

# CIC 2014 CCI

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## Measles Basics and Principles

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Diego Garcia, M.D., M.P.H.



# Disclosure Statement



- I have no affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.

# Measles Characteristics

- Highly infectious disease, caused by a virus
- Spread by respiratory droplets
- Measles virus can live for up to two hours on a surface or in an airspace where the infected person coughed or sneezed.
- Humans are the only natural host.
- Case fatality rate in developed countries is 0.3%. In developing countries, it may be as high as 28%.

## Measles Epidemiology

- |                    |   |
|--------------------|---|
| • Reservoir        | Human                                       |
| • Transmission     | Respiratory<br>Airborne                     |
| • Temporal pattern | Peak in late winter–spring                  |
| • Communicability  | 4 days before to 4 days after<br>rash onset |

# How contagious is it?

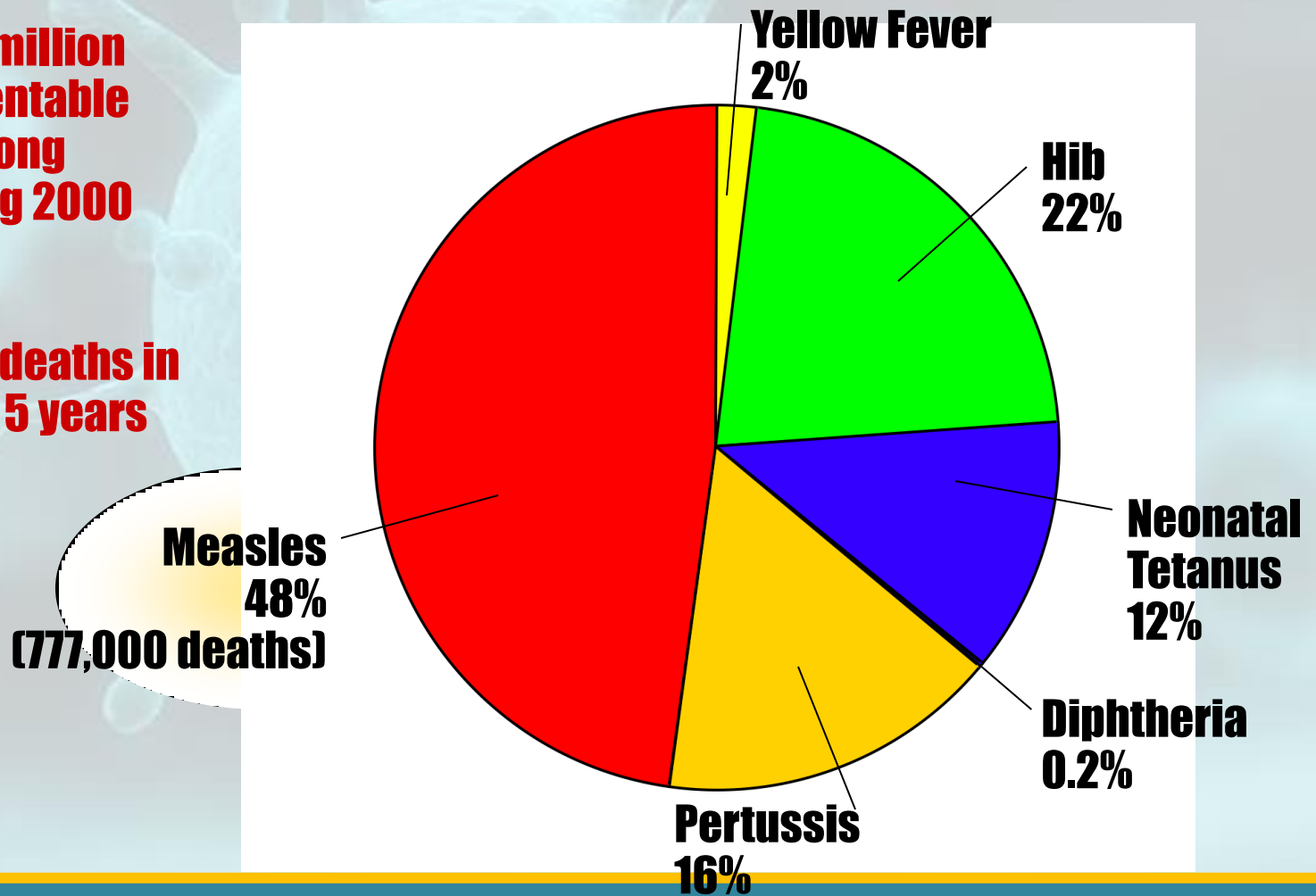


- Seasonal Influenza ranges from 5% to 15%.
- H1N1 range from 22% to 33%.
- Pertussis, secondary attack rates of 80%.
- **Measles**, is highly contagious—90% of people without immunity sharing living space with an infected person will catch it.

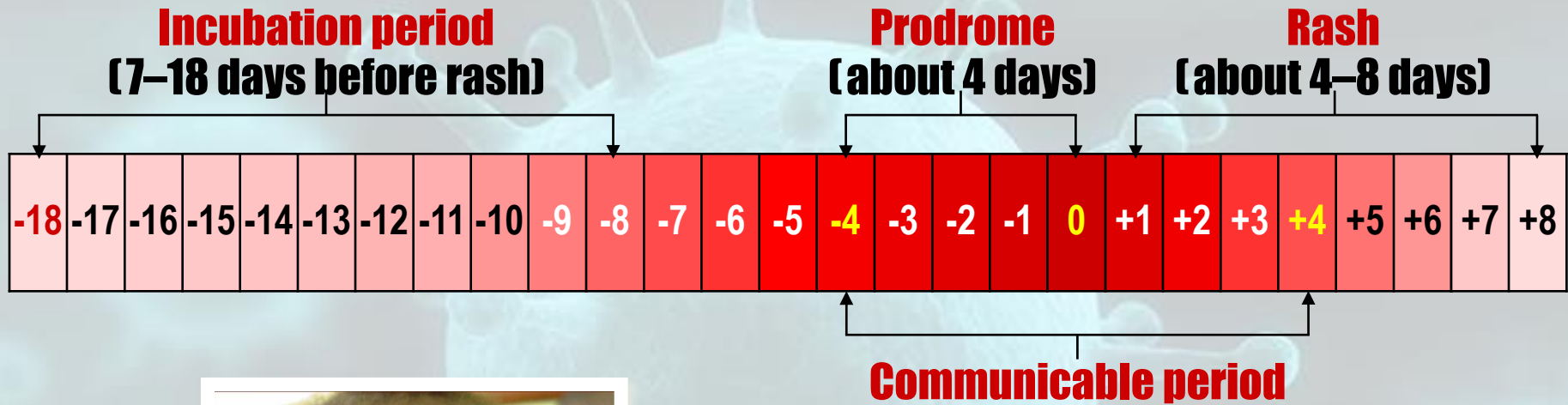
# A Leading Cause of Childhood Death

**Causes of 1.6 million vaccine-preventable deaths among children during 2000**

**Causes 5% of all deaths in children under 5 years**



# Clinical Course of Measles



High fever  
Cough,  
runny nose  
(coryza),  
and/or red  
eyes  
(conjunctivitis)



Red, blotchy  
(maculopapular)  
Moves from face  
to body trunk to  
arms/legs  
Lasts 5–6 days  
Fades in order of  
appearance



# Complication of Measles

**Pneumonia and  
Diarrhea**



**Corneal scarring, causing blindness**



**Encephalitis**



# Measles Vaccine



- Live virus vaccine
- Efficacy:
  - 85% at 9 months
  - 95% at 12–15 months
- Duration of immunity: **life long**
- Maternal antibodies play a significant role in protection against infection in infants younger than 1 year and may interfere with live-attenuated measles vaccination.
- A single dose of measles vaccine administered to a child older than 12 months induces protective immunity in 95% of recipients.
- Because measles virus is highly contagious, a 5% susceptible population is sufficient to sustain periodic outbreaks in otherwise highly vaccinated populations.



**500,000 Birth Cohort**  
**Vaccine Coverage = 80%**

**400,000 Vaccinated**  
**Vaccine Efficacy = 95%**

**100,000 Unvaccinated**  
**and**

**380,000 Immunized**

**20,000 Vaccinated**  
**But Unprotected**

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**380,000 Immunized**

**120,000 Susceptible**

**POPULATION IMMUNITY = 76%**

# Why a Second Opportunity of Measles Vaccine?

- Reaches those vaccinated who did not seroconvert
- Reaches children missed by routine services (drop-outs)
- Ensures high level population immunity (herd immunity when coverage >95%)
- Coverage does not equal population immunity
- One dose is not enough to achieve 95% immunity, even at high (>90%) coverage

# Effect of Second Opportunity of Measles Vaccination

After **first dose** with 80% coverage

$$500K \times 0.80 \times 0.85 = 380K \text{ immune}$$

After **second opportunity** with 90% coverage

$$120K \times 0.90 \times 0.95 = 102.6K \text{ immune}$$

**First + second dose**

$$380K + 102.6K / 500K = > 0.95 \text{ immune (95% immunity)}$$

**Herd immunity threshold achieved**