Global Health and Children

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Outline

- Describe important causes of illness and death among young children
- Discuss the impact of nutrition on child health
- Discuss low-cost interventions that have saved millions of lives
- Describe the impact of immunizations on child survival

How many children under the age of 5 died in 2022?

A) 10 million

B) 7.2 million

C) 4.9 million

D) 1.7 million

Answer

- The under 5 mortality rate is 37 children per 1000 live births which is around 4.9 million children per year (approximately 13,400 per day)

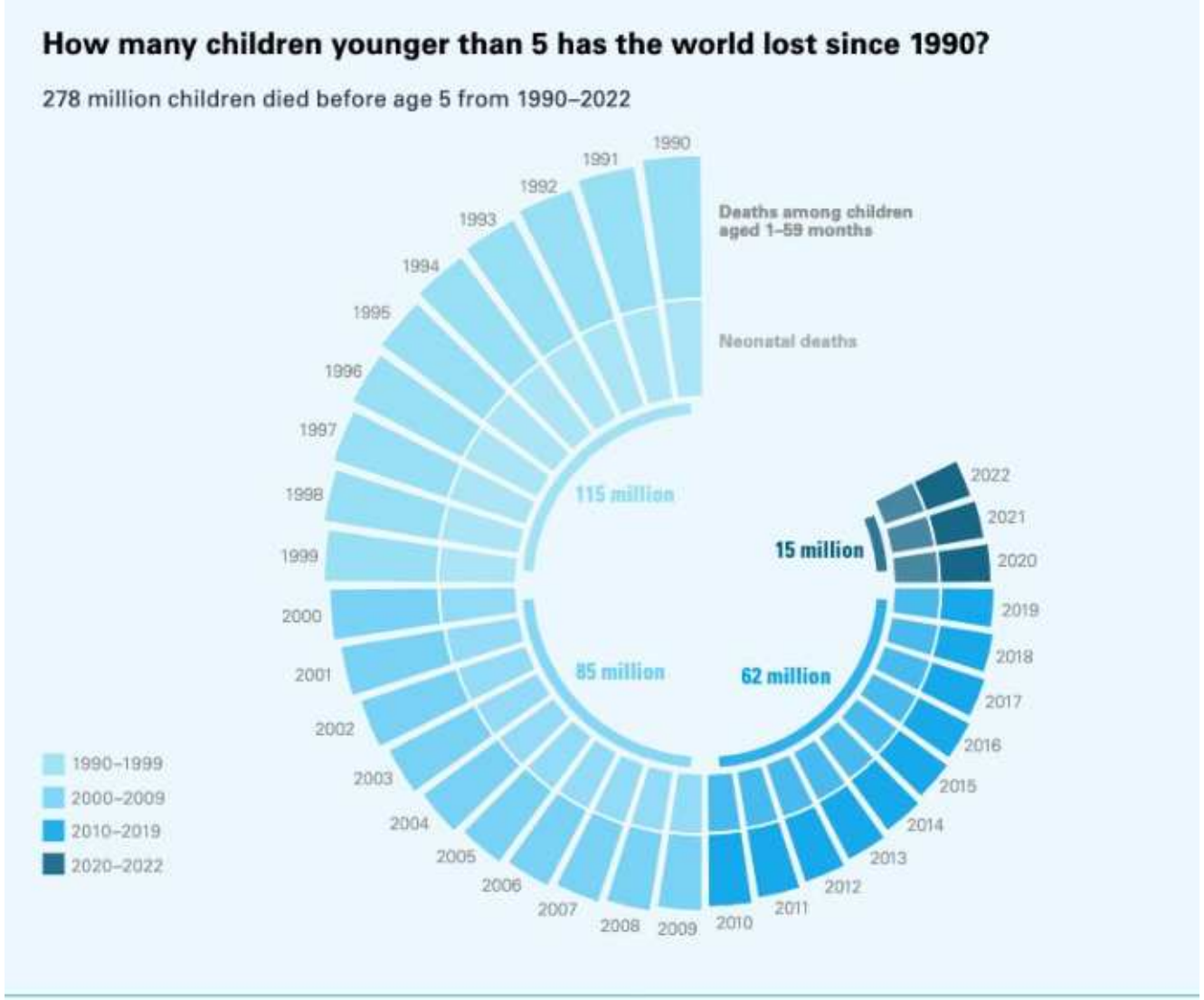
Global Child Deaths: Under-5 Mortality Rate

- Indicator of the state of a nation's children
- Annual number of deaths in children < 5 years per 1,000 live births
- Represents mortality risk during vulnerable years of childhood
- 99% of under-5 deaths occur in low- and middle-income countries

Under-5 Mortality Rate: Progress

- **4.9 million children died worldwide in 2022**
- **In 1990, more than 12 million children died**
- **Estimated rate globally is 37 deaths per 1000 live births**

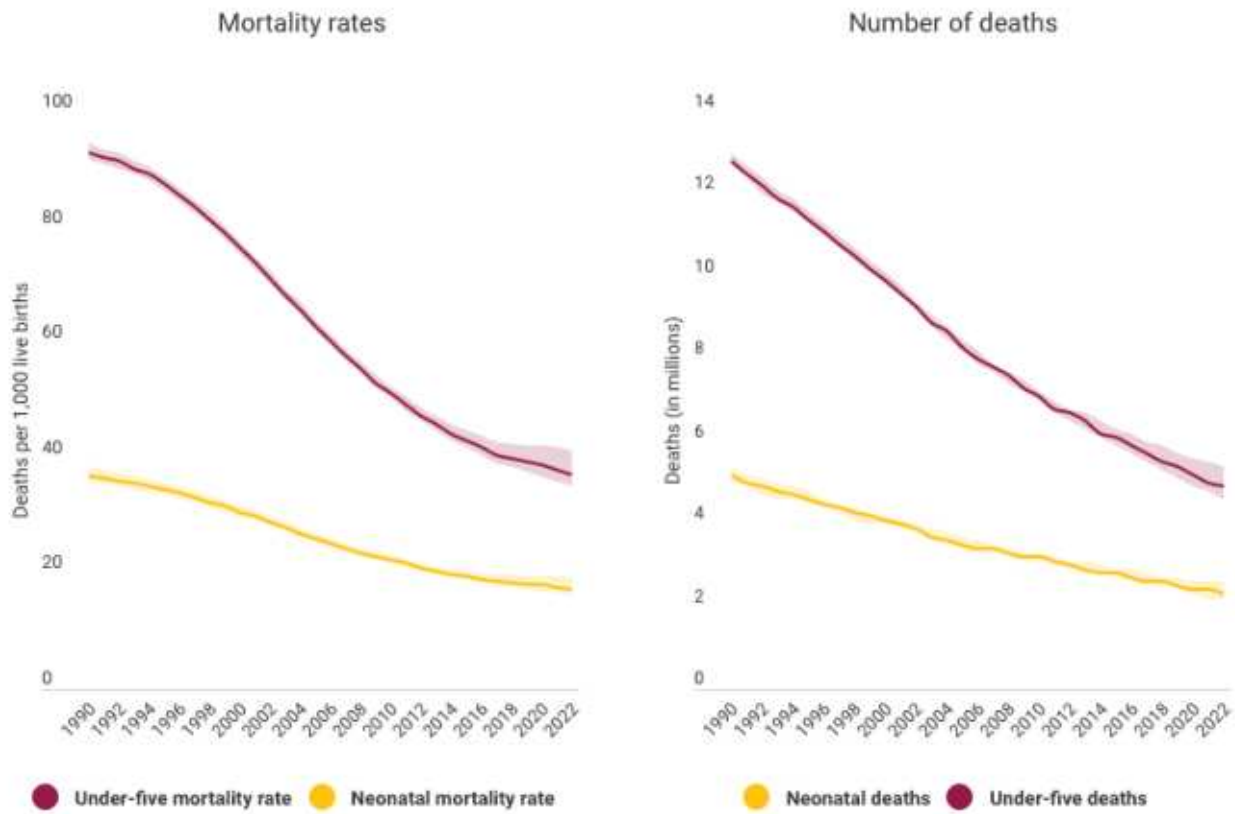
Note: approximately 50% of these deaths occur in the first year of life



Source: https://data.unicef.org/resources/levels-and-trends-in-child-mortality-2024/

Both the under-five mortality rate and the number of under-five deaths have fallen by more than half since 1990

Global mortality rates and number of deaths by age, 1990–2022



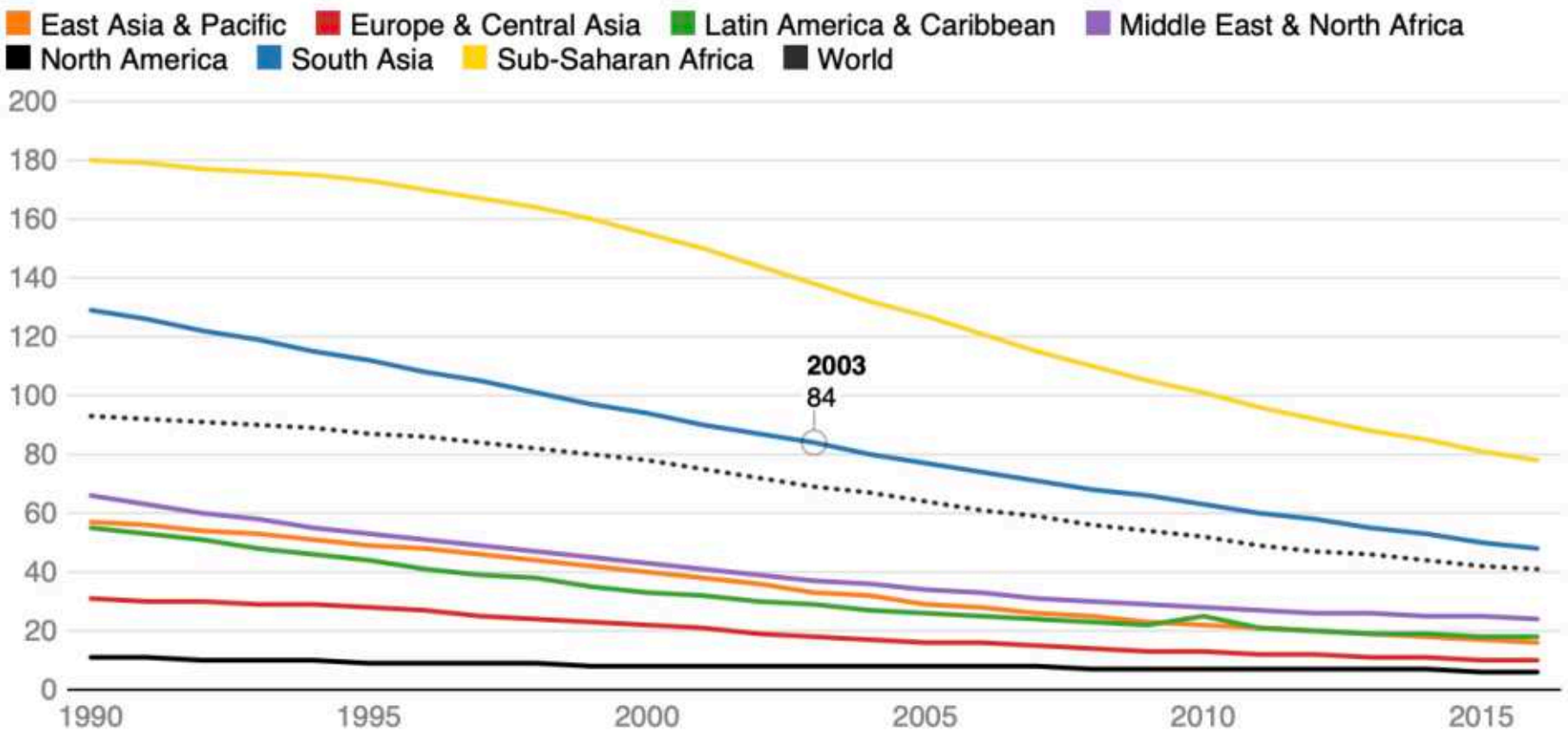
Note: All figures are based on unrounded numbers. The solid line represents the median estimate and the shaded area represents the 90 per cent uncertainty bound around the median value.

Source: United Nations Inter-agency Group for Child Mortality Estimation (UN IGME), 2024.

https://data.unicef.org/topic/child-survival/under-five-mortality/

In the last 26 years, the global under-five mortality rate dropped by 56%

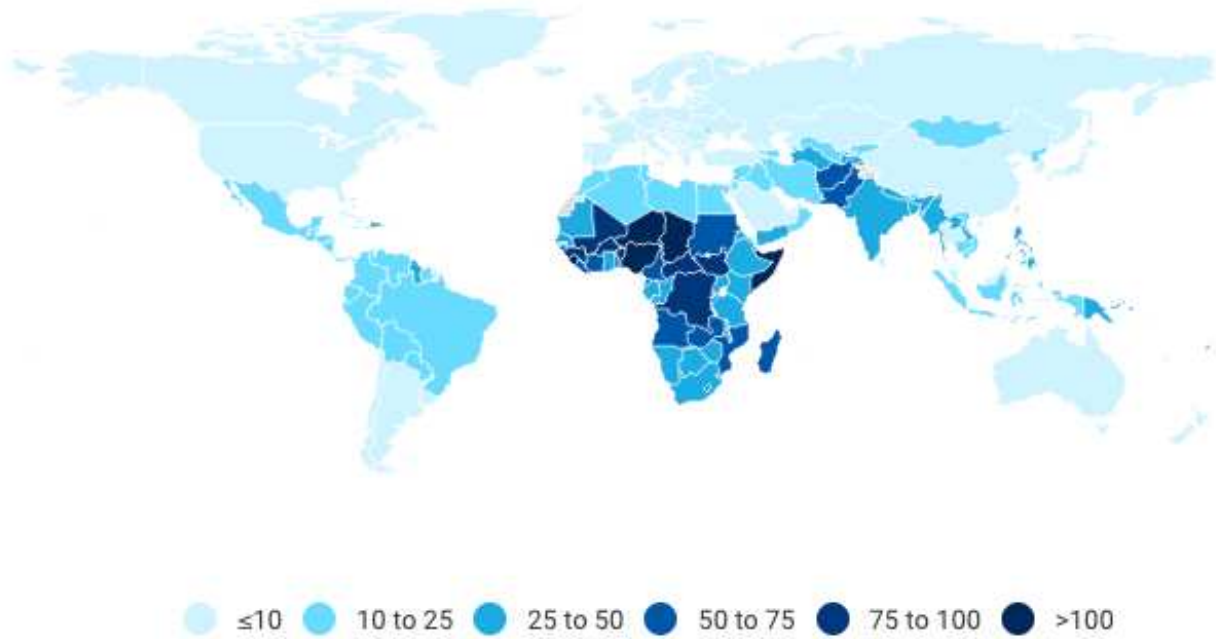
Under-five mortality rate (per 1,000 live births), 1990-2016



Source: World Development Indicators

The highest national under-five mortality rates are found in sub-Saharan Africa

Under-five mortality rate (deaths per 1,000 live births) by country, 2022



This map does not reflect a position by UNICEF on the legal status of any country or territory or the delimitation of any frontiers.

Note: The classification is based on unrounded numbers.

Source: United Nations Inter-agency Group for Child Mortality Estimation (UN IGME), 2024

https://data.unicef.org/topic/child-survival/under-five-mortality/

By Ashish P. Thakrar, Alexandra D. Forrest, Mitchell G. Maltenfort, and Christopher B. Forrest

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NO. 1 (2018): 140–149

Child Mortality In The US And 19 OECD Comparator Nations: A 50-Year Time-Trend Analysis

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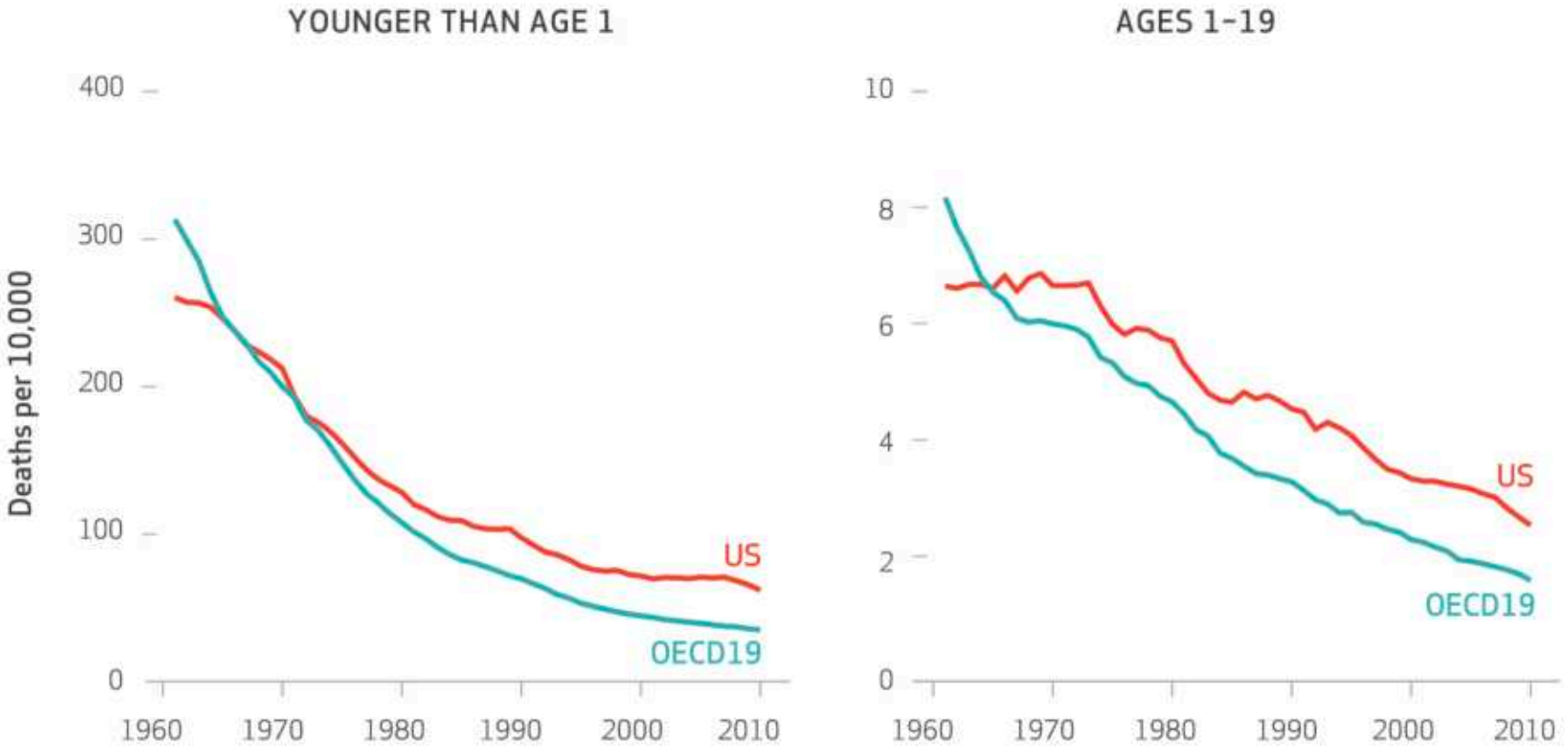
Mitchell G. Maltenfort is a biostatistician at the Children's Hospital of Philadelphia, in Pennsylvania.

Christopher B. Forrest is a professor of pediatrics at the Children's Hospital of Philadelphia.

ABSTRACT **The United States has poorer child health outcomes than other wealthy nations despite greater per capita spending on health care for children. To better understand this phenomenon, we examined mortality trends for the US and nineteen comparator nations in the Organization for Economic Cooperation and Development for children ages 0–19 from 1961 to 2010 using publicly available data. While child mortality progressively declined across all countries, mortality in the US has been higher than in peer nations since the 1980s. From 2001 to 2010 the risk of death in the US was 76 percent greater for infants and 57 percent greater for children ages 1–19. During this decade, children ages 15–19 were eighty-two times more likely to die from gun homicide in the US. Over the fifty-year study period, the lagging US performance amounted to over 600,000 excess deaths. Policy interventions should focus on infants and on children ages 15–19, the two age groups with the greatest disparities, by addressing perinatal causes of death, automobile accidents, and assaults by firearm.**

EXHIBIT 1

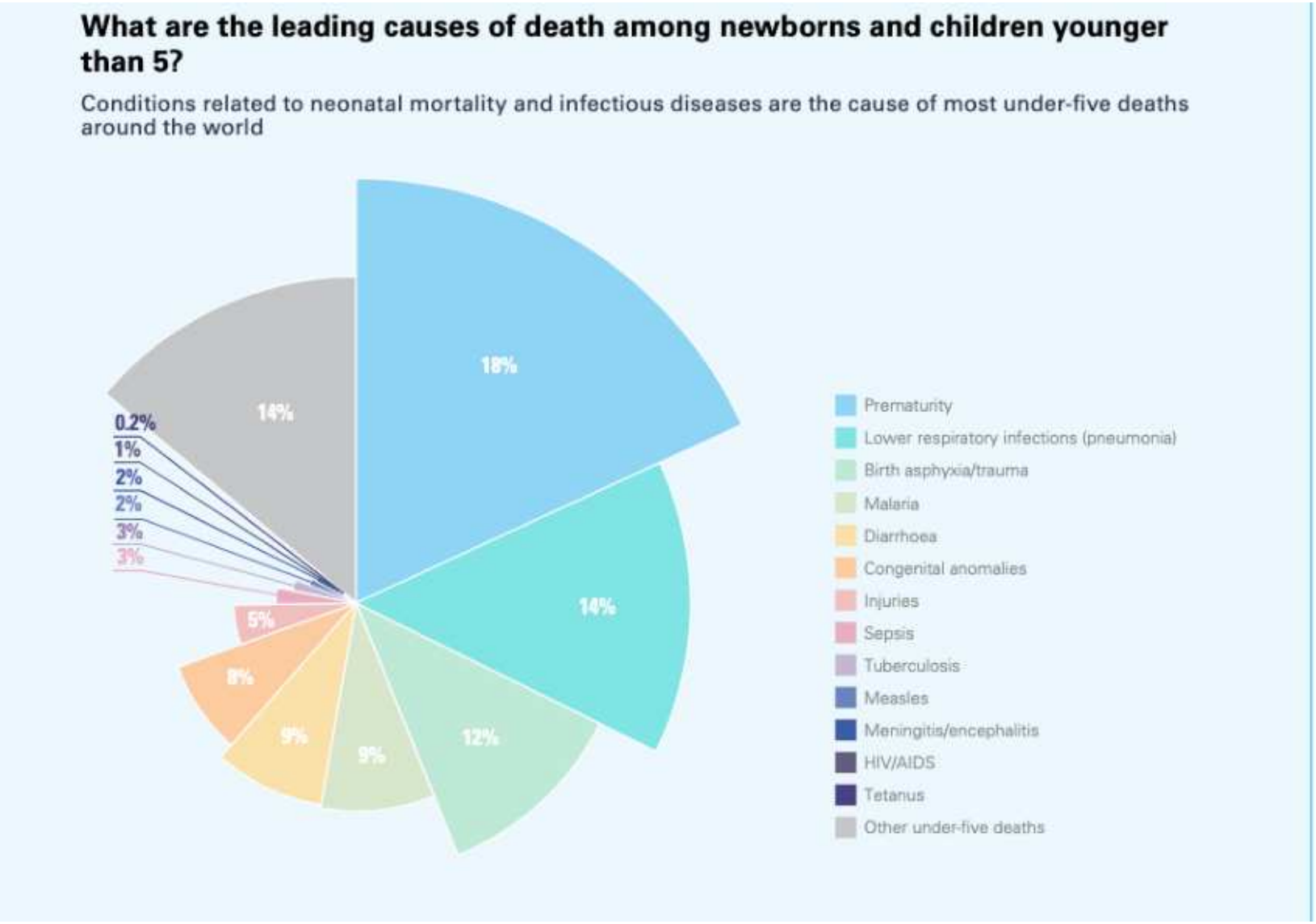
Child mortality in the US and the OECD19, by age group, 1960–2010



SOURCE Authors' analysis of data from the Human Mortality Database (University of California, Berkeley, and Max Planck Institute for Demographic Research). **NOTES** The OECD19 is a group of nineteen developed nations other than the US in the Organization for Economic Cooperation and Development. Results for children in the 1–19 age group are age-adjusted.

What is the most common cause of mortality in young children globally?

A. Motor vehicle accidents
B. Pneumonia
C. Drownings
D. HIV

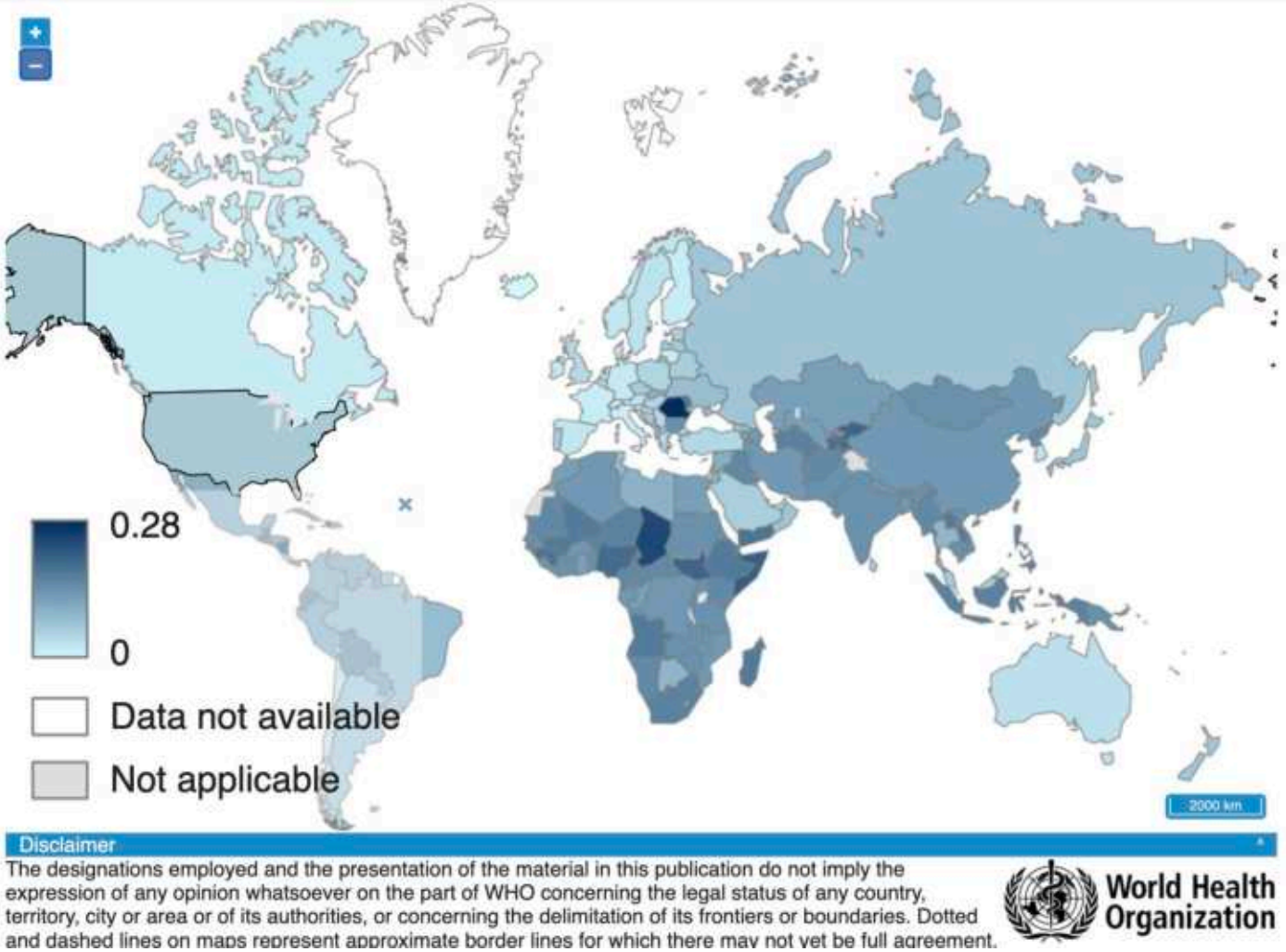


Source: Levels and Trends in Child Mortality: https://data.unicef.org/resources/levels-and-trends-in-child-mortality-2024/

Acute Respiratory Infections (ARI's)

- **Most common cause of death in children worldwide**
- **Pneumonia and other ARI's → 750,000 child deaths**
- **Bacterial and viral pathogens commonly seen in US**
- **Children who die from ARI's usually underweight, have micronutrient deficiencies and suboptimal prevention and treatment options**

Distribution of under-5 deaths caused by ARI's



Challenges with Managing ARI's in LMIC

- Limited access to healthcare
- Shortage of trained healthcare workers
- Delayed diagnosis due to:
  - Symptom overlap with other infections such as malaria
  - Lack of diagnostic tools (CXR, pulse oximeters)
- Limited availability of antibiotics and oxygen therapy
- Increasing antimicrobial resistance
- High treatment costs
- Video: **http://www.youtube.com/watch?v=XFWoKljYJmY**

How to prevent ARI's in children

- Vaccination: pneumococcal, HIB, measles, influenza and RSV
- Exclusive breastfeeding: strengthens the immune system
- Adequate nutrition: improves immunity
- Improved sanitation and hygiene: reduces respiratory infections
- Improved access to healthcare: ensures timely administration of antibiotics and oxygen supplementation

Perinatal/Neonatal Deaths

Approximately 50% of all deaths in children < 5 years occur in the neonatal period

98% of all perinatal deaths occur in LMIC countries

Causes:

Infections	**Birth asphyxia**	**Injuries**	**Prematurity/low birth weight**

Strategies to Reduce Perinatal Deaths

- Quality prenatal care
- Presence of a skilled birth attendant
- Availability of emergency obstetric care
- Prevention and treatment of infections
- Encouraging skin-to-skin contact (kangaroo mother care), especially for preterm babies
- Video: https://vimeo.com/247674958

What advance in 1978 led to a major decline in child deaths from diarrheal disease?

- Quinolone antibiotics
- Rotavirus vaccine
- Slow sand filtration for water purification
- Oral rehydration solution

Oral Rehydration Solution: ORS

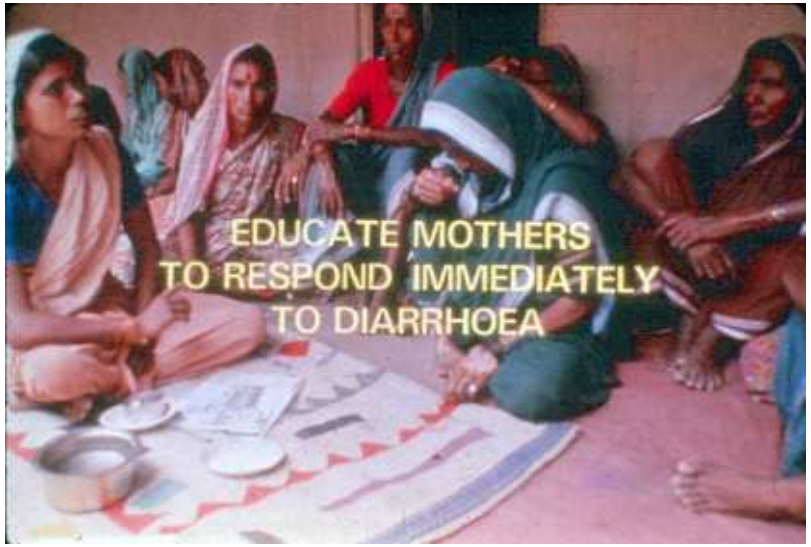
- **"The discovery that sodium transport and glucose transport are coupled in the small intestine so that glucose accelerates absorption of solute and water (is) potentially <u>the most important medical advance this century."</u>**

The Lancet
British Scientific Journal
5th August, 1978

Diarrhea - ORS

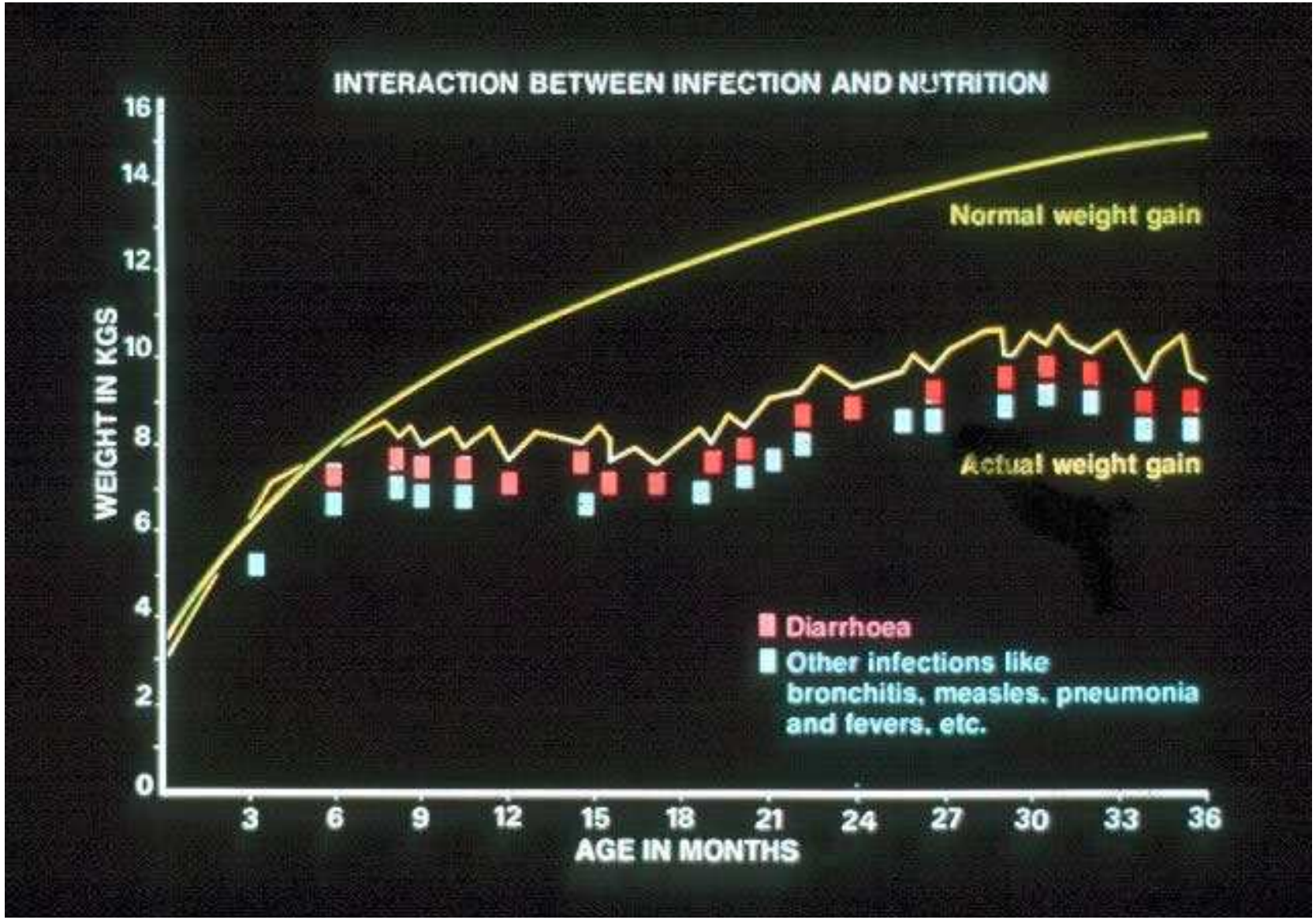
- **One of most important medical advances in 20th century**
- **Introduced in 1978**
- **Millions of lives have been saved**
- **ORS use rate – estimated at < 50%**

Diarrhea - Management



- Continued feedings during diarrheal episodes
- ORS
- Improved female education (better home management and seek health care earlier)
- **Zinc supplementation –reduces duration of diarrhea and stool volume**


weakens the digestive system
DIARRHOEA
MALNUTRITION
greater susceptibility to other diseases


INTERACTION BETWEEN INFECTION AND NUTRITION
WEIGHT IN KGS
16
14
12
10
8
6
4
2
0
Normal weight gain
Actual weight gain
Diarrhoea
Other infections like bronchitis, measles, pneumonia and fevers, etc.
3
6
9
12
15
18
21
24
27
30
33
36
AGE IN MONTHS

Malnutrition

- **Most important threat to health**
- **Mild to moderate underweight and stunting most common**
- **Micronutrient deficiencies**
- **Severe forms: marasmus and kwashiorkor**

Protein-energy malnutrition (PEM)

- **Most prevalent form of malnutrition – affects at least 500 million children**
- **Major factor in 50% deaths**
- **Spectrum: stunting and underweight to kwashiorkor and marasmus**
- **Rates of severe forms range from 1-5% except during times of famine**
- **Rates of mild to moderate forms 30-70%**
- **Pathogenesis complex**

Childhood Stunting

- **Children who are too short for their age group**
- **About 165 million children are stunted globally; highest rates in Africa and Asia**
- **Key indicator of chronic malnutrition**
- **Results from insufficient calories, a vitamin- and mineral deficient diet, disease**
- **As growth slows down, brain development lags which leads to poor learning**

Kwashiorkor

- **“Displaced child”**
- **Often preceded by a significant infection**
- **Low albumin, edema, muscle wasting, skin lesions, lightened hair color, enlarged fatty liver, apathy**
- **Traditionally viewed as protein malnutrition**

Marasmus

- **A severe form of PEM**
- **Characterized by calorie deficiency**
- **Body mass significantly decreased**
- **Irritability, chronic diarrhea, wasted appearance**

WHO Breastfeeding Recommendations

- **Exclusive breastfeeding for 6 months**
  - **Fewer than 4 in 10 children EBF**
  - **Least developed countries have higher rates (48%)**
- **Introduce safe complementary foods at 6 months**
- **Continued breastfeeding for up to 2 years**

World Health Organization

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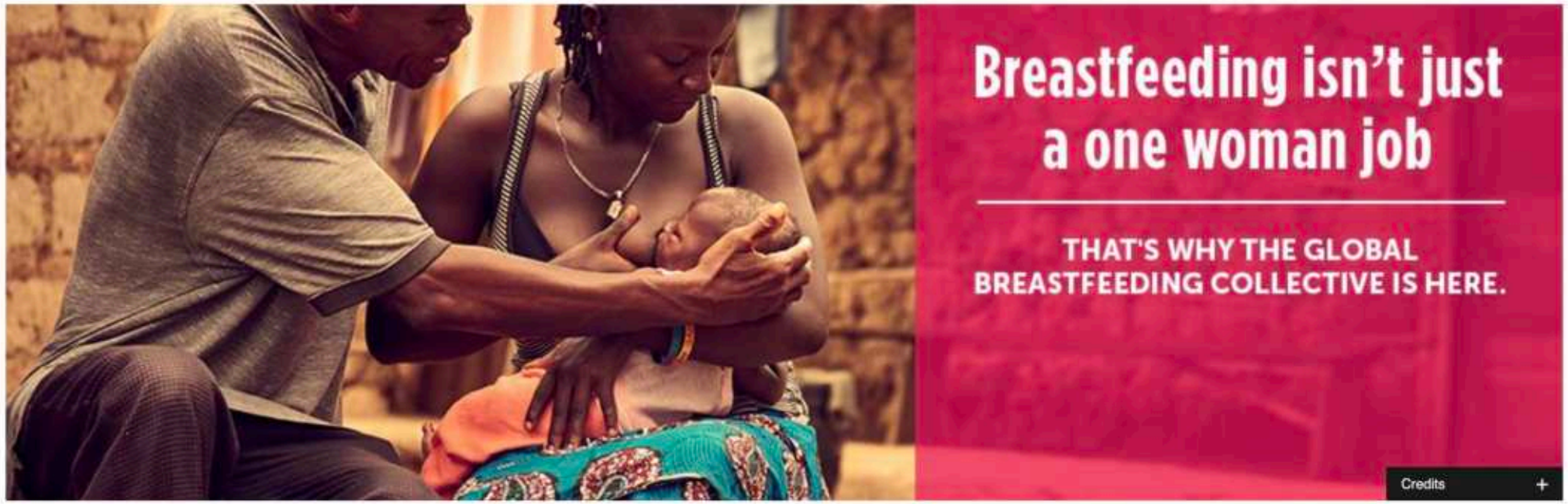
Home / Newsroom / Detail / Babies and mothers worldwide failed by lack of investment in breastfeeding



Babies and mothers worldwide failed by lack of investment in breastfeeding

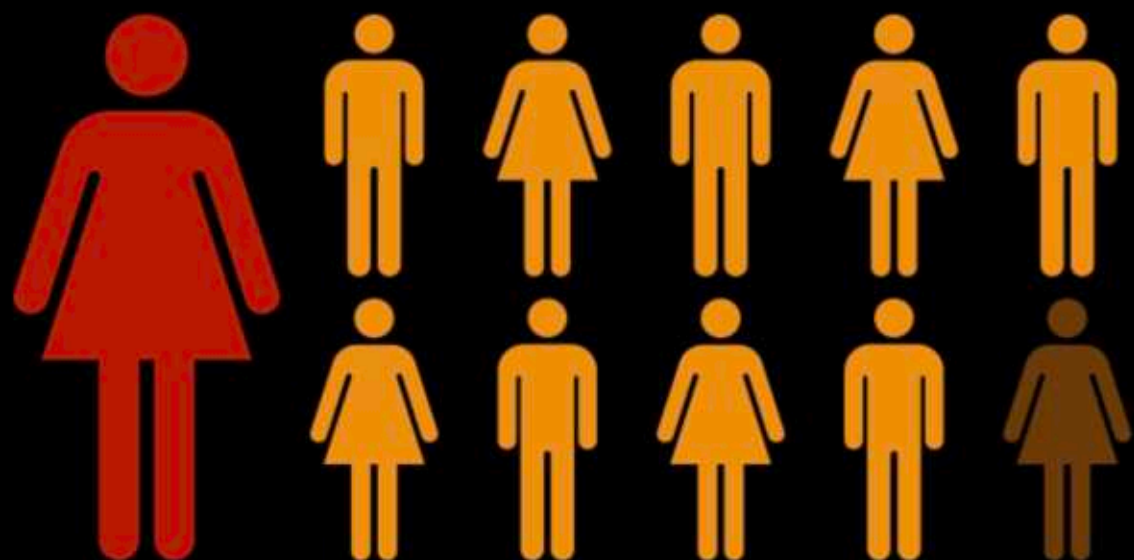
العربية | 中文 | Français | Русский | Español

Which vaccine preventable disease is considered one of the most highly contagious diseases in the world?

A. Measles
B. Pertussis
C. Influenza
D. Mumps

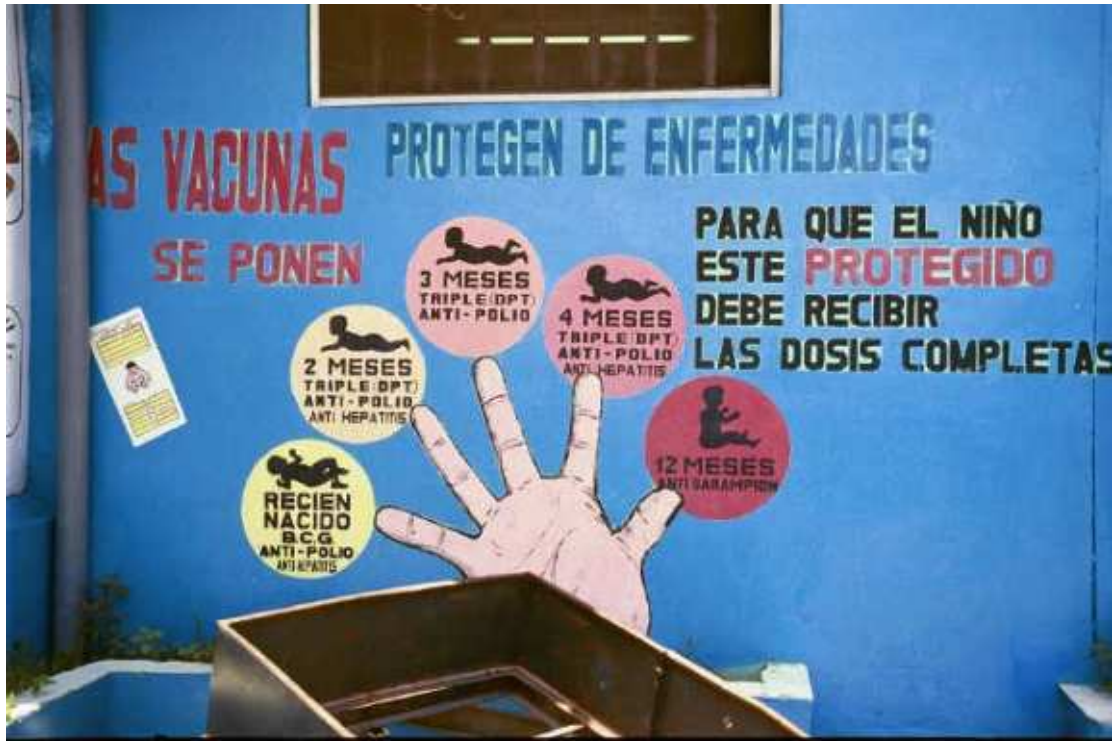
MEASLES

is **highly contagious** and spreads through the air when an infected person **coughs or sneezes**.



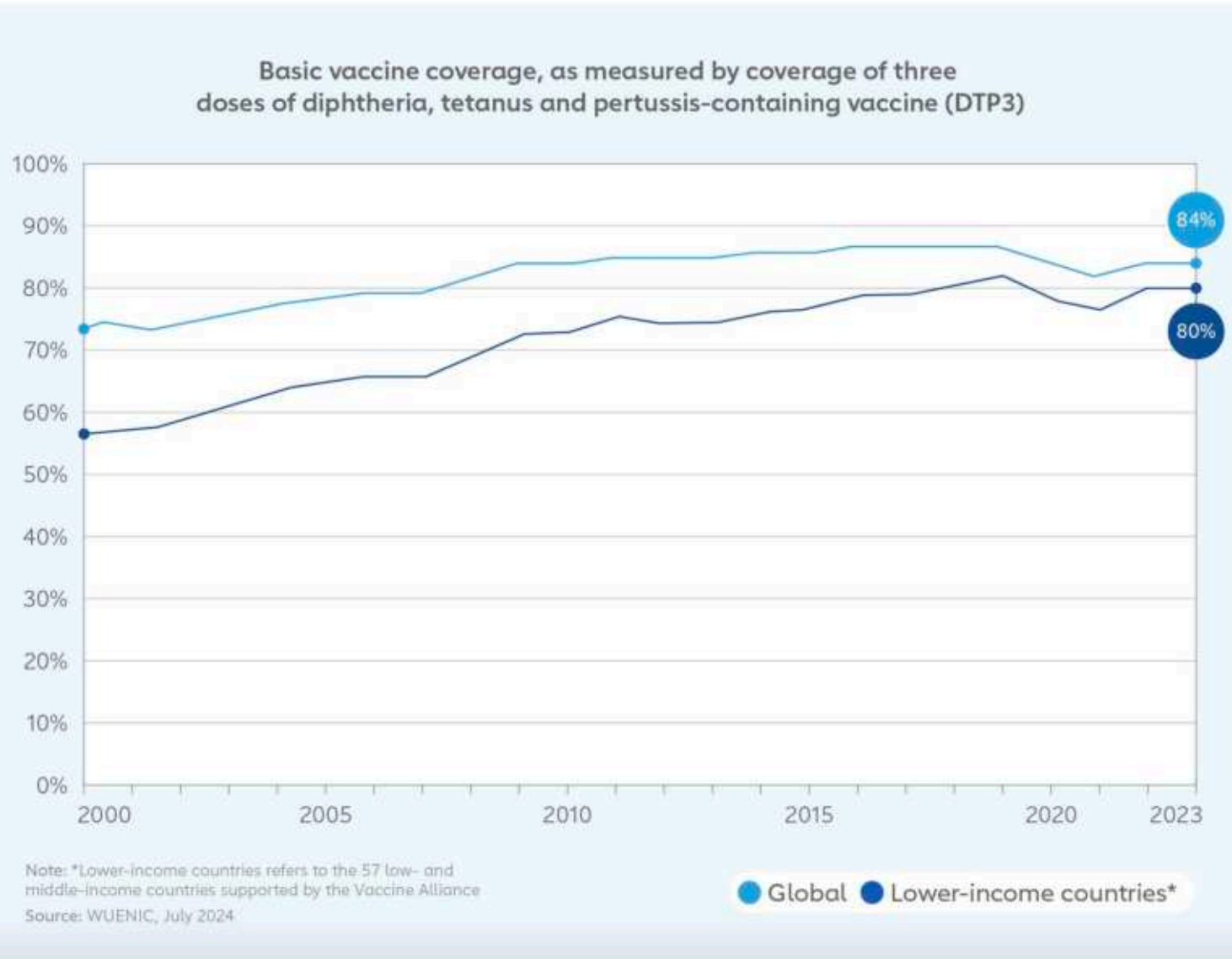
It is so contagious that if one person has it, **9 out of 10 people** of all ages around him or her will also become infected if they are not protected.

Vaccines


AS VACUNAS PROTEGEN DE ENFERMEDADES
SE PONEN
PARA QUE EL NIÑO
ESTE PROTEGIDO
DEBE RECIBIR
LAS DOSIS COMPLETAS
3 MESES
TRIPLE (DPT)
ANTI-POLIO
4 MESES
TRIPLE (DPT)
ANTI-POLIO
2 MESES
TRIPLE (DPT)
ANTI-POLIO
ANTI HEPATITIS
12 MESES
RECIEN
NACIDO
B.C.G.
ANTI-POLIO

Vaccine Coverage

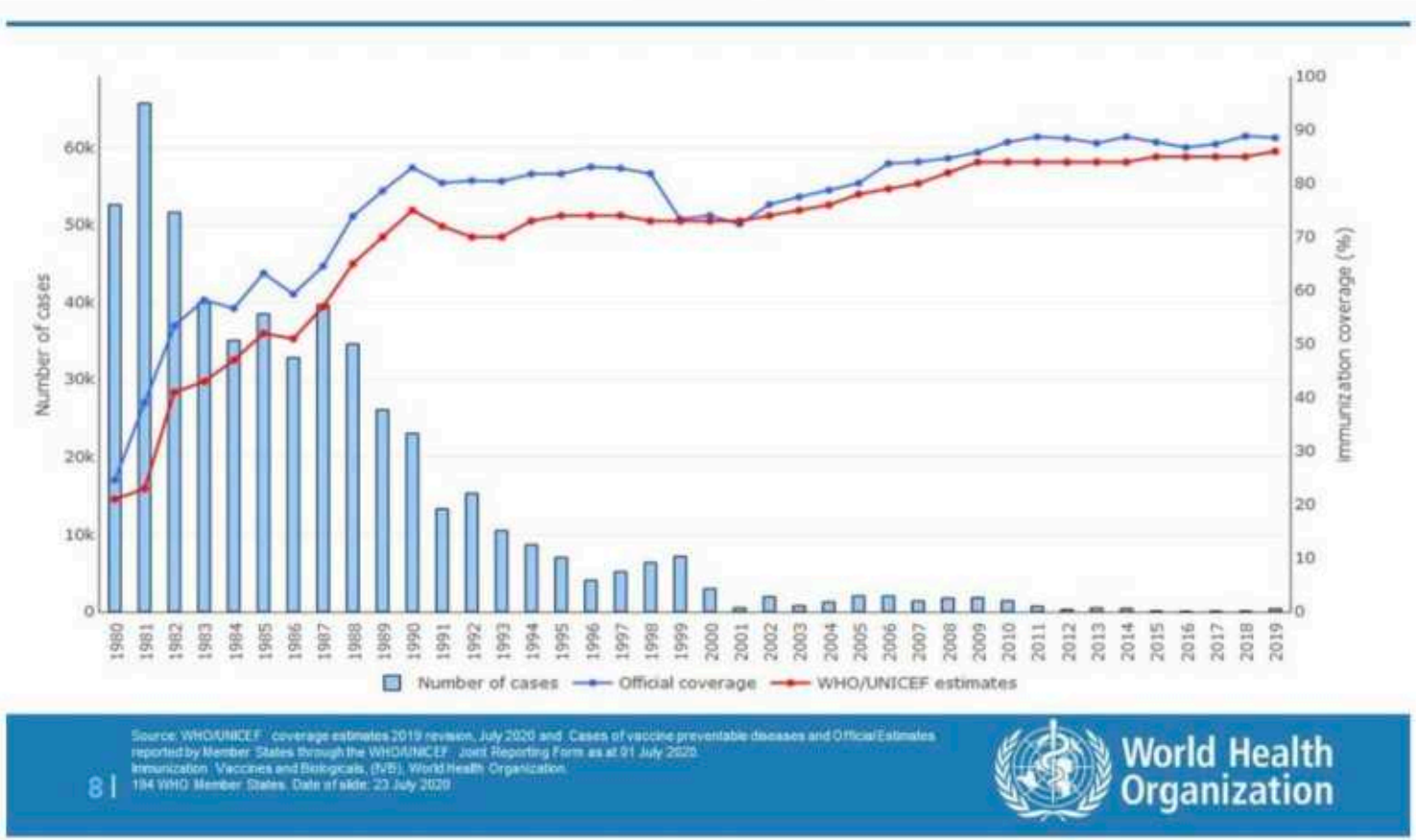
- **Immunization averts around 2-3 million deaths per year**
- **Around 19 million infants worldwide are not receiving vaccines**
- **Key challenges: limited resources, competing health priorities, poor management of health systems; inadequate monitoring and supervision**


Basic vaccine coverage, as measured by coverage of three doses of diphtheria, tetanus and pertussis-containing vaccine (DTP3)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2000
2005
2010
2015
2020
2023
84%
80%
Note: *Lower-income countries refers to the 57 low- and middle-income countries supported by the Vaccine Alliance
Source: WUENIC, July 2024
Global
Lower-income countries*

Polio

- **Mainly impacts children under 5 year old**
- **One out of every 200 infections leads to irreversible paralysis**
- **There were only 6 reported cases of wild polio virus infection in 2021**
- **Endemic transmission continues to occur in only 2 countries: Afghanistan, and Pakistan**

Poliomyelitis Global annual reported cases and Pol3 coverage 1980-2019



Source: WHO/UNICEF coverage estimates 2019 revision, July 2020 and Cases of vaccine preventable diseases and Official Estimates reported by Member States through the WHO/UNICEF Joint Reporting Form as at 01 July 2020.
Immunization, Vaccines and Biologicals, (IVB), World Health Organization.
194 WHO Member States. Date of slide: 23 July 2020

World Health Organization

The number of polio cases has dropped significantly, but the COVID pandemic threatens this progress.

Progress with Measles

- Prior to introduction of the measles vaccine, an estimated 2.6 million people died from measles each year
- **There were 136,000 deaths in 2022**
- Causes of death from measles usually due to complications: encephalitis, pneumonia, diarrhea with dehydration
- Severe cases more common in children with Vitamin A deficiency
- Global measles vaccines coverage has stalled at 85 % for the last several years

But….in 2016 measles deaths were only 90,000

Immunization, measles (% of children ages 12-23 months)

WHO and UNICEF (who.int/immunization/monitoring_surveillance/en).

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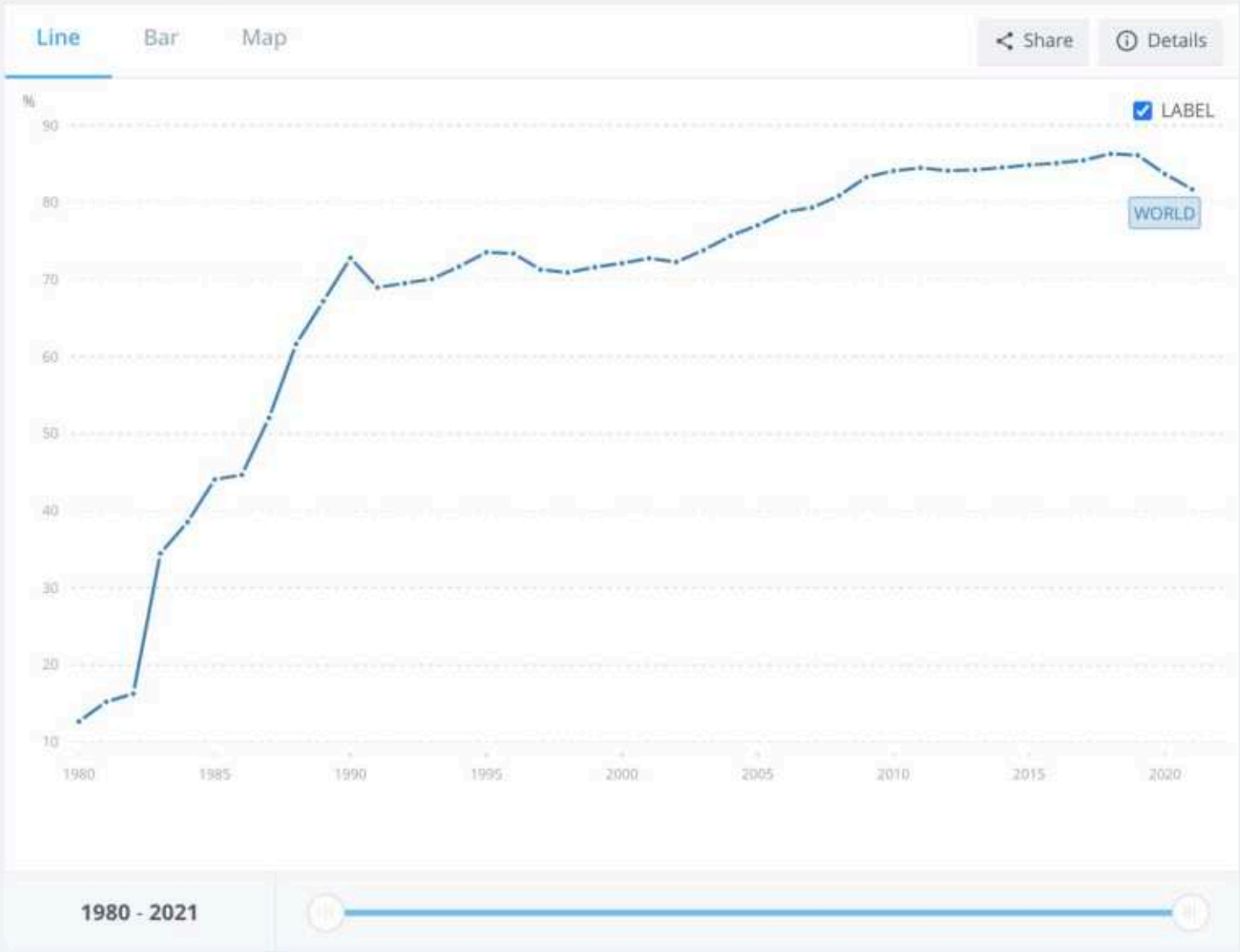
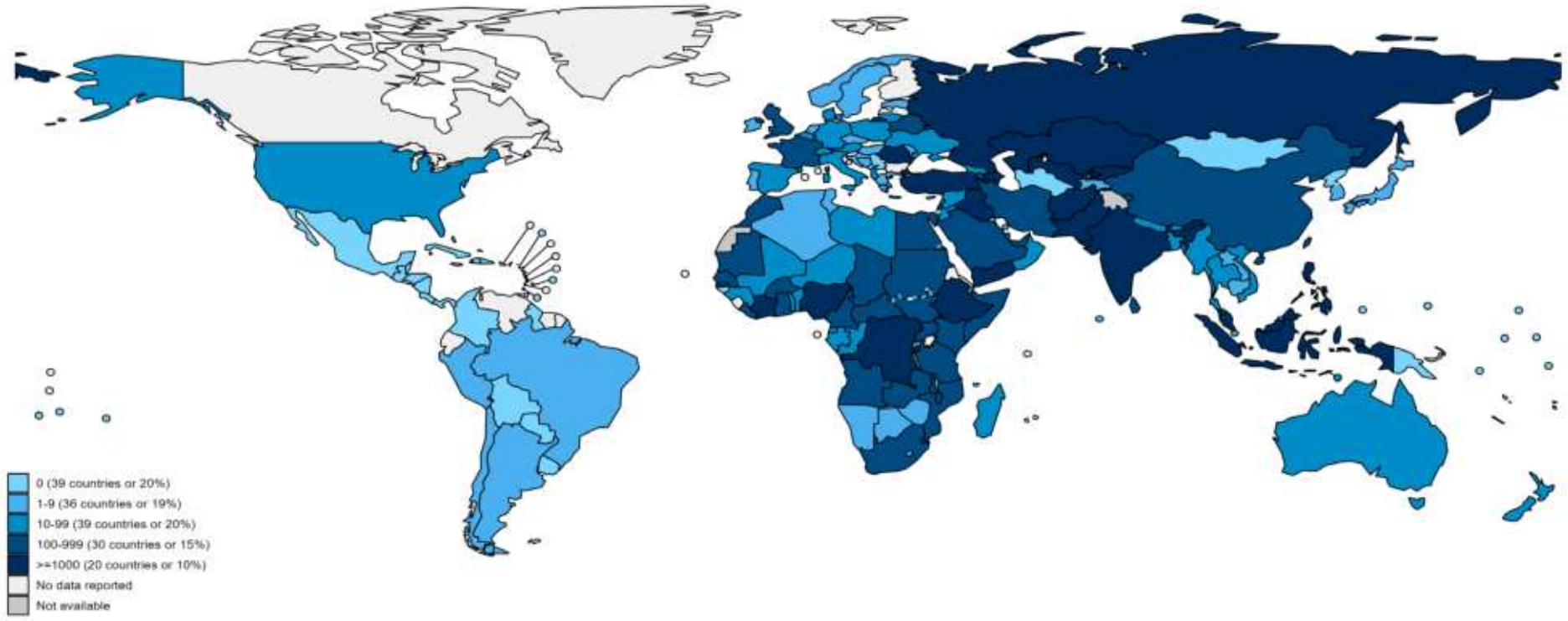


Number of Reported Measles Cases (Last 6 months)



World Health Organization

Data source: IVB Database

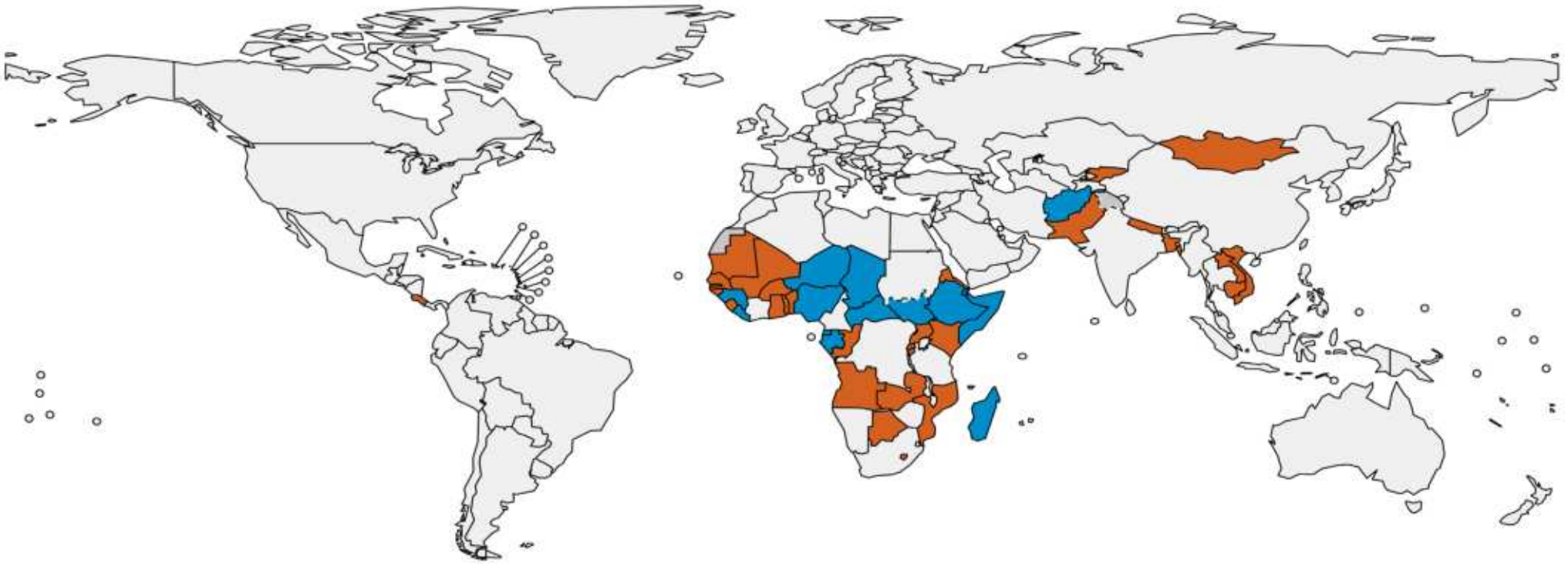
Disclaimer: The boundaries and names shown and the designations used on this map do notimply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

0 875 1750 3500 Kilometers

Country	Cases*
Kazakhstan	21,740
Azerbaijan	13,720
Yemen	13,676
India**	13,220
Iraq	11,595
Ethiopia	9,042
Kyrgyzstan	7,601
Russian Federation	7,594
Pakistan	5,812
Indonesia	5,648

Notes: Based on data received 2024-03 - Surveillance data from 2023-08 to 2024-01 - * Countries with highest number of cases for the period - **WHO classifies all suspected measles cases reported from India as measles clinically compatible if a specimen was not collected as per the algorithm for classification of suspected measles in the WHO VPD Surveillance Standards. Thus numbers might be different between what WHO reports and what India reports.

Upcoming MMR, MR and Measles campaigns (2024-2025)



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0 875 1750 3500 Kilometers

Measles MR No campaign planned Not applicable

Measles US 2025

U.S. Cases in 2025

Total cases

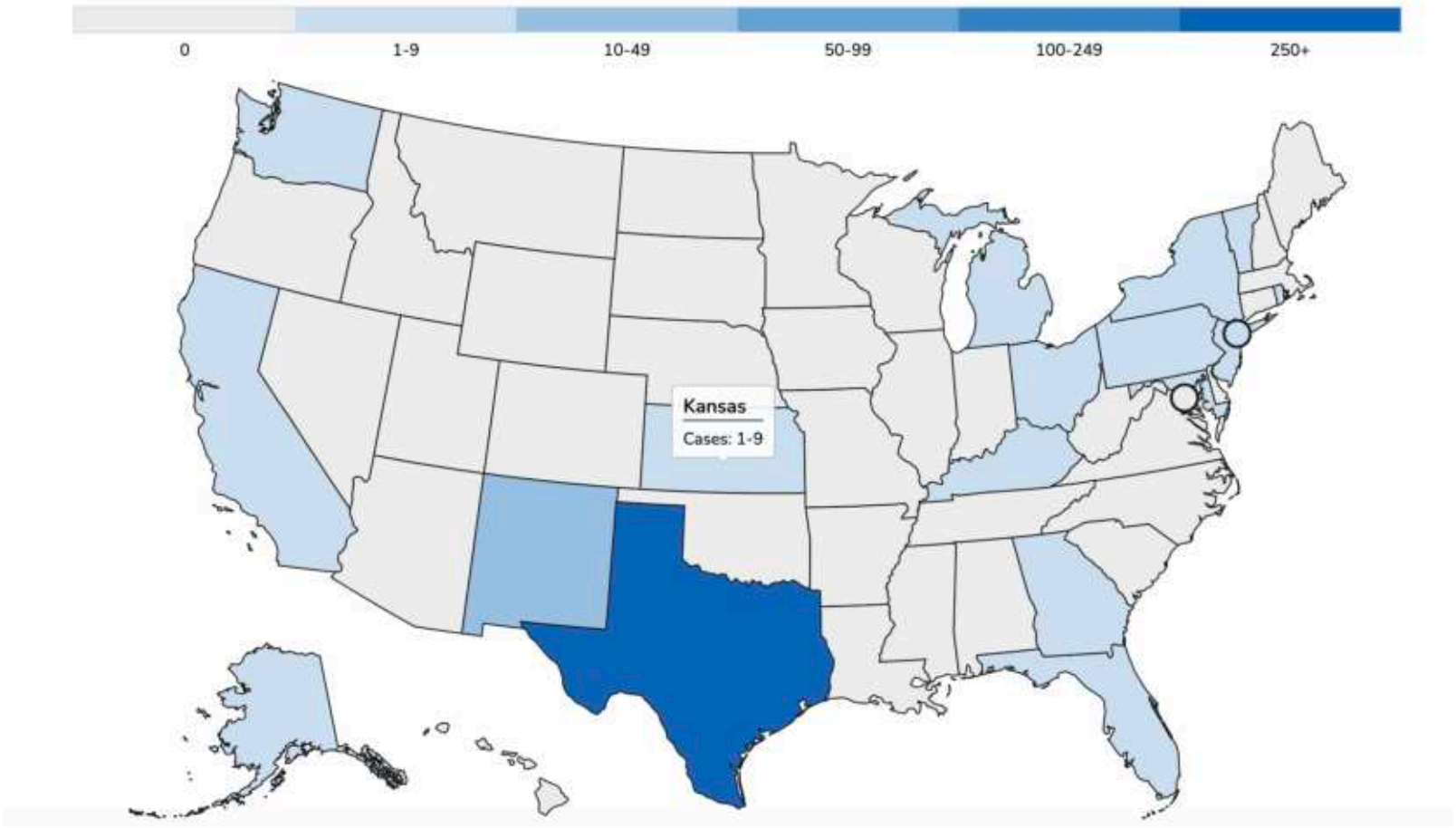
378

Age
Under 5 years: **124 (33%)**
5-19 years: **159 (42%)**
20+ years: **86 (23%)**
Age unknown: **9 (2%)**

Vaccination Status
Unvaccinated or Unknown: **95%**
One MMR dose: **3%**
Two MMR doses: **2%**

https://www.cdc.gov/measles/data-research/index.html

Measles in the US 2025



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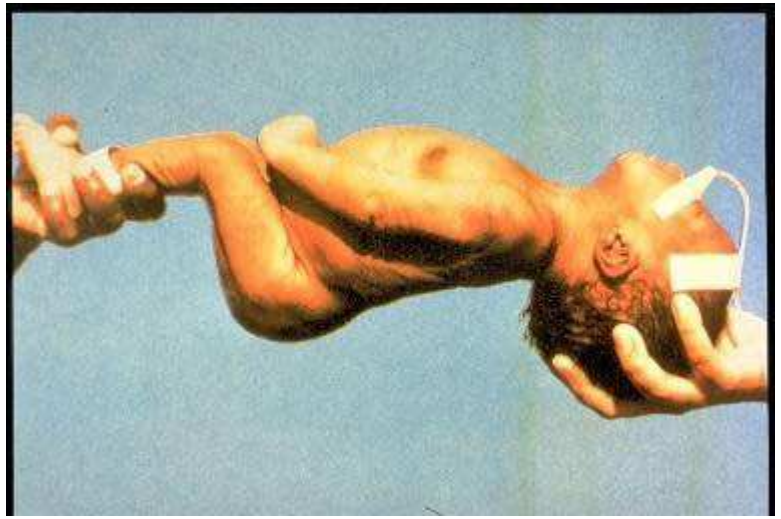
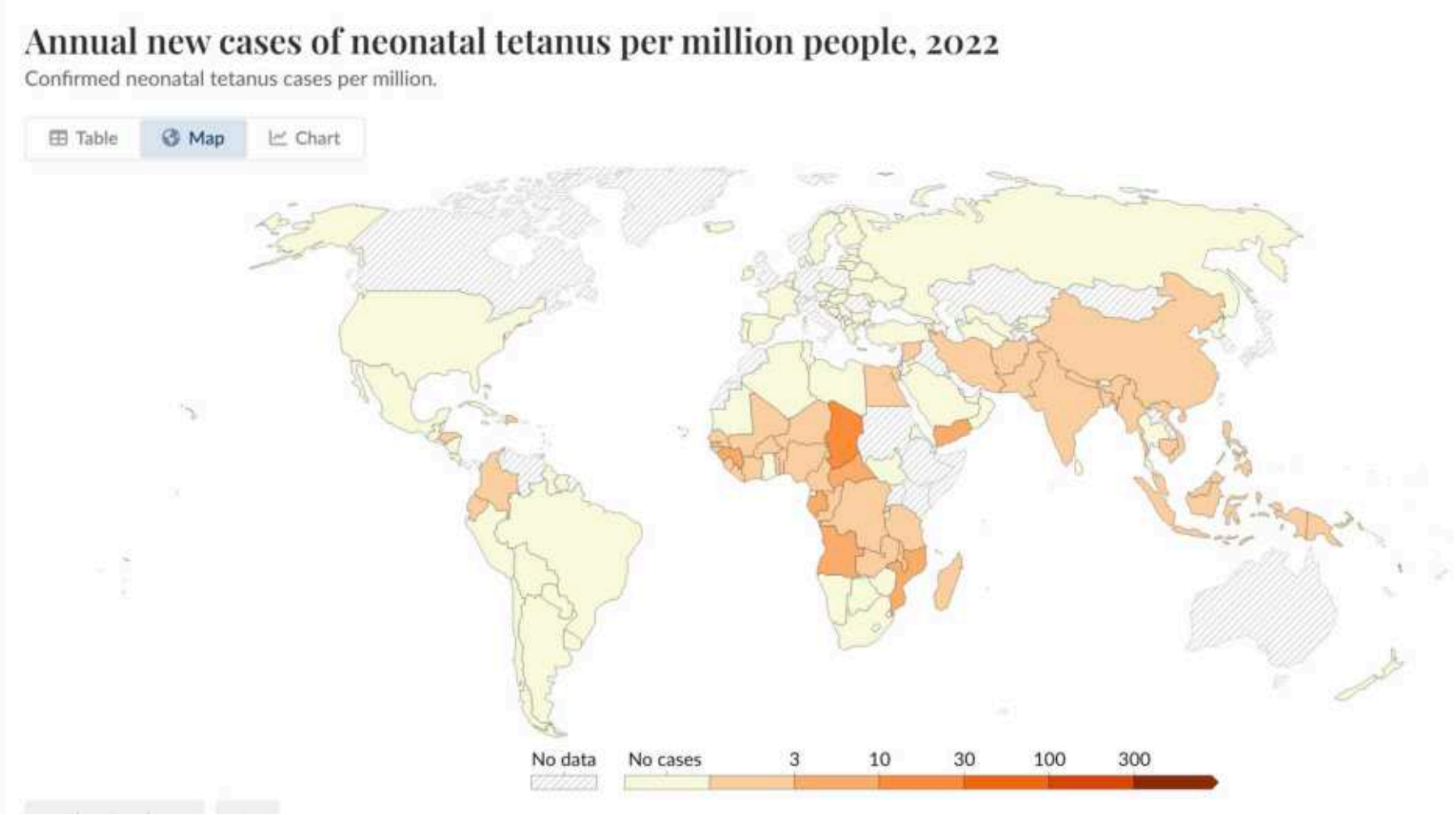
Neonatal Tetanus



- **Common in rural areas with home deliveries and inadequate sterile procedures**
- **Caused by the action of a potent neurotoxin produced during the growth of the bacteria in dead tissues, e.g. in dirty wounds or in the umbilicus following non-sterile delivery**

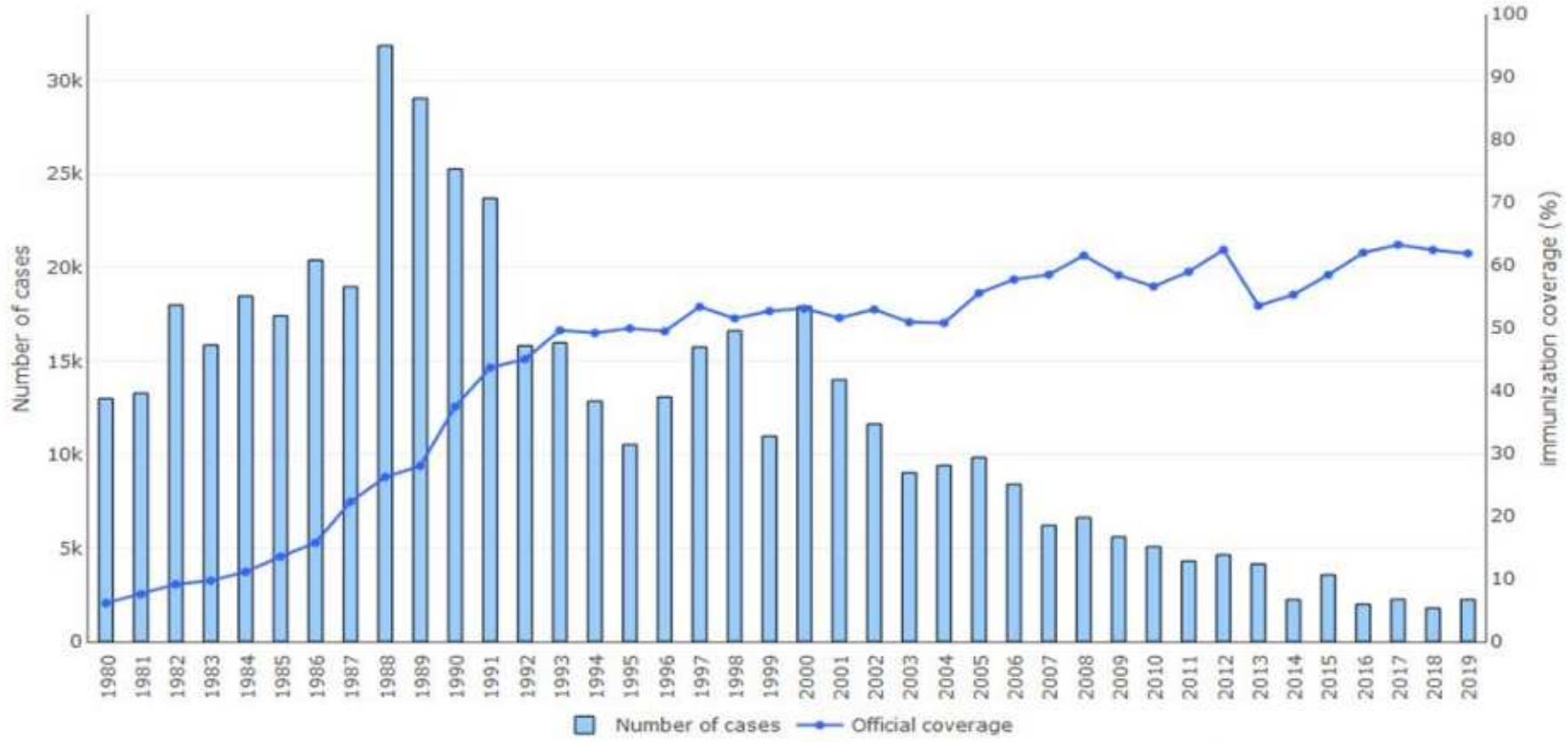
Maternal Neonatal Tetanus Update

- **MNT was eliminated between 2000 and 2014 in 35 of 59 countries**
- **As of 2022, 47 countries have eliminated MNT; MNT continues to be a major public health problem in 12 LMIC**
- **Neonatal tetanus was estimated to have affected 1,995 babies in 2021**



Data source: World Health Organization - Global Health Observatory (2024); Population based on various sources (2023) – Learn more about this dataOurWorldinData.org/tetanus | CC BY

Neonatal tetanus Global annual reported cases and TT2plus coverage 1980-2019



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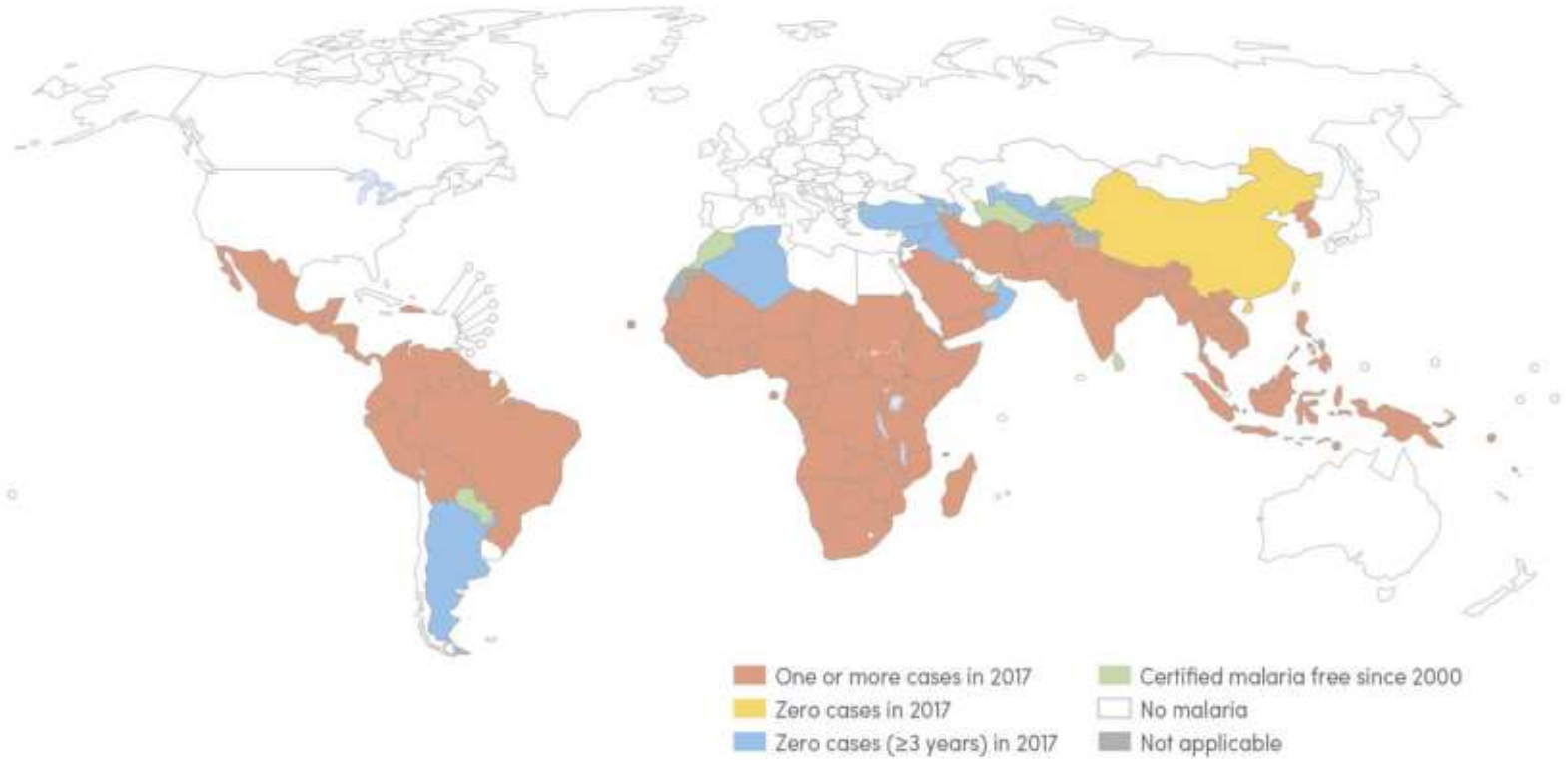
The parasite most responsible for childhood death is:

A. Entamoeba histolytica
B. Leishmania tropica
C. Plasmodium falciparum
D. Trypanosoma brucei

Malaria: Half of the world's population is at risk

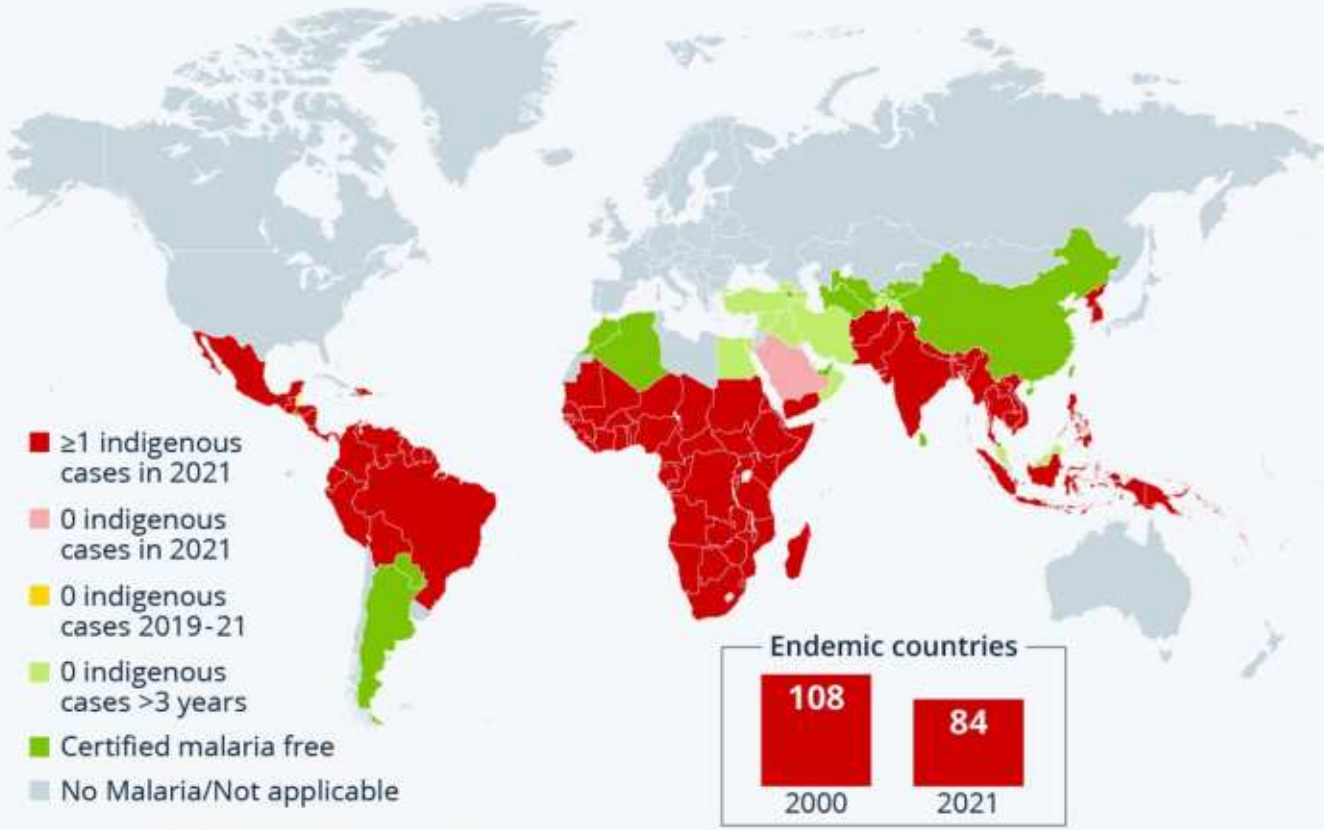
Countries with indigenous cases in 2000 and their status by 2017 Countries with zero indigenous cases over at least the past 3 consecutive years are considered to be malaria free. All countries in the WHO European Region reported zero indigenous cases in 2016 and again in 2017. In 2017, both China and El Salvador reported zero indigenous cases. *Source: WHO database.*



WHO: World Health Organization.

Malaria: Progress and Challenges

Status of indigenous malaria cases in 2021
in countries which had at least one case in 2000



Source: World Health Organization

Malaria

- **Fever/chills - periodicity**
- **Myalgias/fatigue**
- **Headache**
- **Nausea/vomiting/ abdominal pain/diarrhea**
- **Cough/dyspnea**
- **HSM/jaundice**
- **Mental confusion**

Responsible for approximately 5% of childhood deaths

Malaria Facts - 2023

- **Approximately 263 million cases of malaria occurred globally**
- **An estimated 597,000 deaths due to malaria – around 80% of the deaths were in children under age 5 years**
- **The majority of malaria deaths (94%) were in the Africa region**

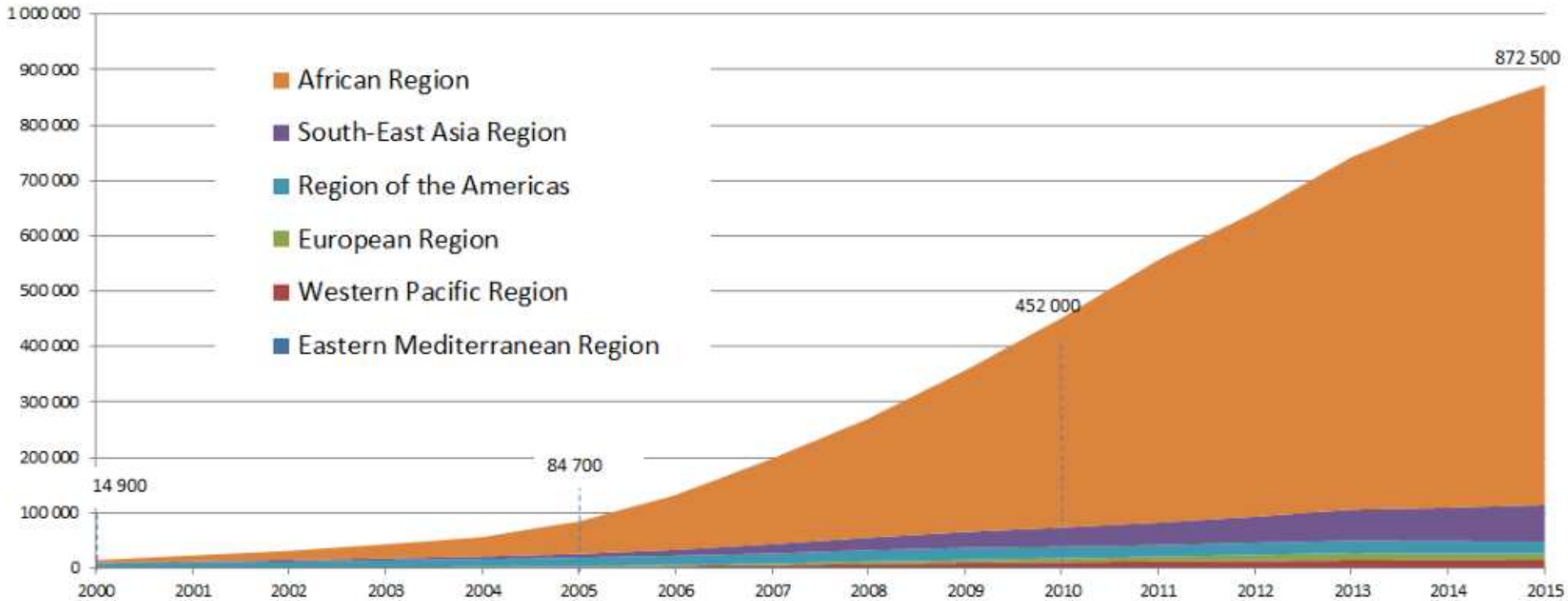
HIV/AIDS

- Biggest impact in Sub-Saharan Africa
- Takes a heavy toll on children by infecting them, making them orphans, disrupting economies and healthcare systems

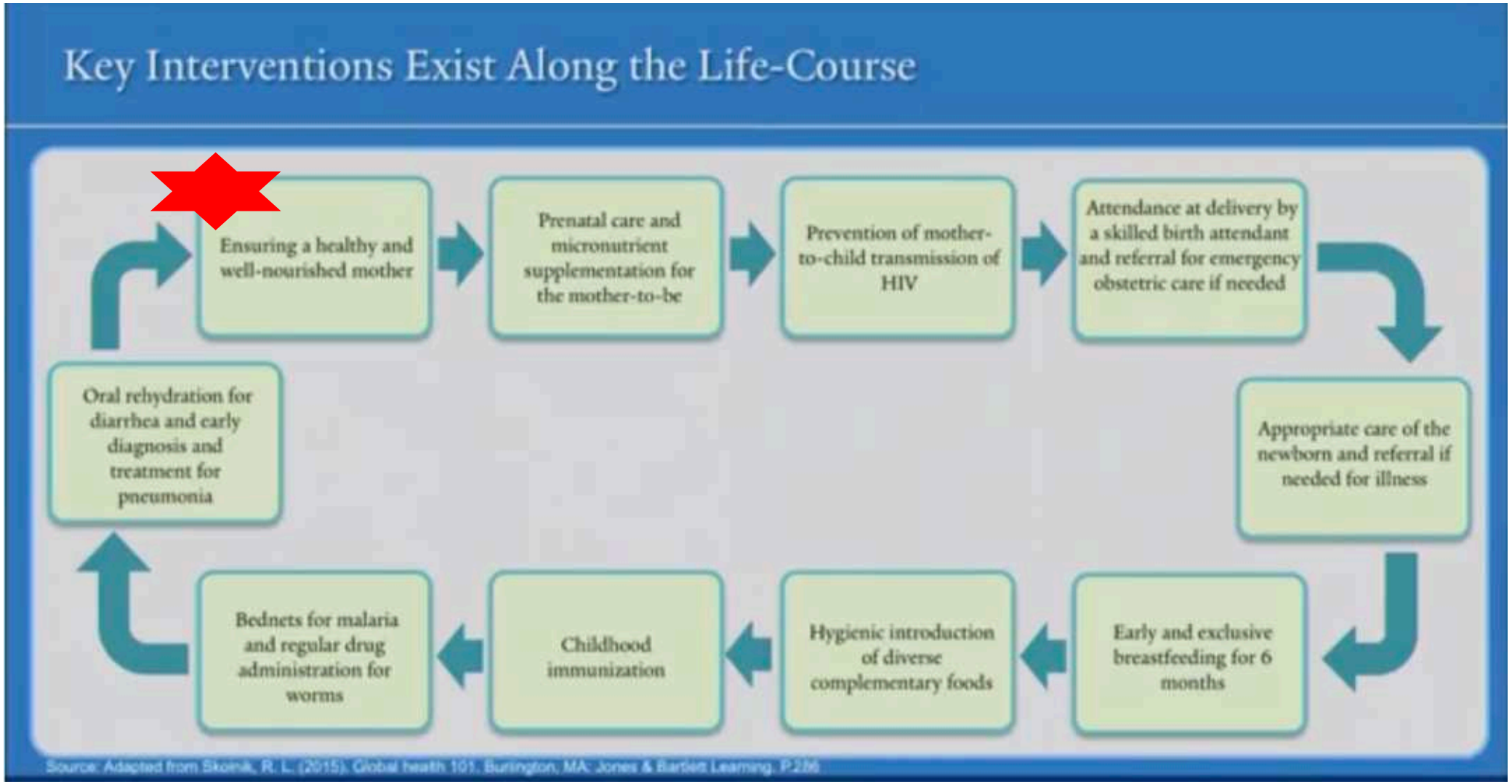
HIV/AIDS

- Estimated 2.5 million children and adolescents living with HIV in 2023 ; majority in SSA (88%)
- 100,000 children died from HIV-related causes in 2022
- Majority of children acquire HIV from their mother during pregnancy, birth, or breastfeeding
- Percent of children receiving ART in 2023: 57%
- As of 2019, approximately 13.8 million children have lost one or both parents due to AIDS (90% of these children live in SSA)

Number of children (<15 years) receiving ART globally, and by WHO region, 2000-2015



Interventions to Reduce Child Mortality



Adapted from Skolnik, RL (2015), Global Health 101. Burlington, MA: Jones and Bartlett Learning, p. 286
and from the Yale University course lecture by Richard Sholnik, entitled Child Health; in *Essentials in Global Health*

Education and Women

- Fewer children
- Seek prenatal and delivery care
- Decreased maternal mortality
- Children better nourished
- Children more likely to be vaccinated

Each year of maternal education decreases deaths in their children under 5 years by 5 to 10%

Summary

- Significant progress has been made in reducing child mortality since 1990
- There are substantial disparities in under-5 mortality across countries and regions with SSA remaining the area with the highest rates in the world
- Malnutrition is a tremendous contributor to child deaths
- Over 50% of under-5 deaths could be prevented through simple, cost-effective interventions