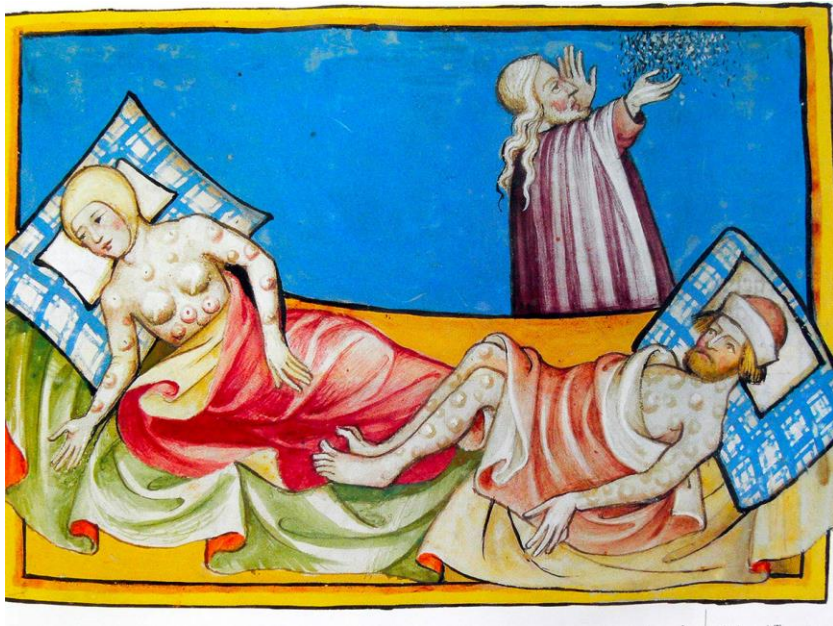
- Demonstrated feasibility of elimination.

To date, only one infectious disease that affects humans has been eradicated

SMALLPOX



www.bcm.edu/departments/molecular-virology-and-microbiology/emerging-infections-and-biodefense/smallpox-virus



Minature of smallpox from the Toggenburg Bible, 1411

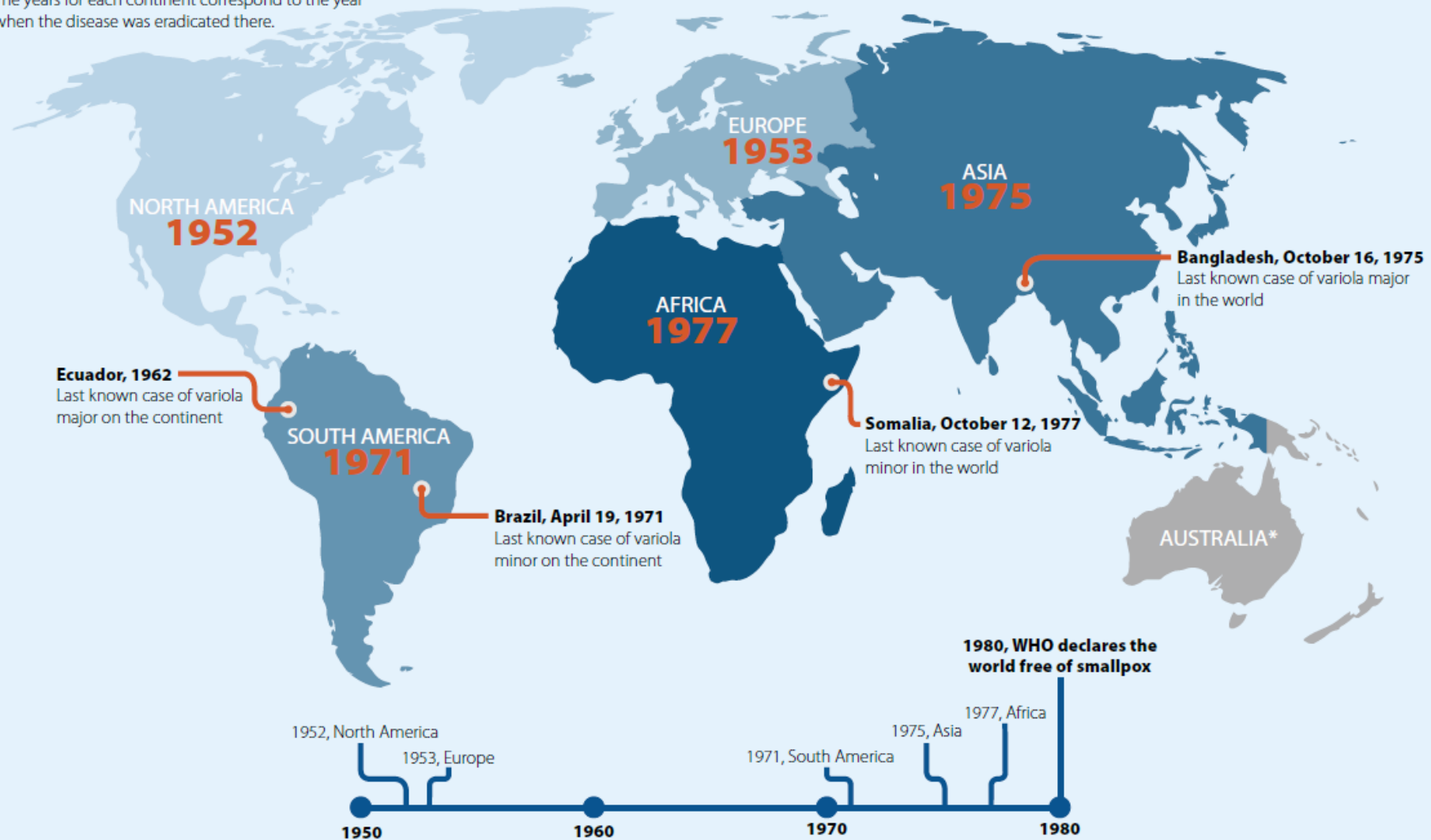


The Fever of 1721 by Stephen Coss

GLOBAL SMALLPOX ERADICATION

The historically important dates highlighted in the map show countries in which the last naturally acquired cases of smallpox occurred.

The years for each continent correspond to the year when the disease was eradicated there.



* Smallpox was never endemic (widespread) in Australia
CS265471-A



Vaccination

- Live vaccinia virus
- Administered using a bifurcated needle, not an injection
- Bifurcated needle is dipped into the vaccine and then used to prick the skin 15 times in about 3 seconds in a 5mm radius area
- Administered into the superficial layer of the skin



A crowd of people in Niger, West Africa awaiting vaccination during the Smallpox Eradication and Measles Control Program in the late 1960s or early 1970s. Image: Dr. JD Millar/CDC.



<https://www.who.int/features/2010/smallpox/surveillance/en/index2.htm>



May 8, 1980, the 33rd World Health Assembly officially declared the world free of this disease. Eradication of smallpox is considered the biggest achievement in international public health.

US CDC



Eradication: Why Smallpox

- The disease is highly visible: Easily recognized rash
- The time from exposure to the initial appearance of symptoms is short, so that the disease usually can't spread very far before it's noticed.
- Only humans can transmit and catch smallpox.
- The ability to protect individuals against infection.
 - Natural infection leads to lifelong immunity.
 - Smallpox vaccination was highly effective.

International Task Force for Disease Eradication (1989 – 1992)

- Considered 90 diseases
- Six diseases could probably be eradicated by using current technology
 - Dracunculiasis (guinea worm)
 - Poliomyelitis
 - Mumps, rubella
 - Lymphatic filariasis
 - Cysticercosis





POLIO



Wilson Home for crippled children in
Takapuna, Auckland, 1943.



Alexander Turnbull Library,
Photographer: John Pascoe Reference: 1/4-000643-F

Still not there.....

Wild polio 2019* (2018)

- **TOT 56 (13)**
 - Afghanistan 11 (10)
 - Pakistan 45 (3)

No type 2 cases since 1999

Last type 3 case 2012

Type 1 still circulating

* To 23 July 2019

Vaccine-derived polio 2019* (2018)

- **TOT 43 (15)**
 - Angola 3 (0)
 - Central African Republic 4 (0)
 - China 1 (0)
 - Democratic Republic of the Congo 15 (7)
 - Ethiopia 1 (0)
 - Ghana 1 (0)
 - Myanmar 2 (0)
 - Niger 1 (0)
 - Nigeria 12 (2)
 - Papua New Guinea 0 (1)
 - Somalia (Type 2) 3 (2)
 - Somalia (Type 3) 0 (3)

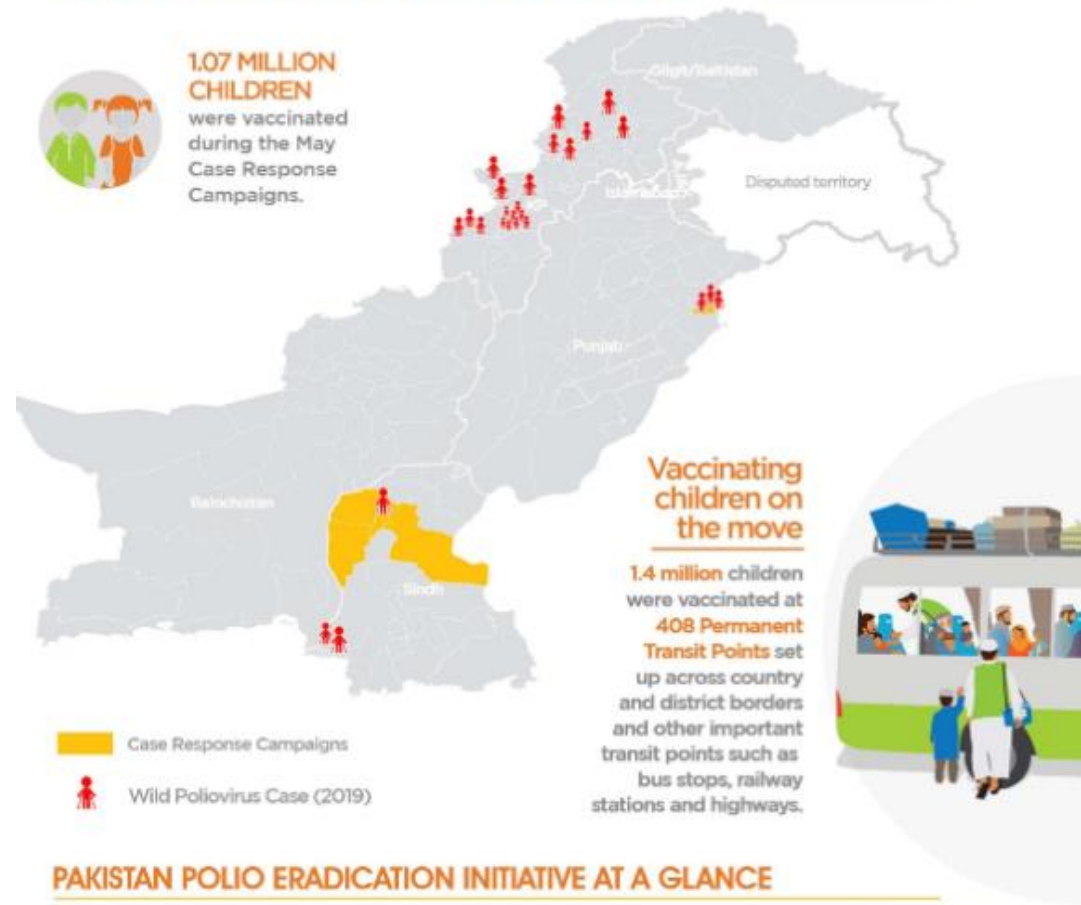
Polio outbreak in Papua New Guinea reaches capital Port Moresby

First case confirmed in the capital which is preparing to host high-level Apec summit



▲ A mother and baby at a polio vaccination clinic in Lae, Morobe province, Papua New Guinea. Photograph: [Source]

MAY 2019 POLIO VACCINATION CAMPAIGNS



PAKISTAN POLIO ERADICATION INITIATIVE AT A GLANCE





Immunizing a small boy on a canoe as they ferry across their village, Makoko. © UNICEF/Peter Idowu



<http://polioeradication.org/news-post/pakistan-polio-snapshot-may-2019/>

Challenges

- Wild virus: Pakistan and Afghanistan
 - Conflict and mistrust
 - Inaccessibility for vaccination
 - parts of Afghanistan and Nigeria
- Large numbers of circulating vaccine-derived polioviruses originating from the oral polio vaccine
- Poor vaccination coverage with IPV in many countries
- IPV shortages

Polio worker shot dead in Pakistan, over 100 killed since December 2012

Taliban militants have attacked polio workers in the past in Pakistan -- one of only three countries where the crippling disease remains endemic.

WORLD Updated: Jul 27, 2017 17:25 IST

ht Press Trust of India
Press Trust of India, Islamabad

Killings of police and polio workers halt Pakistan vaccine drive

Deaths follow wave of rumours and a hoax video intended to derail final push to eradicate the disease



▲ Pakistani police officers escort members of a polio vaccination team during a door-to-door campaign on the outskirts of Islamabad. Photograph: Aamir Qureshi/AFP/Getty Images

A federal government **campaign to vaccinate** more than 40 million children under five against polio in Pakistan has been suspended following a series of

Guardian April 2019

Fundamentalist clerics and militants claim that government vaccination campaigns are part of a Western conspiracy to sterilize Pakistani children.

RadioFreeEurope RadioLiberty Pakistan April 2019







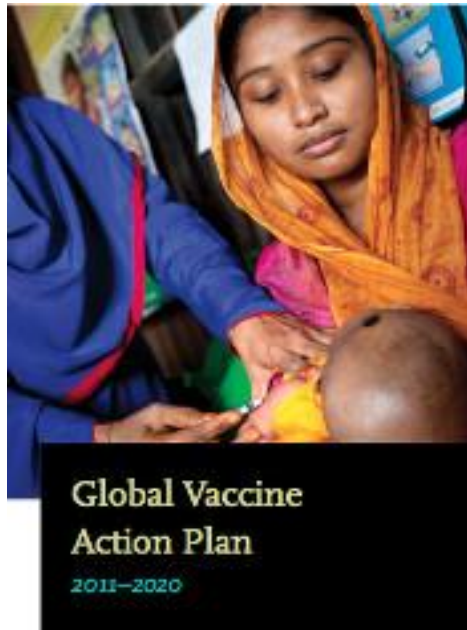
Measles and Rubella Elimination Targets



Global: World Health Assembly, 2010

Milestones by 2015:

1. MCV1 coverage $\geq 90\%$ national & $\geq 80\%$ in every district
2. Measles reported incidence < 5 cases/million
3. Measles mortality reduction of 95% vs. 2000



Regional elimination: GVAP, 2012

By 2015:

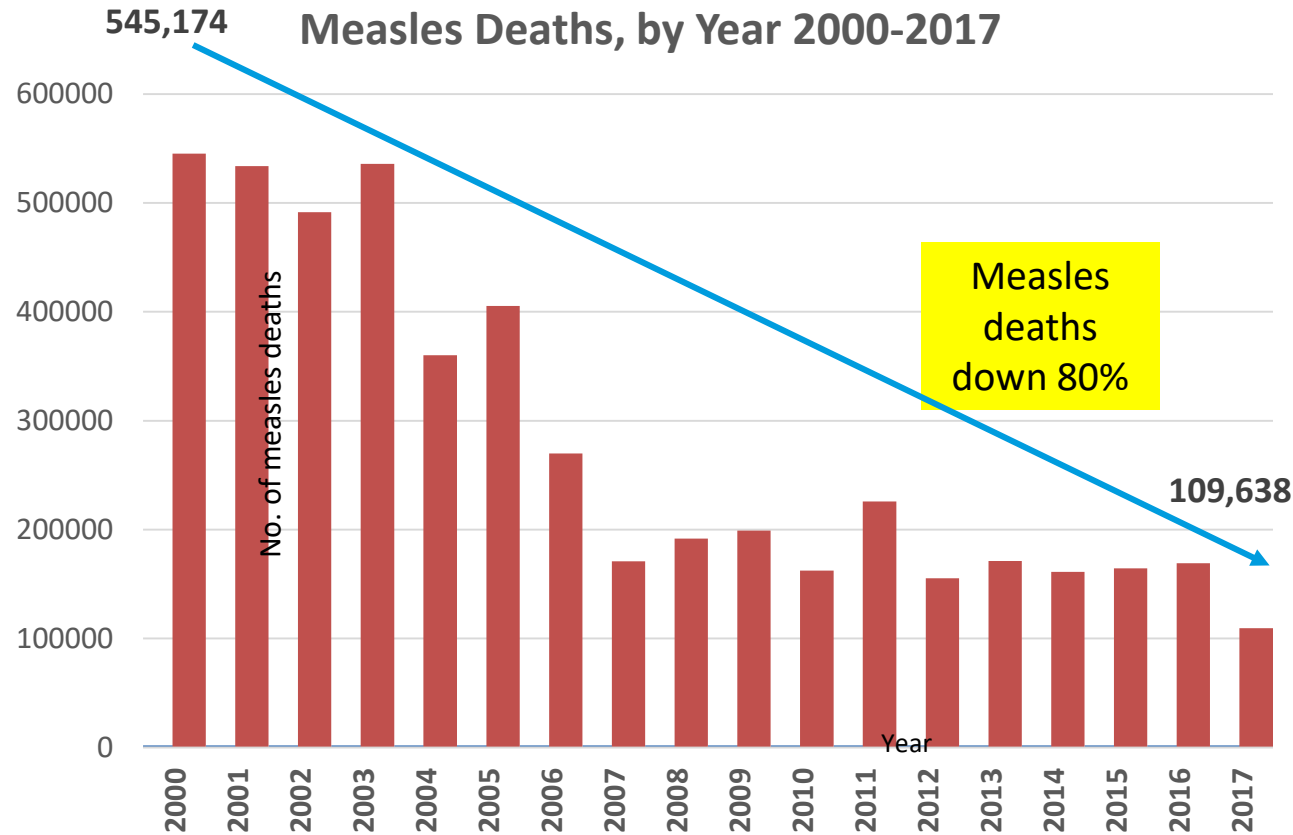
- Elimination of measles in 4 WHO Regions
- Elimination of rubella in 2 WHO Regions

By 2020:

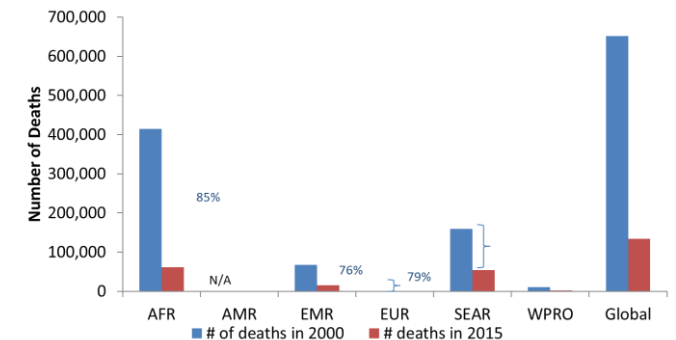
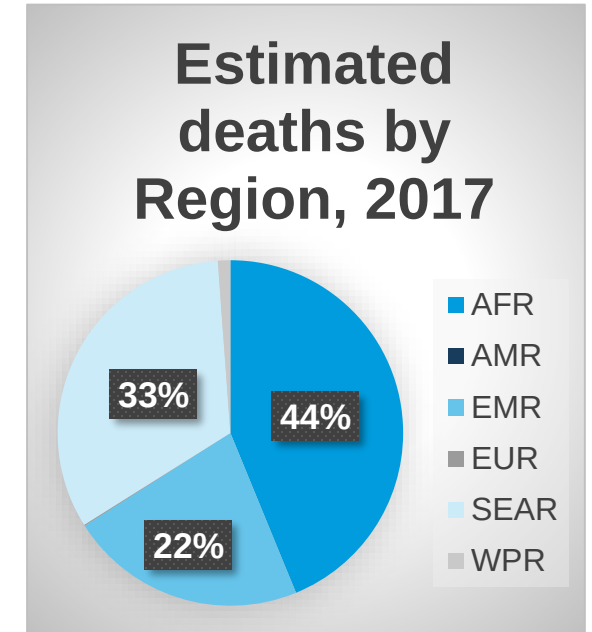
- Elimination of measles & rubella in 5 WHO Regions

Global Milestone #3

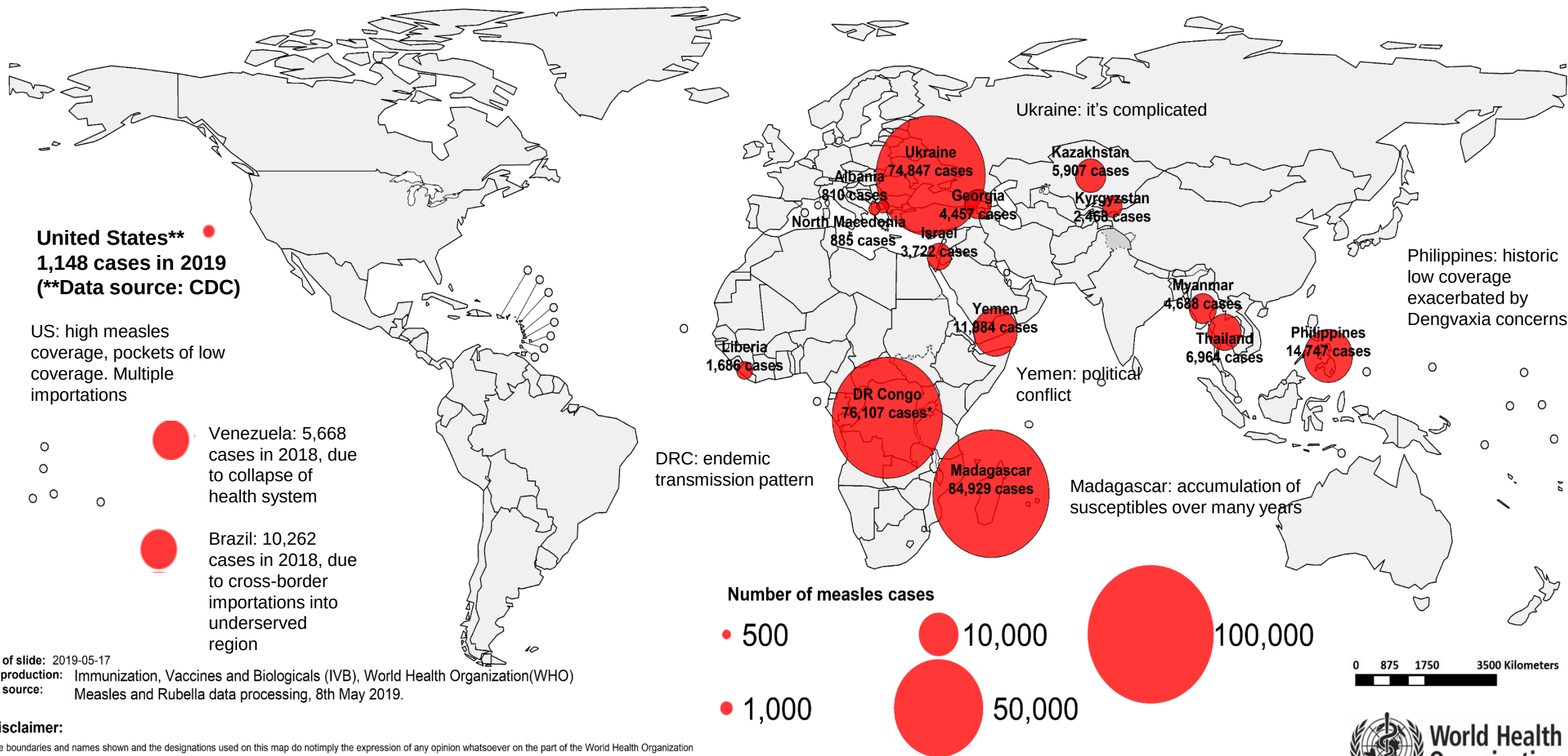
95% Reduction in Measles Deaths



21.1 million deaths prevented from 2000-2017 by measles vaccination



2019 Selected Measles Outbreaks



Measles: How a preventable disease returned from the past

By Prof Helen Bedford
University College London

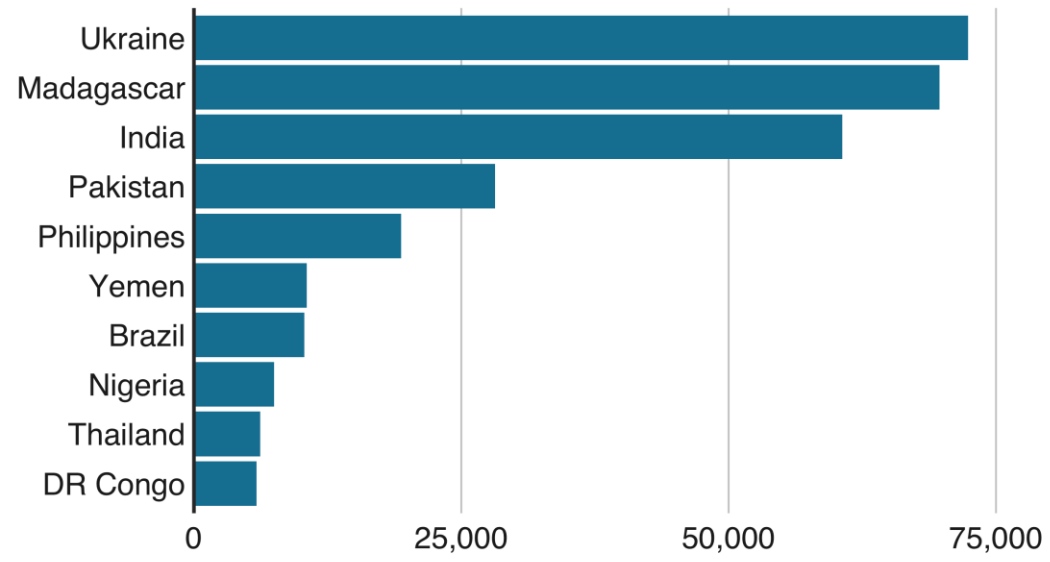
5 April 2019

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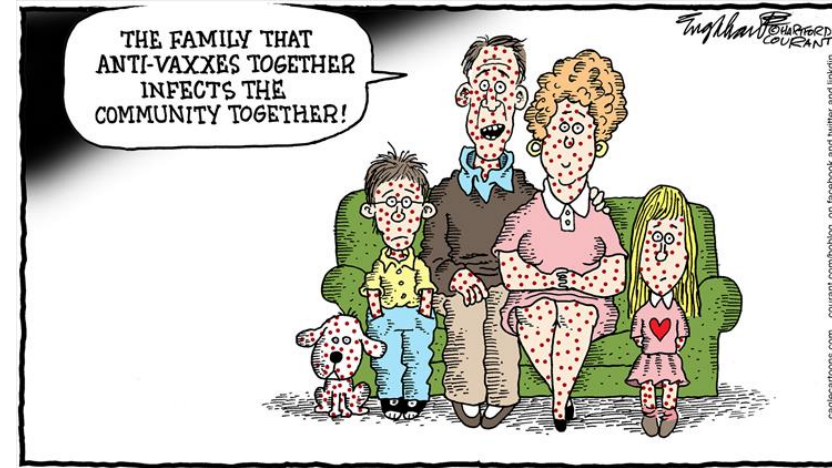


Top 10 countries by number of measles cases

Data is for 12 month period between Mar 2018 and Feb 2019



Source: World Health Organization



Why Now? Cause(s) of Measles Up-swing



- **Root Cause:** **Gaps in population immunity** because of insufficient vaccine coverage over many years
 - ✓ **Weak and fragile health systems** in many countries (e.g., CAR, DRC, Madagascar)
 - ✓ **Civil unrest, famine, active conflict, socio-economic/political crisis** (e.g., Syria, Venezuela, Yemen)
 - ✓ **Vaccine hesitancy, quality and access of services** (Philippines, Ukraine, United States)
 - ✓ Susceptible populations distributed across **wide age groups** (France, Bangladesh)
- Outbreaks affecting **sub-groups**: adolescent-adults, migrants, indigenous, religious groups (United States)
- **Global spread**
 - ✓ Increasing interconnectedness
 - ✓ Measles virus highly infectious, incubation period 7-21 days
 - ✓ Outbreaks in countries with high international travel creates pressure on eliminated countries

Eradication ?



- **2009 International Task Force on Disease Eradication:** Measles eradication is biologically feasible
 - Americans free of endemic measles officially Sep 27, 2016
- **WHA 2010: 3 milestones are established for measles control by 2015**
- **2010 SAGE:** measles can and should be eradicated. A goal for measles eradication should be established with a proposed target date based on measurable progress made towards existing goals and targets.
- **2016 Midterm Review of the MR Global Strategic Plan 2012-2020:** A determination should be made, not later than 2020, whether a formal global goal for measles eradication should be set with timeframes for achievement.

News

WHO verifies New Zealand has eliminated measles and rubella due to high vaccination rates

The World Health Organisation has verified that New Zealand has eliminated measles and rubella for the first time.

October 6, 2017

Total confirmed cases this year to date:

221

Increase in cases since yesterday (17/07/19):

+4*

Rodney

2

West Auckland

63

South Auckland

97^{+2*}

North Shore

6

Central Auckland

31^{+1*}

East Auckland

12

Franklin

10^{+1*}

Total confirmed cases last week:

189

Is Eradication feasible for measles and rubella

Biologically = YES

- **Programmatic feasibility**

e.g., political will, public support, donor support - **under review**

- **In the current context unlikely**

- **However all regions continue to have elimination goals**

- **Costs of delaying eradication**

- Human – preventable CRS cases, and measles deaths and morbidity
- Financial – cost of maintaining elimination; re-importations; outbreak response
- Political – inconsistent messaging; de-prioritization if goals not met
- Technical – progressive immunity gaps in older age cohorts; waning maternal immunity



ebolaalert.org



A DISEASE-FREE
WORLD IS POSSIBLE

Elimination is not eradication

Disease elimination (definition can be used variably)

- Cessation of transmission of a disease in a single country, continent or other limited geographic area
- Can 'eliminate' a disease in humans while the microbe remains at large in the environment eg neonatal tetanus
- A clinical manifestation can be eliminated although the disease may remain eg blindness from trachoma
- Can also mean control of a disease or its manifestation to a level no longer considered a 'public health problem' eg possibly cervical cancer 'elimination'

Cervical cancer elimination?

Call to Action: Towards Elimination of Cervical Cancer (WHA May 2018)

Vision: A world without cervical cancer

Goal: Eliminate cervical cancer as a public health problem by reducing the incidence of cervical cancer to below **4 cases per 100,000 woman-years**

2030
TARGETS

90%

of girls fully vaccinated with
HPV vaccine by 15 years of
age

70%

of women screened with an
HPV test at 35 and 45 years of
age and all managed
appropriately

30%

reduction in mortality from
cervical cancer

The 2030 targets and elimination threshold are subject to revision depending on the outcomes of the modeling exercise (SAGE Oct 2018)





A DISEASE-FREE
WORLD IS POSSIBLE