

Management of Prevalent Infections in Children Following a Disaster

Module 5

Learning Objectives

- Describe the strategy of the Integrated Management of Childhood Illness (IMCI) program
- Identify key clinical signs used to assess a child with cough or difficulty breathing
- Define the appropriate management strategies of important acute infections in disaster settings
- List other infectious considerations in disaster settings
- Describe outbreak situations that require the use of vaccines and/or prophylaxis in outbreaks
- Define concepts of outbreaks and pandemic management

Infectious Diseases Concepts

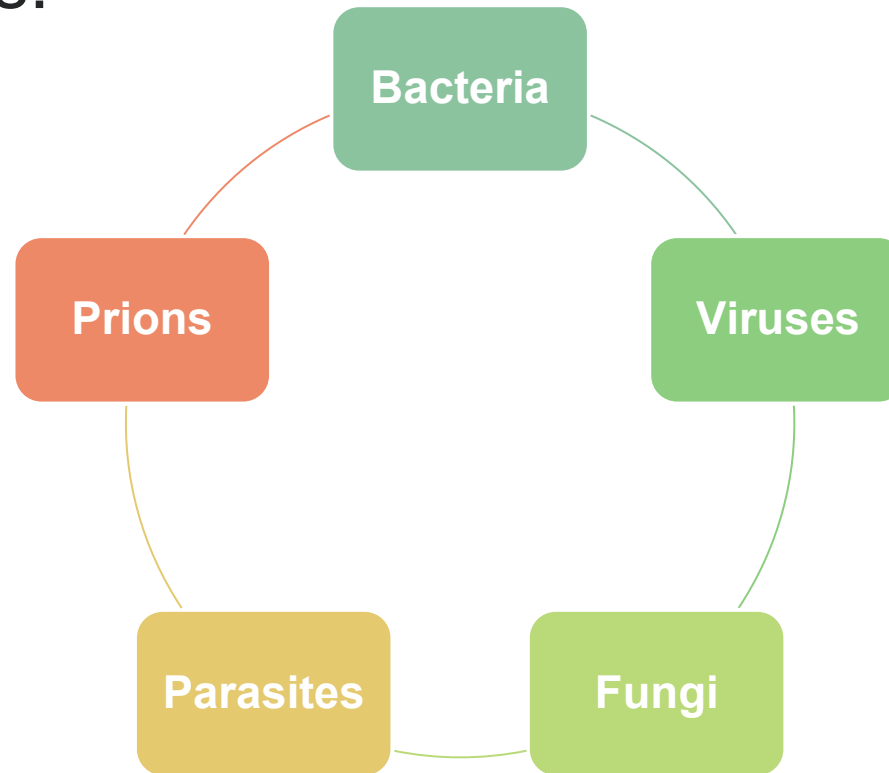


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Definition

- Illness caused by an infectious agent that can enter the body and cause infection
- Infectious agents:



Modes of Transmission

Airborne



- Very small particles that can remain in air for a long time
- e.g., Measles, Tuberculosis

Droplet



- Large droplets that do not remain suspended in air
- e.g., Influenza, Meningococcus

Contact



- Direct contact with agent (skin-to-skin, sexual transmission)
- e.g., Herpes

Fecal-Oral



- Indirect or direct contact with infected stool, contaminated water or food
- e.g., Hepatitis A, Salmonella

Vector-borne

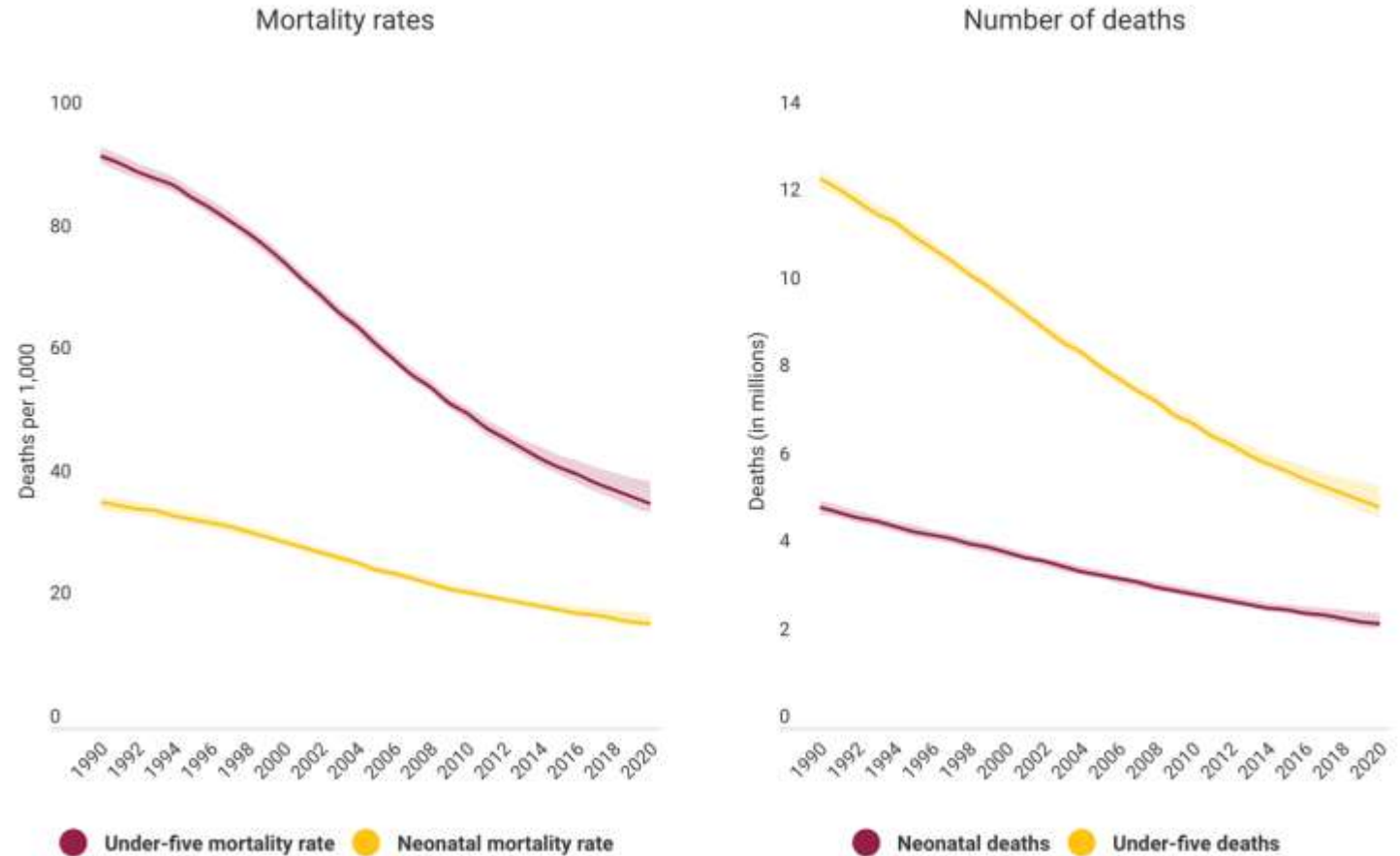


- Spread via insects
- e.g., Malaria

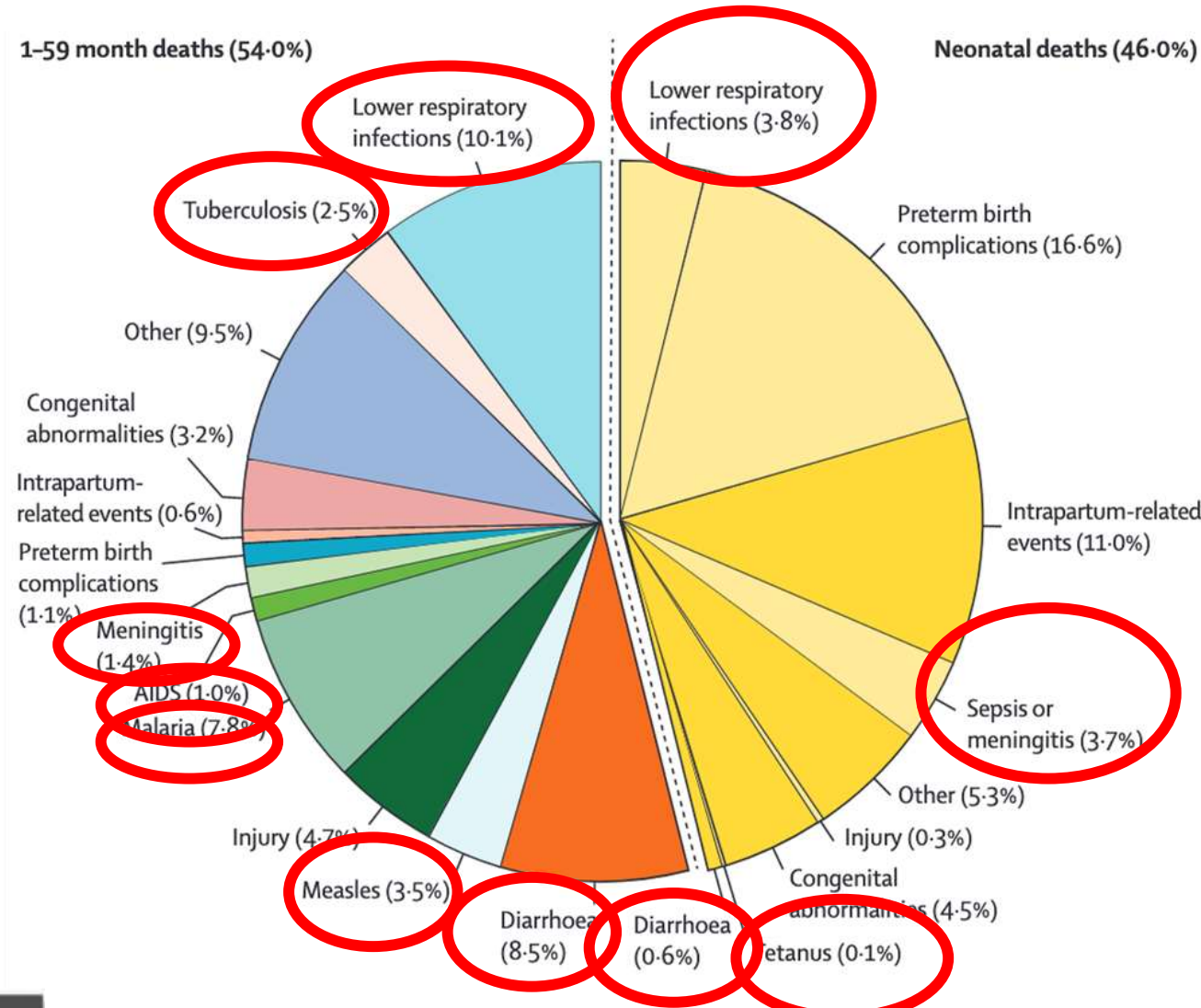
Importance

- Under-five mortality: probability of a child dying between birth and 5 years of age
- Declined 61% from 1990 to 2020
- But, 13800 under-five deaths still occur every day

Global mortality rates and number of deaths by age, 1990–2020



Global Causes of Under-Five Deaths (2019)



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Infections in Disaster Situations

- High baseline under-five mortality in low-middle income countries (LMIC)
- Humanitarian emergencies/disasters exacerbate already heavy disease burden
- New diseases related to complications of disaster
- Care provision suffers
- Co-morbid malnutrition
- Collapse of public health infrastructure



Integrated Management of Childhood Illness (IMCI)

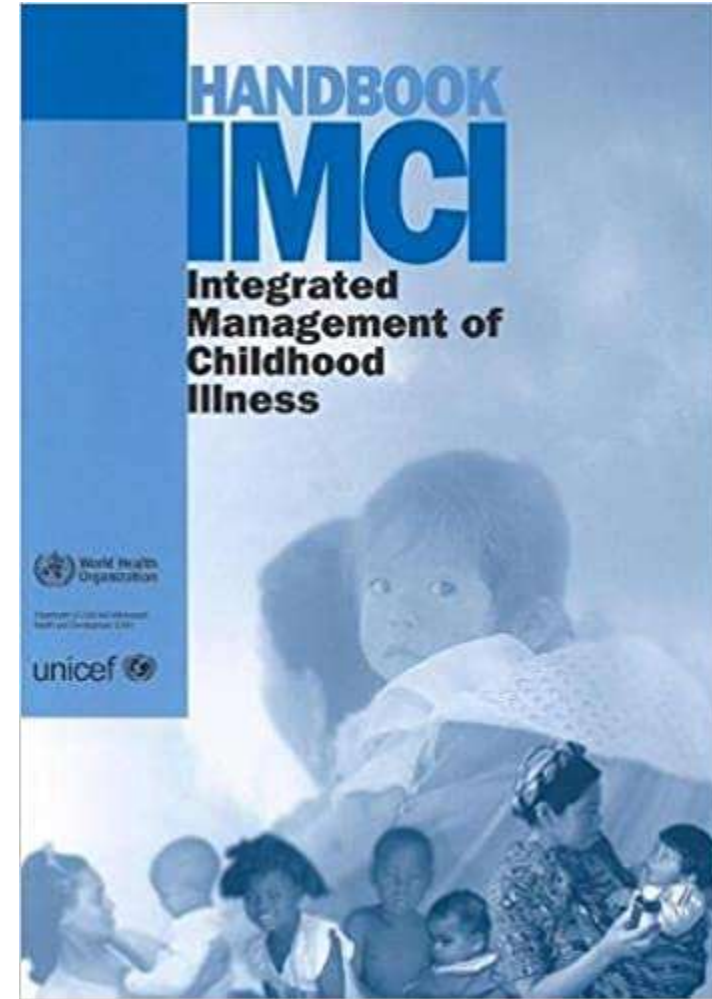


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IMCI

- Designed by World Health Organization (WHO) and United Nations Children's Fund (UNICEF) in 1990s
- Strategy to reduce mortality and morbidity from most prevalent diseases in LMIC using simplified algorithmic approach
 - 1) Improve management skills of healthcare providers
 - 2) Improve health systems
 - 3) Improve family and community health practices
- **Early Diagnosis -> Early Treatment -> Timely Referral**



IMCI Management

- A combination of individual signs leads to a child's classification rather than a diagnosis
 - Guides: management, follow-up, parental counseling, return instructions, referral indications
- Classification:
 - **Pink** = Urgently refer to a higher level of care
 - **Yellow** = Requires specific treatment
 - **Green** = Can be safely managed at home
- Care pathways match color-coding



IMCI Assessment



- Take a history and talk with the caregiver about the child's problem



- Check for danger signs



- Assess major symptoms



- Evaluate nutritional status



- Assess child's feeding



- Check Immunization status



- Look for other problems

IMCI Danger Signs

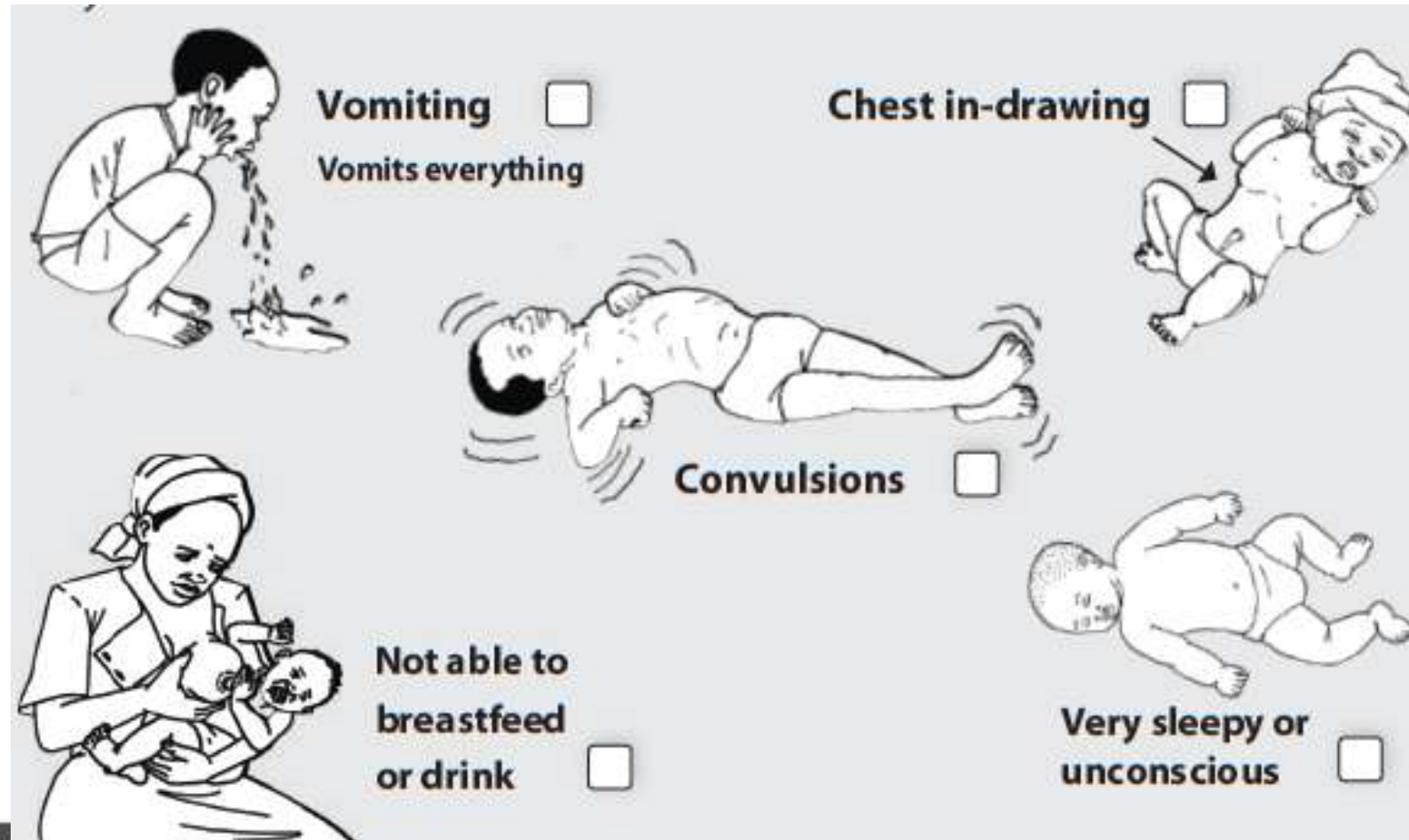
Sick Children 2 months to 5 years

- 1) Not able to drink or breastfeed
- 2) Vomits everything
- 3) Had convulsions
- 4) Lethargic or unconscious
- 5) Now convulsing

Sick Young Infant < 2 Months

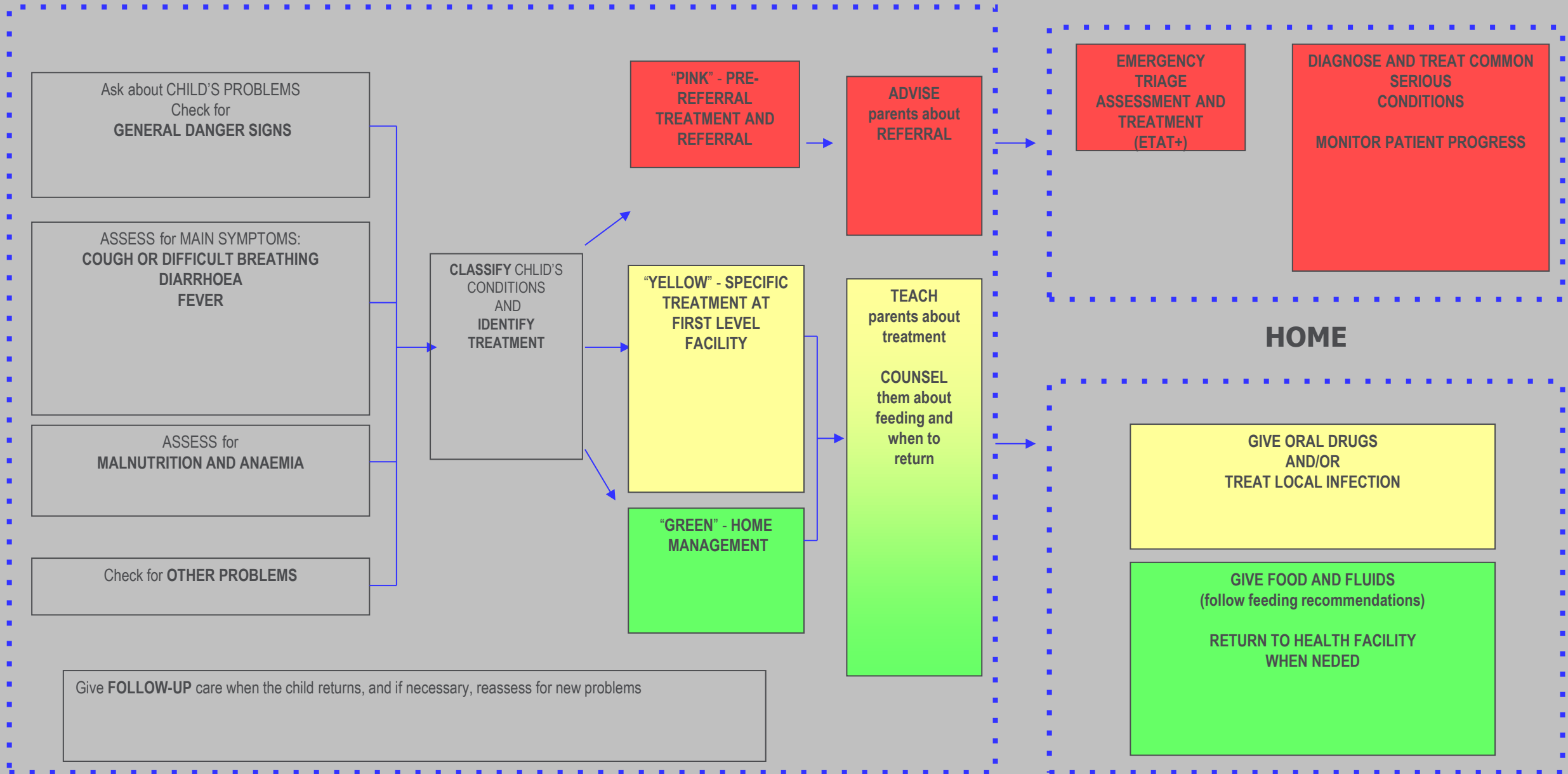
- 1) Not feeding
- 2) Convulsions
- 3) Fast breathing
- 4) Severe chest indrawing
- 5) Fever or low temperature
- 6) Lack of movement

IMCI Danger Signs



FIRST-LEVEL OUTPATIENT HEALTH FACILITY

FIRST-LEVEL REFERRAL HEALTH FACILITY



CHECK FOR VERY SEVERE DISEASE AND LOCAL BACTERIAL INFECTION

ASK:

- Is the infant having difficulty in feeding?
- Has the infant had convulsions (fits)?

LOOK, LISTEN, FEEL:

- Count the breaths in one minute. Repeat the count if more than 60 breaths per minute.
- Look for severe chest indrawing.
- Measure axillary temperature.
- Look at the umbilicus. Is it red or draining pus?
- Look for skin pustules.
- Look at the young infant's movements.
If infant is sleeping, ask the mother to wake him/her.
 - Does the infant move on his/her own?*If the young infant is not moving, gently stimulate him/her.*
 - Does the infant not move at all?

YOUNG
INFANT
MUST
BE
CALM

Classify ALL YOUNG
INFANTS

Any one of the following signs

- Not feeding well or
- Convulsions or
- Fast breathing (60 breaths per minute or more) or
- Severe chest indrawing or
- Fever (37.5°C^* or above) or
- Low body temperature (less than 35.5°C^*) or
- Movement only when stimulated or no movement at all.

Pink:

VERY SEVERE DISEASE

- Give first dose of intramuscular antibiotics
- Treat to prevent low blood sugar
- Refer URGENTLY to hospital **
- Advise mother how to keep the infant warm on the way to the hospital

- Umbilicus red or draining pus
- Skin pustules

Yellow:

LOCAL BACTERIAL INFECTION

- Give an appropriate oral antibiotic
- Teach the mother to treat local infections at home
- Advise mother to give home care for the young infant
- Follow up in 2 days

- None of the signs of very severe disease or local bacterial infection

Green:

SEVERE DISEASE OR LOCAL INFECTION UNLIKELY

- Advise mother to give home care.

* These thresholds are based on axillary temperature. The thresholds for rectal temperature readings are approximately 0.5°C higher.

** If referral is not possible, manage the sick young infant as described in the national referral care guidelines or WHO Pocket Book for hospital care for children.

IMCI Management

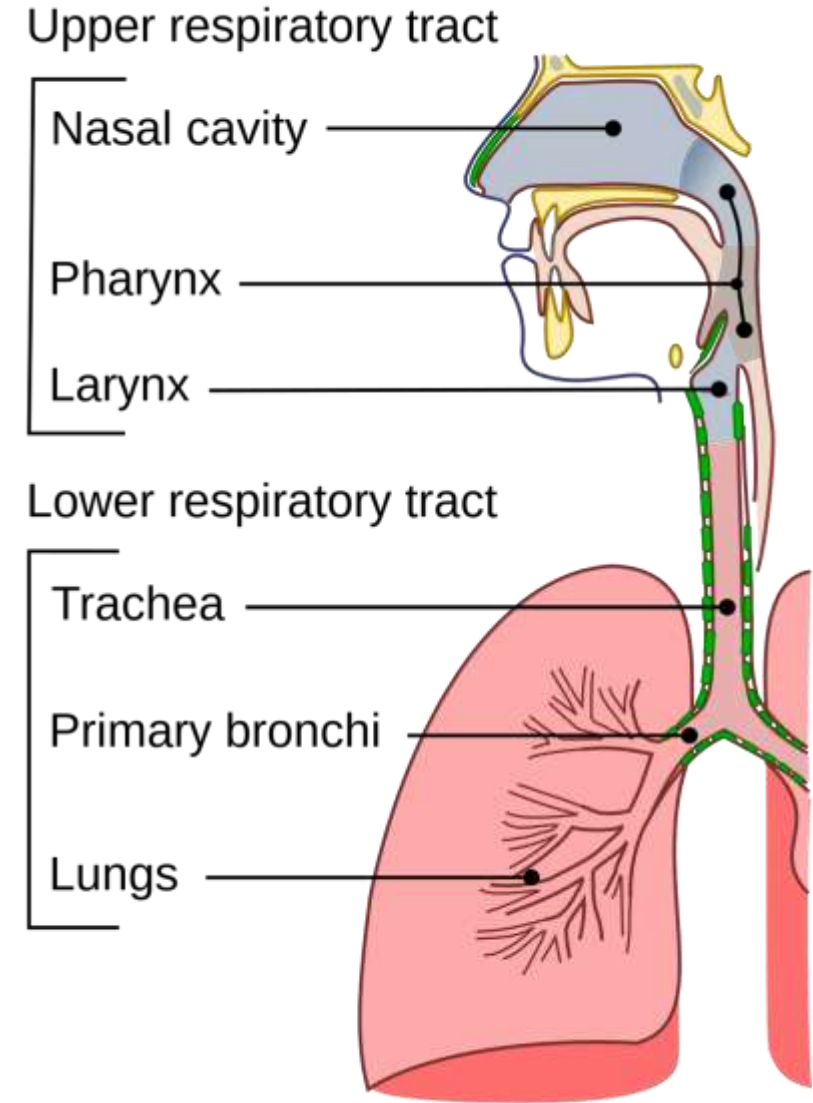
- Addresses most common illnesses
 - Certain chronic or less common illnesses require further care
- Uses limited number of essential drugs
- Encourages active participation of caretakers
 - Essential focus on counseling of caretakers (feeding, fluids, return precautions, etc)



Acute Respiratory Infections (ARI)

ARI

- Infections can occur in both the upper and lower respiratory tract
- Commonly caused by viruses but some are caused by other infectious agents (e.g., bacteria)
- Pneumonia is a major cause of childhood mortality and morbidity



Assessment of a Child with an ARI

- Evaluate for
 - 1) Respiratory rate
 - 2) Chest indrawing
 - 3) Noisy breathing
 - Stridor: Upper airway obstruction
 - Wheezing: Lower airway obstruction

TABLE 1. Respiratory rate

Child's age	Cutoff rate for fast breathing (tachypnea)
2 week to < 2 months	~60 breaths per minute or more
2 months to < 12 months	~50 breaths per minute or more
12 months to < 2 years	~40 breaths per minute or more
2 years to < 5 years	~30 breaths per minute or more
5 years to < 12 years	~25 breaths per minute or more
12 years to $\leq$ 18 years	~20 breaths per minute or more

Pneumonia

- In 2019, pneumonia accounted for 14% of all deaths of children under 5
- Can be caused by viruses, bacteria, fungi
- Most common causes in children
 - *Streptococcus pneumoniae*
 - *Haemophilus influenza* (including type B (Hib))
 - Respiratory syncytial virus (RSV)

Pneumonia

- Classification and management of child with cough and/or difficulty breathing per IMCI:
 - **Pink:** Severe pneumonia or very severe disease
 - Parental antibiotics and refer
 - **Yellow:** Pneumonia
 - Oral antibiotics
 - **Green:** No pneumonia
 - Home care advice

Important Acute Infections in Disaster Settings

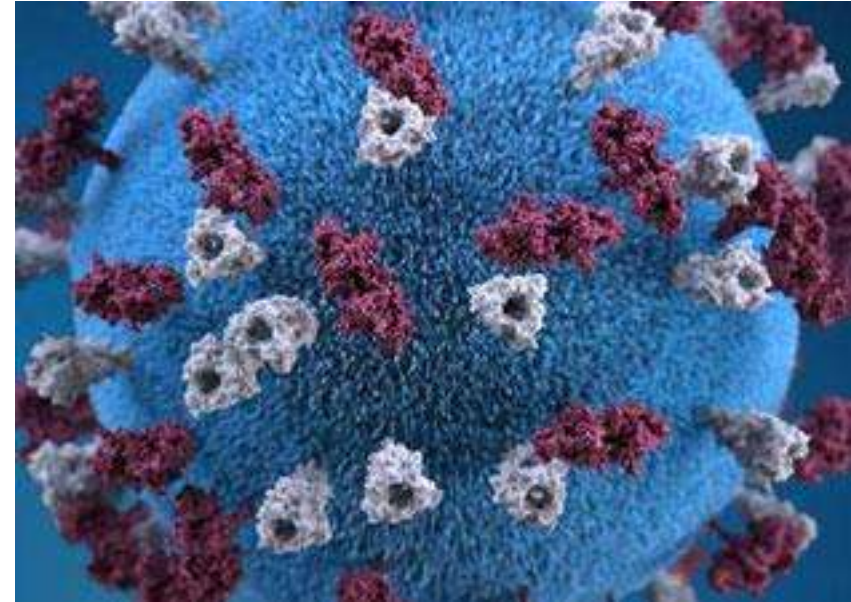


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Measles

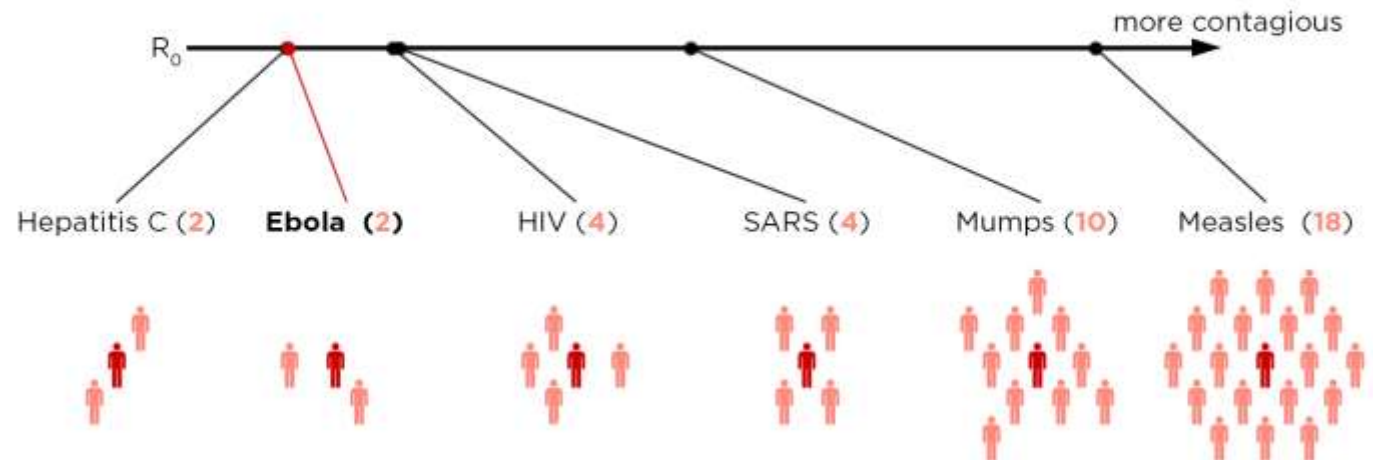
- Single-stranded RNA virus
- Case fatality rates of all measles infections $<0.1\%$ in developed countries but exceeds 1-2% in developing countries
- Extremely important pathogen to pay attention to in disaster situations



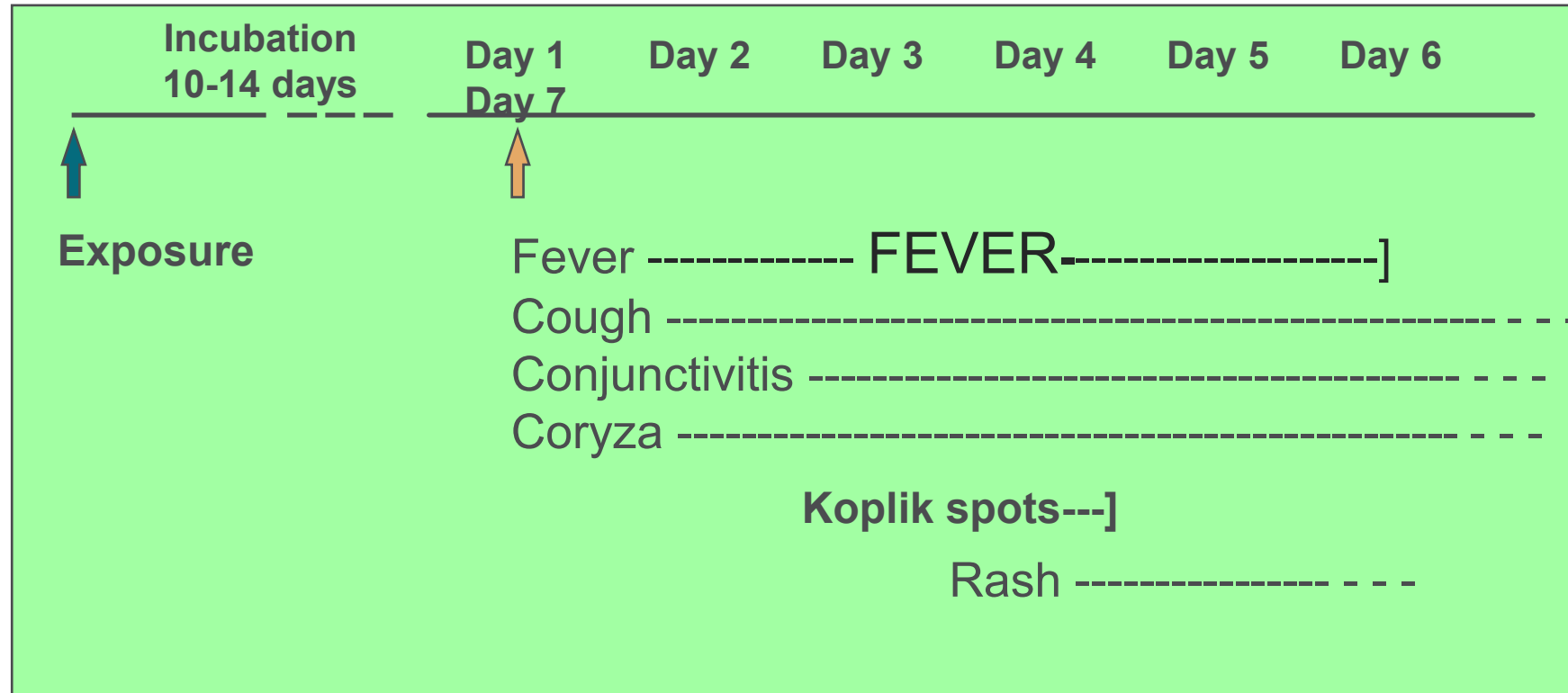
Measles: Epidemiology

- Extremely contagious
 - Nearly 100% of susceptible contacts develop infection
- Transmission: Via respiratory secretions
- Incubation Period: 10-14 days

The number of **people** that **one sick person** will infect (on average) is called R_0 . Here are the maximum R_0 values for a few viruses.

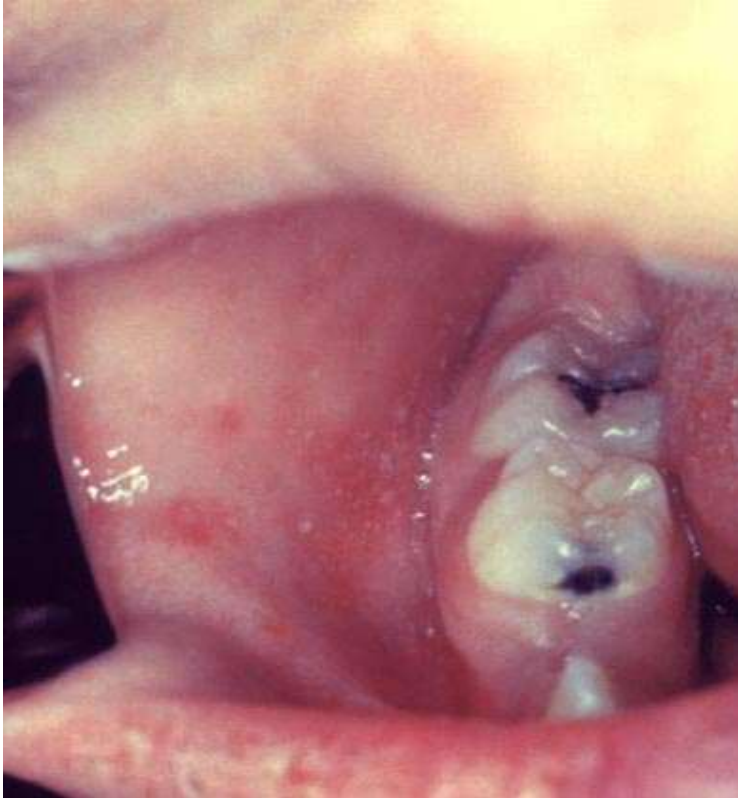


Measles: Natural History of Infection



Measles: Koplik Spots and Rash

Koplik Spots

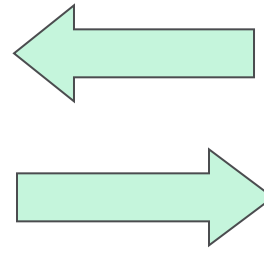


Rash: Develops on face, and then moves downward

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

Measles & Vitamin A

MEASLES
Unmasks an
underlying Vitamin A
deficiency



VITAMIN A DEFICIENCY
(even subclinical)
Increases measles-
associated morbidity
and mortality

Measles Management

Severe Complicated Measles

- Child with danger signs, cornea clouding, deep mouth lesions
- Give vitamin A, antibiotic, eye ointment
- Refer urgently

Measles with Eye or Mouth Complications

- Presence of eye drainage or mouth lesion without signs of serious illness
- Give vitamin A, eye ointment, encourage oral hygiene
- Close follow up

Measles Without Complications

- Give vitamin A only

Measles: Complications

- Pneumonia
- Croup
- Otitis media
- Diarrhea
- Long term sequelae
 - Blindness
 - Malnutrition
 - Chronic lung disease



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Measles Outbreak Mitigation



Vector-Borne Diseases



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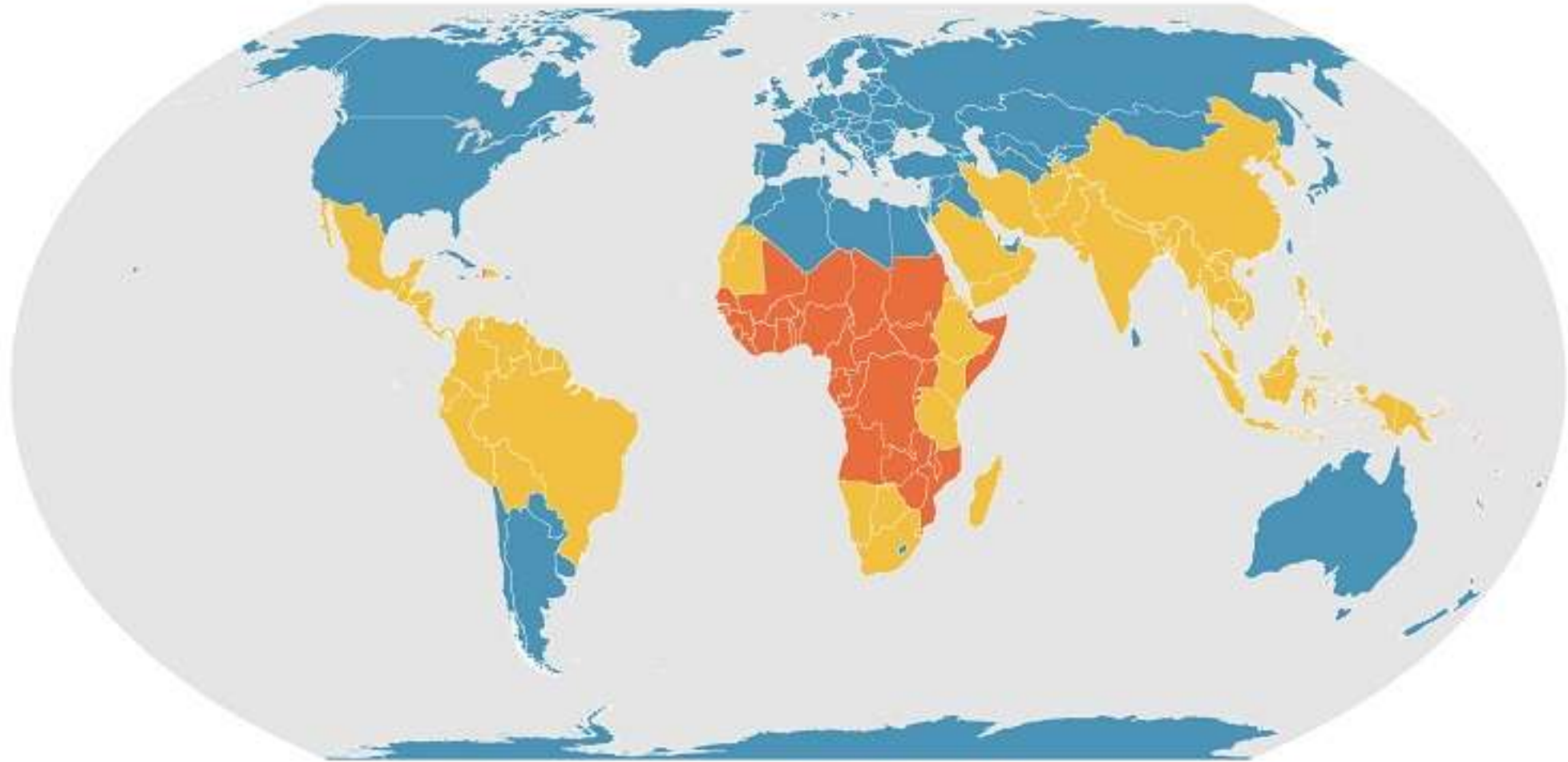
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Malaria

- Caused by protozoan blood parasite
- There are four species that commonly cause infection in humans:
 - *Plasmodium falciparum*
 - *Plasmodium malariae*
 - *Plasmodium ovale*
 - *Plasmodium vivax*
 - *Plasmodium knowlesi* is the other that primarily infects non-human primates
- Transmitted by *Anopheles* mosquito

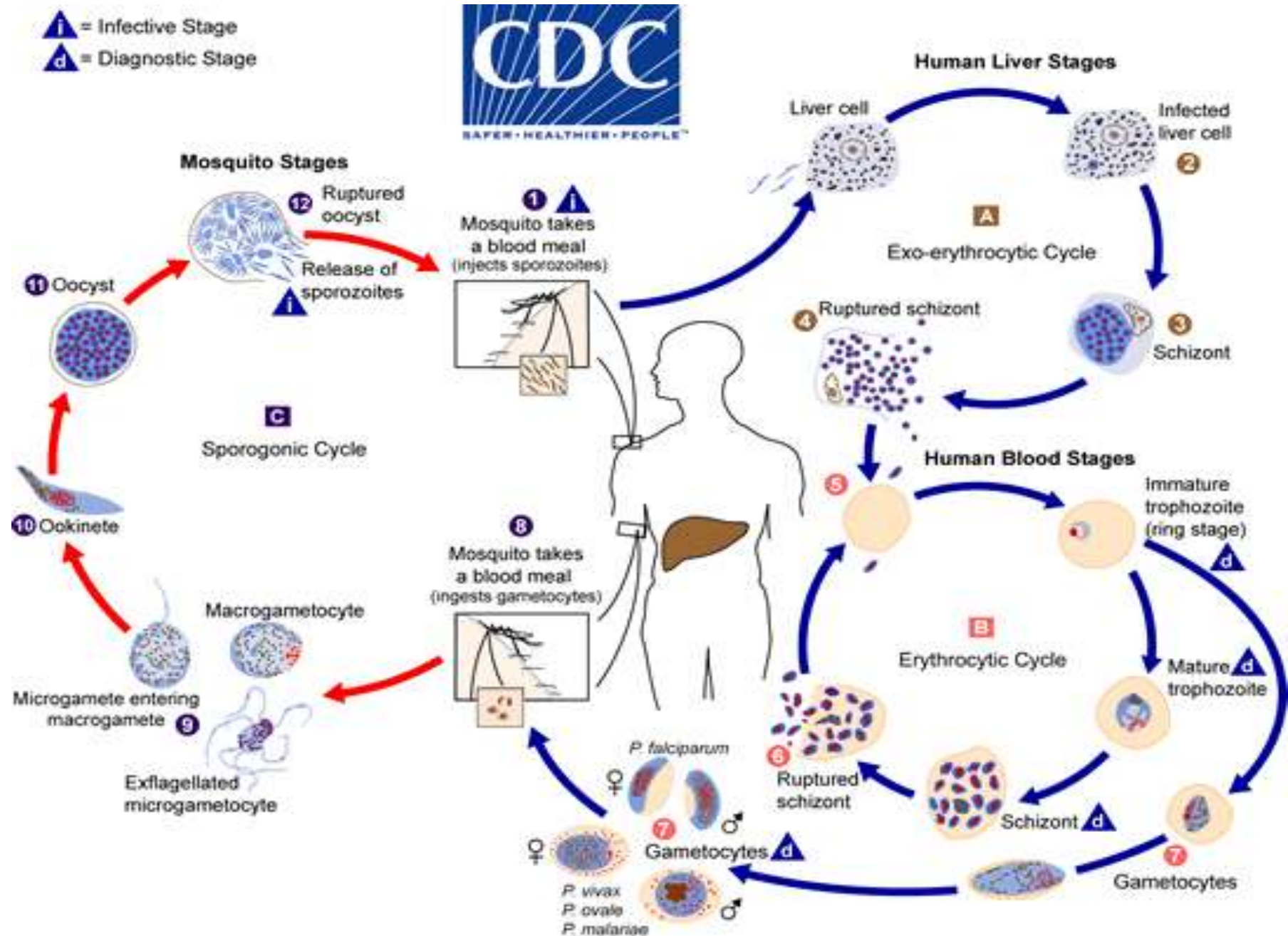


Malaria Geographic Distribution



- Malaria transmission is not known to occur
- Malaria transmission occurs in some places
- Malaria transmission occurs throughout

Malaria Life Cycle



Malaria: Epidemiology

- In 2020, there was an estimated 241 million cases of malaria worldwide with an estimated 627,000 deaths
- Transmission: Vector-borne
- Incubation Period: 7-30 days
- Risk factors for severe disease:
 - Infants and young children
 - Pregnant women
 - Malnourished individuals
 - Those infected with *P.falciparum*



Malaria: Signs & Symptoms

Uncomplicated Malaria

- Fever, chills, headaches, myalgias, diarrhea, anemia
- Paroxysms of fever and shaking chills lasting 8-12 hours and every 2-3 days
 - Coincide with cyclical release of parasites from ruptured blood cells

Severe, Complicated Malaria

- Impaired consciousness
- Prostration
- Multiple convulsions
- Acute pulmonary edema and acute respiratory distress syndrome
- Circulatory collapse or shock
- Electrolyte derangements
- Acute kidney injury
- Clinical jaundice
- Abnormal bleeding
- Hyperparasitemia

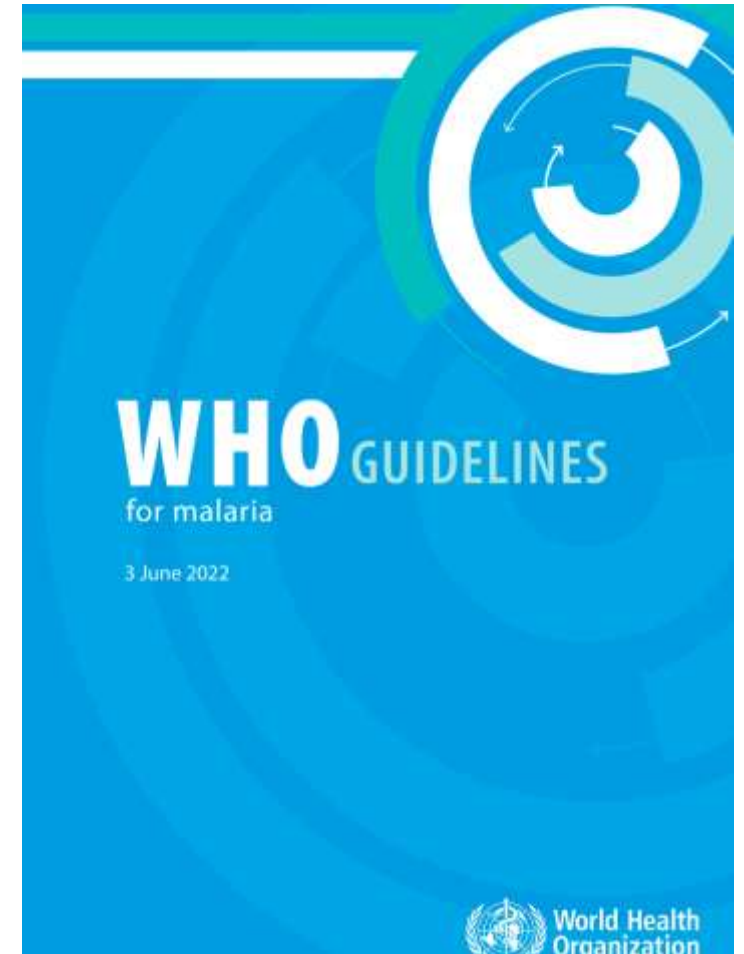
Malaria: Diagnosis

- Rapid diagnostic tests
 - Point-of-care antigen detection
- Microscopy (thin/thick smears)
 - Hard in disaster settings
- Supporting Rapid Tests
 - Hemoglobin



Malaria: Treatment

- Anti-malarial medications
 - Based on local guidelines
 - WHO guidelines available
- Supportive cares
 - Glucose!
 - Hypoglycemia major cause of mortality
 - Fever control
 - Hydration
 - Evaluate for secondary bacterial co-infections



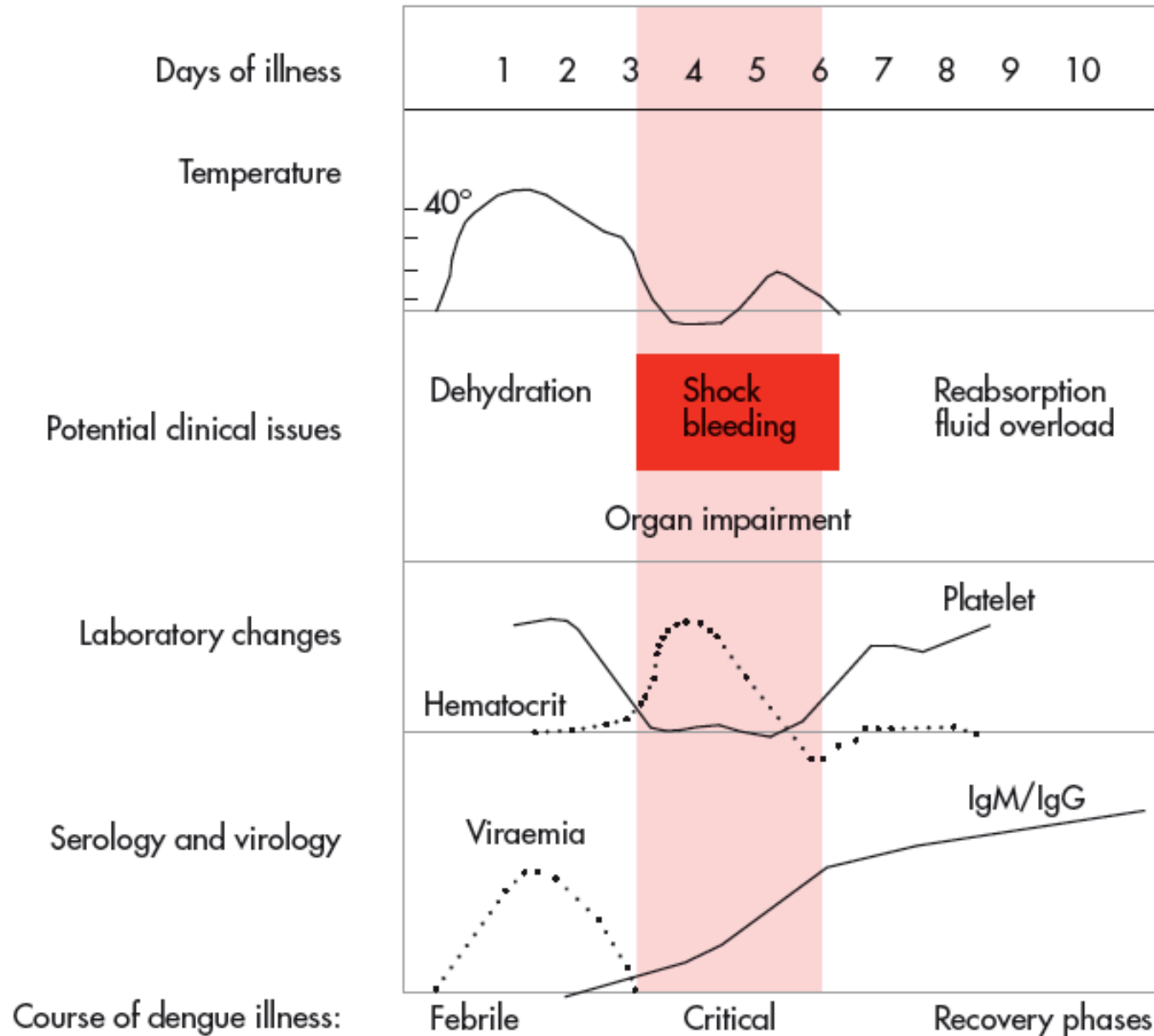
Dengue

- Caused by dengue virus
- Four closely related serotypes
- Estimated 100-400 million infections occur each year
 - Most children (~80%) asymptomatic
- Transmission: Vector-borne
 - Transmitted by *Aedes* mosquito
- Incubation Period: 4-10 days



Aedes mosquito

Dengue: Phases



Dengue: Treatment

- Supportive cares
 - Rest
 - Acetaminophen/paracetamol
 - No aspirin or NSAIDS
 - Risk of bleeding
 - Hydration

Meningitis

- Inflammation of “membranes” (meninges) that surround the brain and spinal cord
- Caused by many different types of pathogens but most commonly viruses and bacteria
- *Neisseria meningitidis* is a particular concern in disaster settings given its outbreak potential

Meningitis

Clinical Manifestations	Management
● Change in mental status ● Change in level of activity ● Irritability ● Unresponsiveness ● Seizures ● Meningeal irritation signs (may not be present in all)	● Antibiotics for bacterial meningitis ● Supportive cares ● Close monitoring of complications ● Consider need for prophylaxis for contacts

Other Infectious Diseases: Key Considerations

Other Key Considerations

- Many other clinical entities may need to be triaged and managed during disaster settings
 - Tuberculosis (TB) secondary to *Mycobacterium tuberculosis*
 - Leading cause of death in some parts of the developing world
 - Treatment typically not part of emergency relief response, but need to recognize in displaced population
 - Human Immunodeficiency Virus (HIV)
 - At risk for common childhood infections and opportunistic infections
 - Ensure that antiretroviral therapy (ART) is continued during a disaster setting and re-started if interrupted
 - Diarrheal infections
 - Common cause of illness in children and can be caused by multiple pathogens
 - Hydration crucial to treatment and some require specific antimicrobials

Vaccination in Disaster Settings

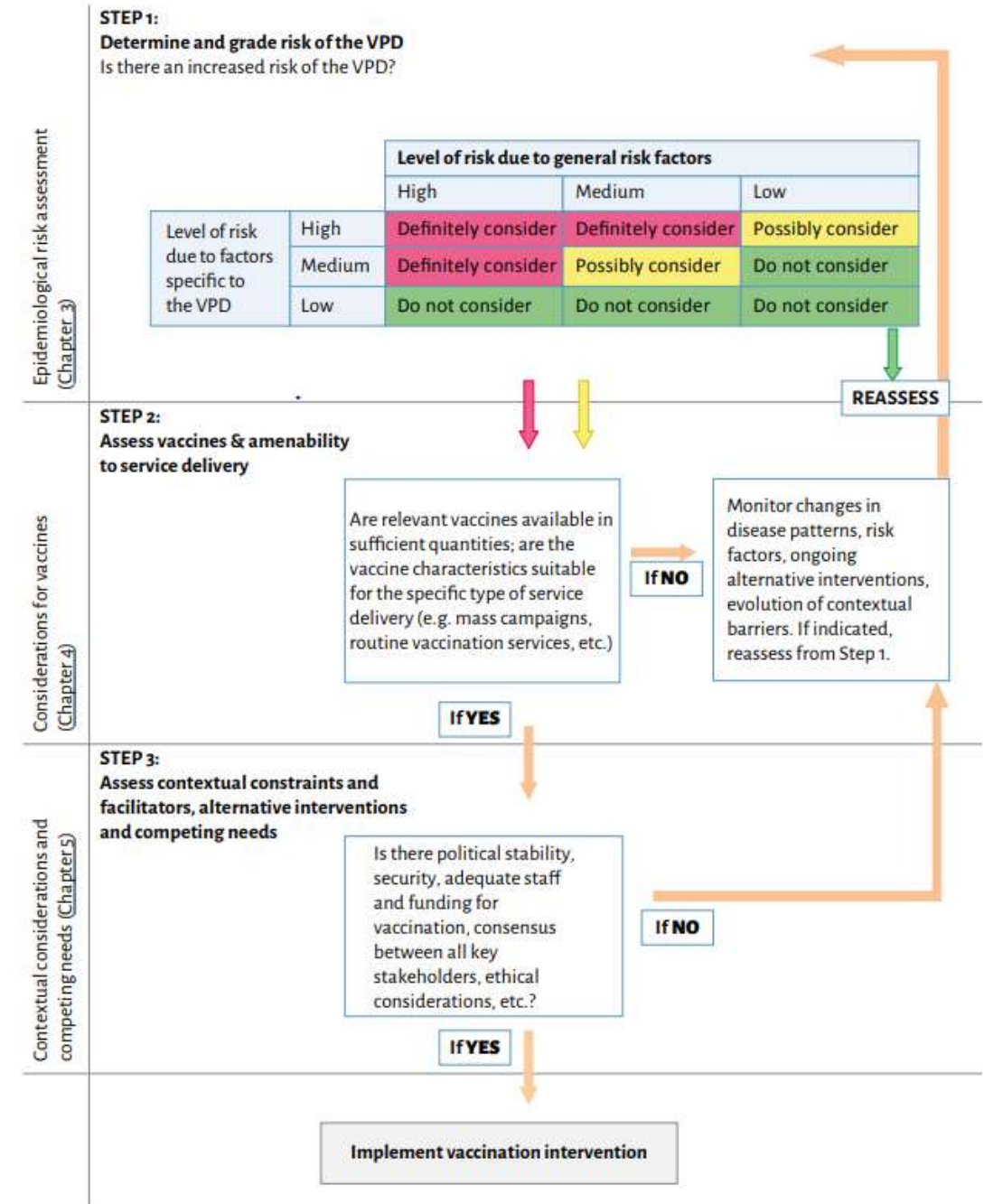


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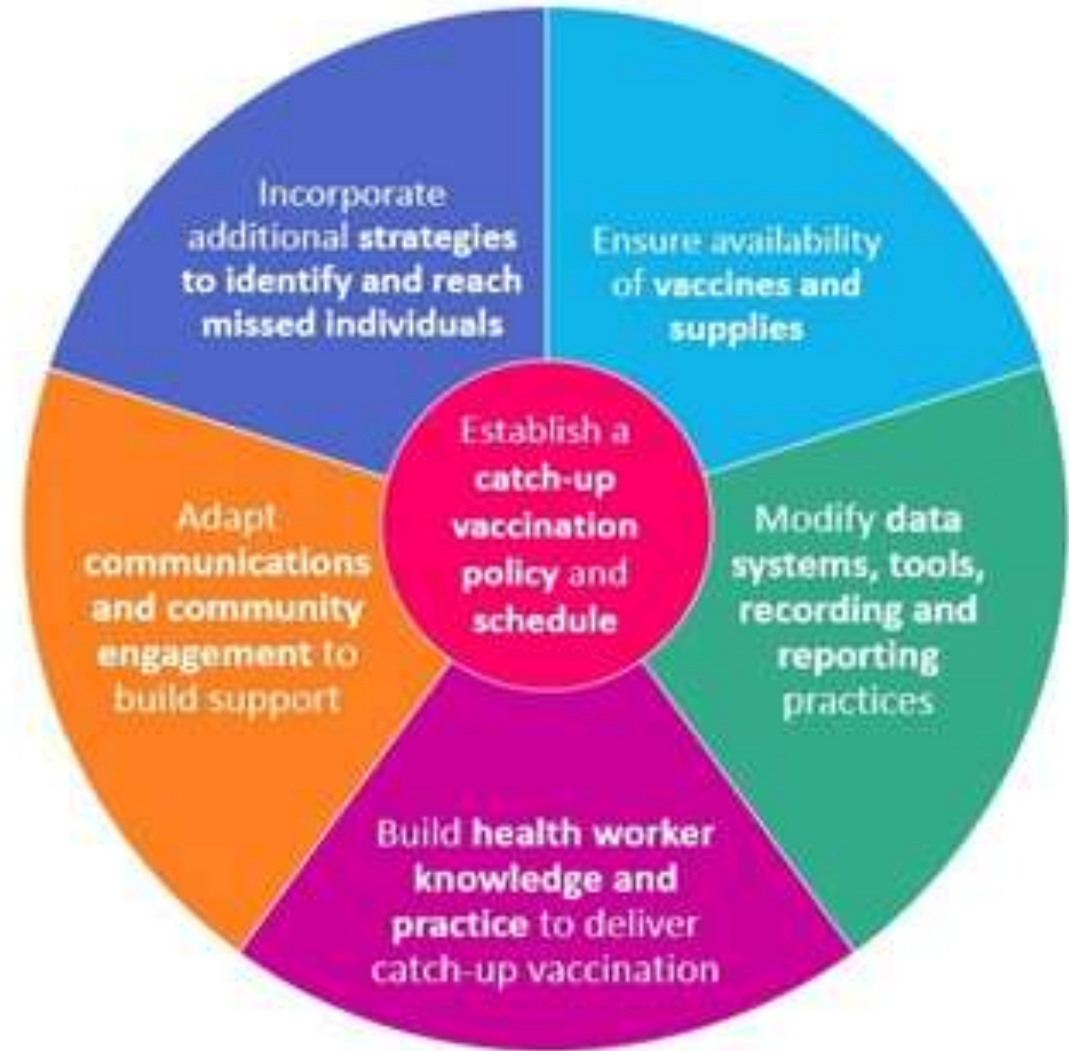
Strategies for Immunization Programs

Vaccination in acute humanitarian emergencies: a framework for decision making. Geneva, Switzerland: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO.

Fig. 1 Decision-making steps on vaccine use in acute humanitarian emergencies



Catch-up Vaccination Considerations



<https://www.who.int/teams/immunization-vaccines-and-biologicals/essential-programme-on-immunization/implementation/catch-up-vaccination>

Disease Specific Situations Requiring Prophylaxis

- There are certain diseases generally covered by routine childhood vaccinations in which prophylaxis with a vaccine and/or medication (chemoprophylaxis) is recommended to prevent infections in outbreak settings
 - Diphtheria
 - Haemophilus influenzae Type b
 - Hepatitis A
 - Measles
 - Meningococcus
 - Pertussis
 - Tetanus
 - Varicella-zoster virus

Outbreak Management



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Definitions

- Endemic
 - Level of disease occurrence that is present constantly in a population
- Epidemic (Outbreak)
 - Occurrence of more cases of a disease than normally expected in a place/group of individuals over a given period of time
- Pandemic
 - Epidemic/outbreak that has spread over several countries or continents

Definitions

- Isolation:
 - For those who have the disease and attempting to separate from those who are not sick with the disease
- Quarantine:
 - For those who were exposed to the disease and attempting to separate from others and to monitor for illness

Considerations for Outbreak Management

- Screening, surveillance, identification of cases
- Prevention strategies (e.g., quarantine, isolation, PPE, vaccinations)
- Preparation for surge capacity and ensuring adequate supply of tests, vaccines, medications, and healthcare supplies
- Clear, effective communication
- Collaboration and support

Summary

- Many infectious diseases contribute to significant morbidity and mortality in children and then are exacerbated during a disaster
- IMCI is a focused, simple community-based approach to task-shift management of biggest causes of pediatric morbidity and mortality
 - Promotes home care and timely referrals
 - Integrates aspects of nutrition, immunization, health promotion, and disease prevention
- Prompt recognition of contagious infectious diseases is important for mitigation strategies to prevent further spread