

Overview of Child Health in developing countries



Photo by Brett Nelson. No permission needed.

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Discussion outline

I. Child mortality (U5MR)
and its causes

II. Essentials in the
management of U5MR

III. Summary



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i. Child mortality and its causes



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Child mortality

- 7.6 million children <5 each year (2010)
- ~half of these deaths in Africa
- 94% of these deaths in 60 countries

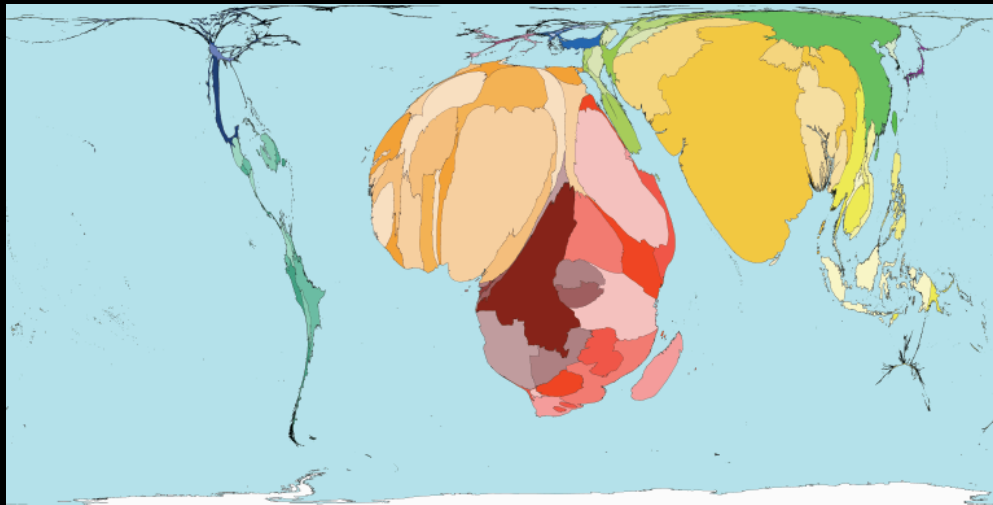


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Child mortality

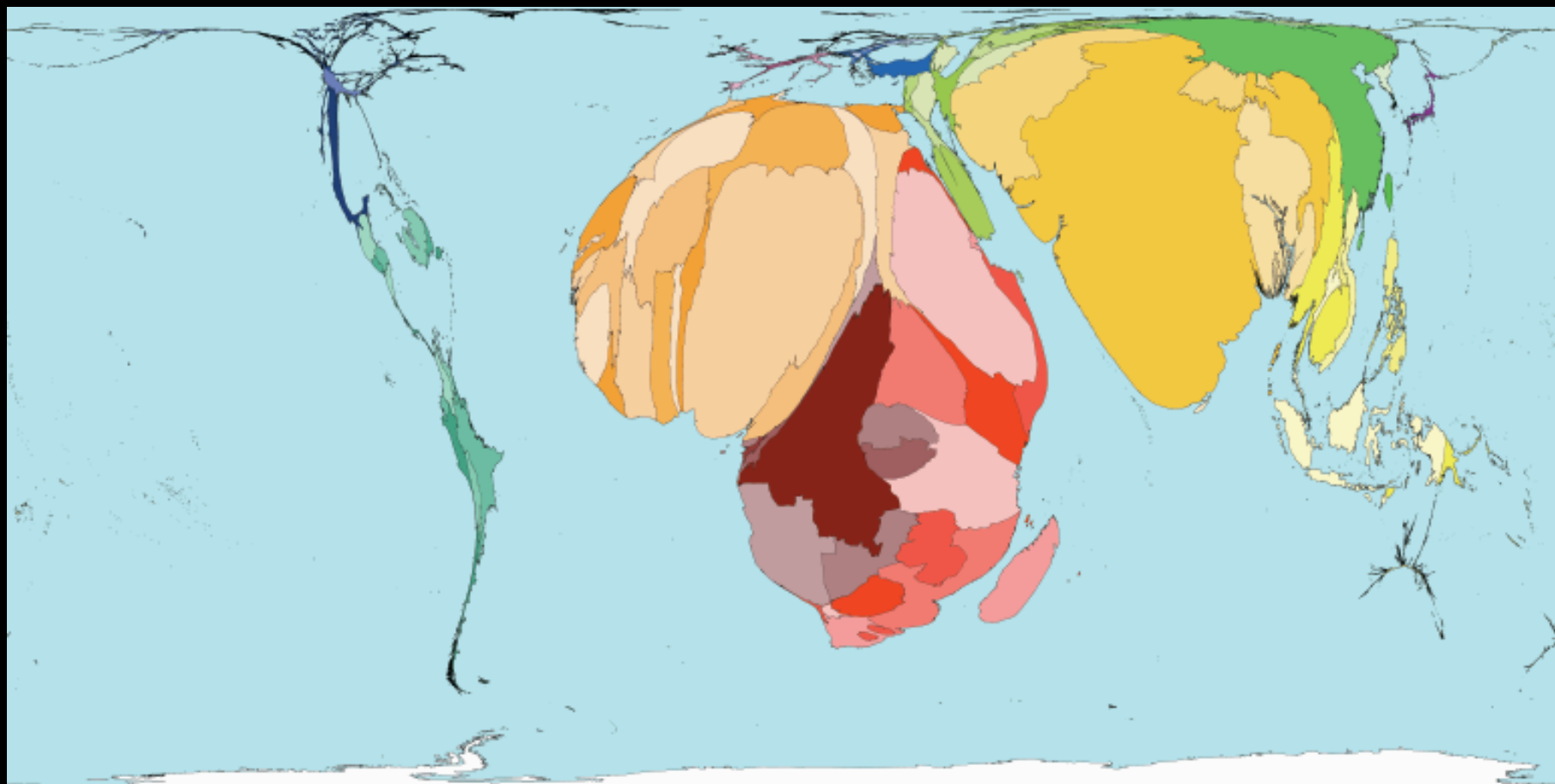


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Public health spending

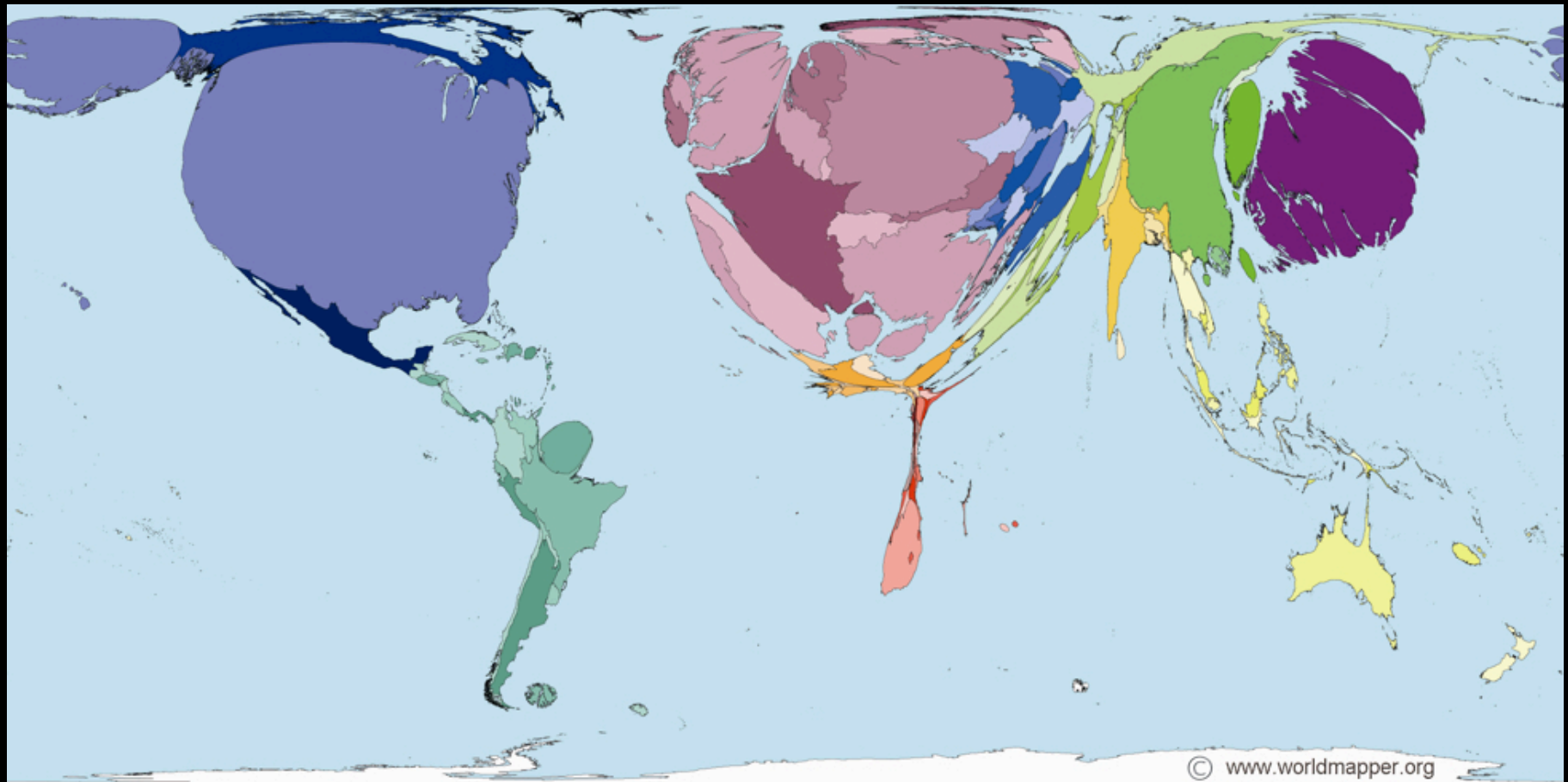


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Physicians working

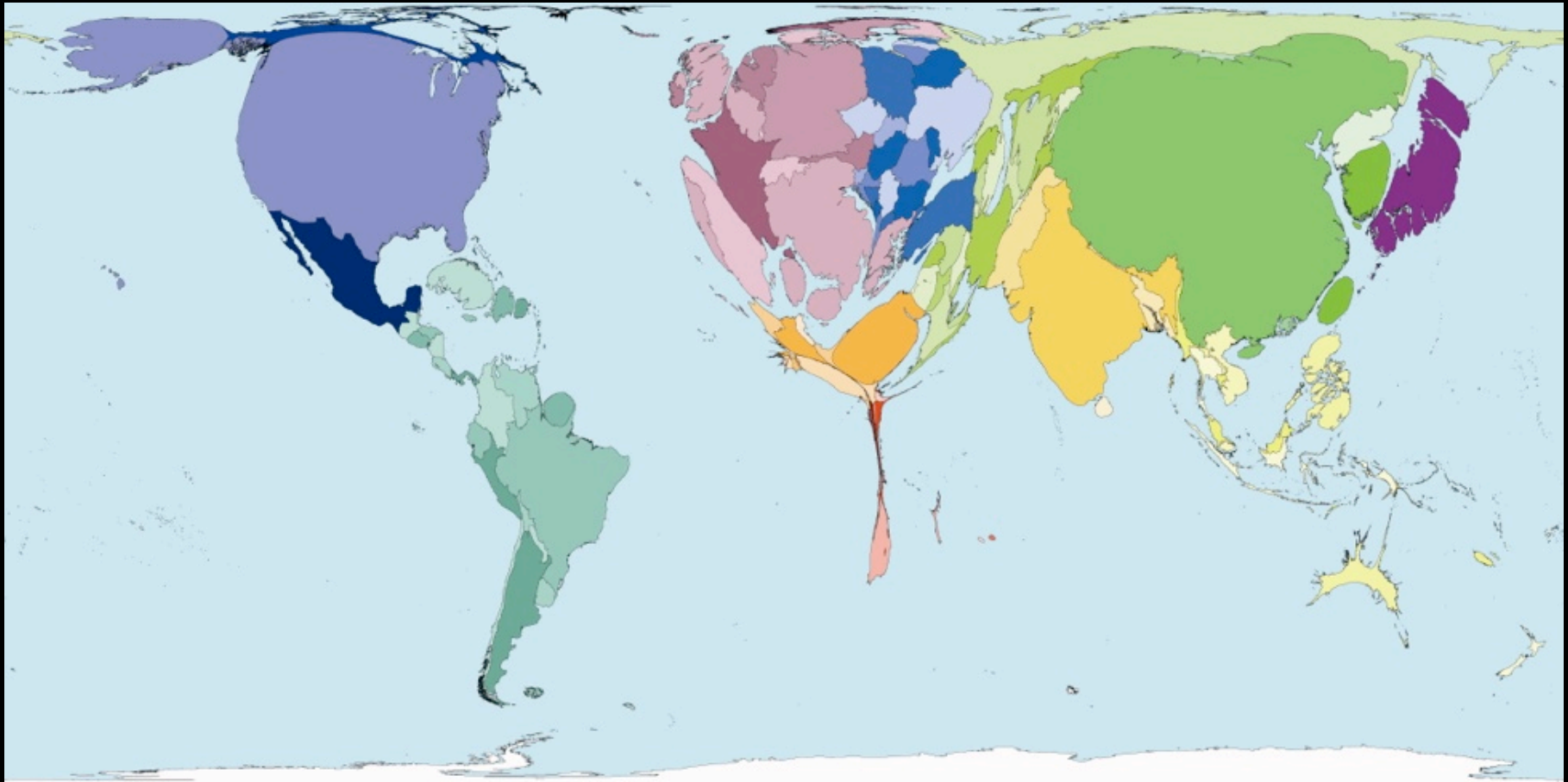


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Child mortality by region

[WHO figure of child mortality by region, available from WHO. Global Burden of Disease. 2004.]

Child mortality trend over time

[WHO figure of child mortality over time. Available from WHO World Health Report. <http://www.who.int/whr/en/index.html>]

Figure 1.1 Slowing progress in child mortality: how Africa is faring worst

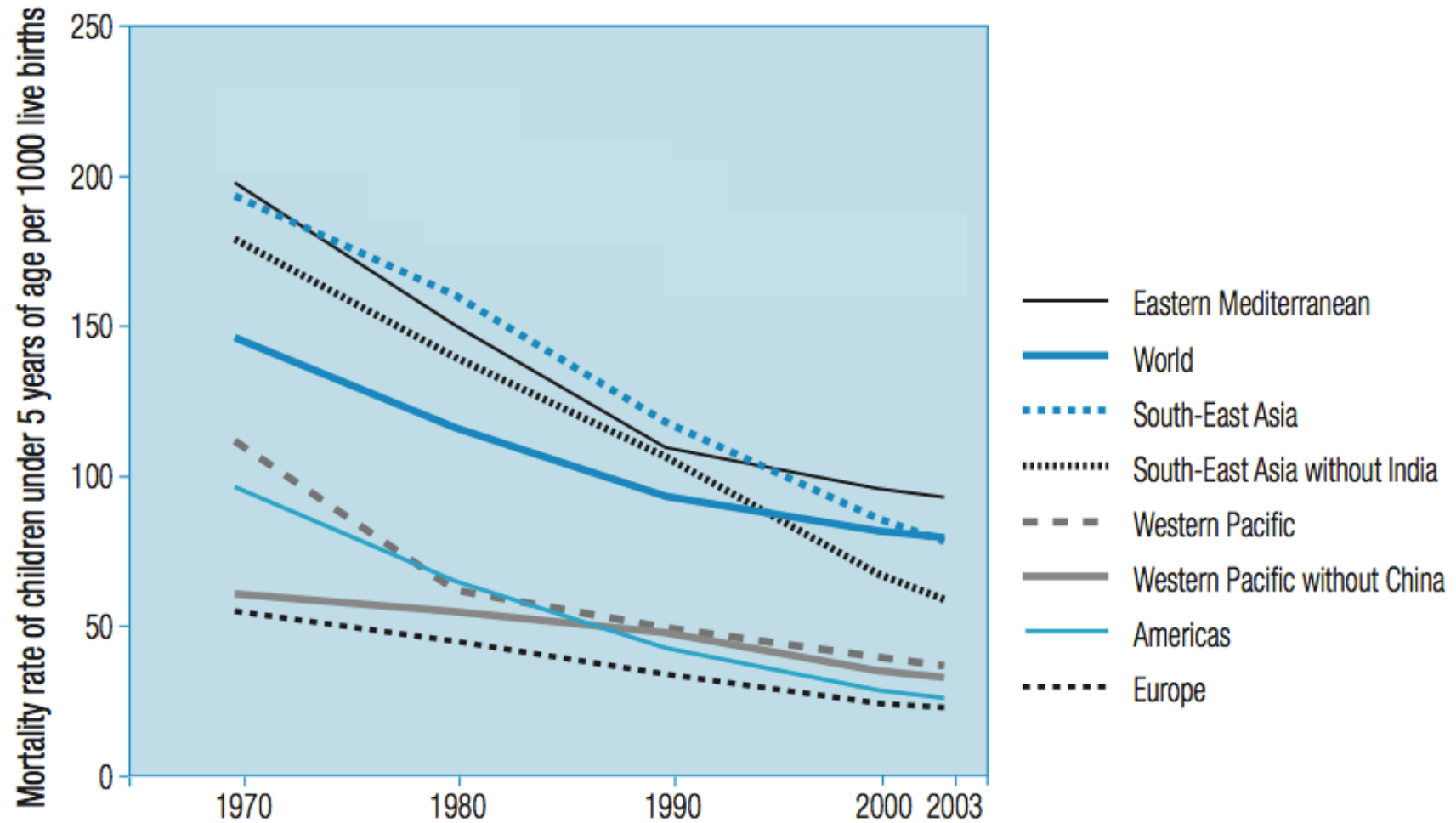


Image from WHO. World Health Report, 2005. Image in public domain.

Figure 1.1 Slowing progress in child mortality: how Africa is faring worst

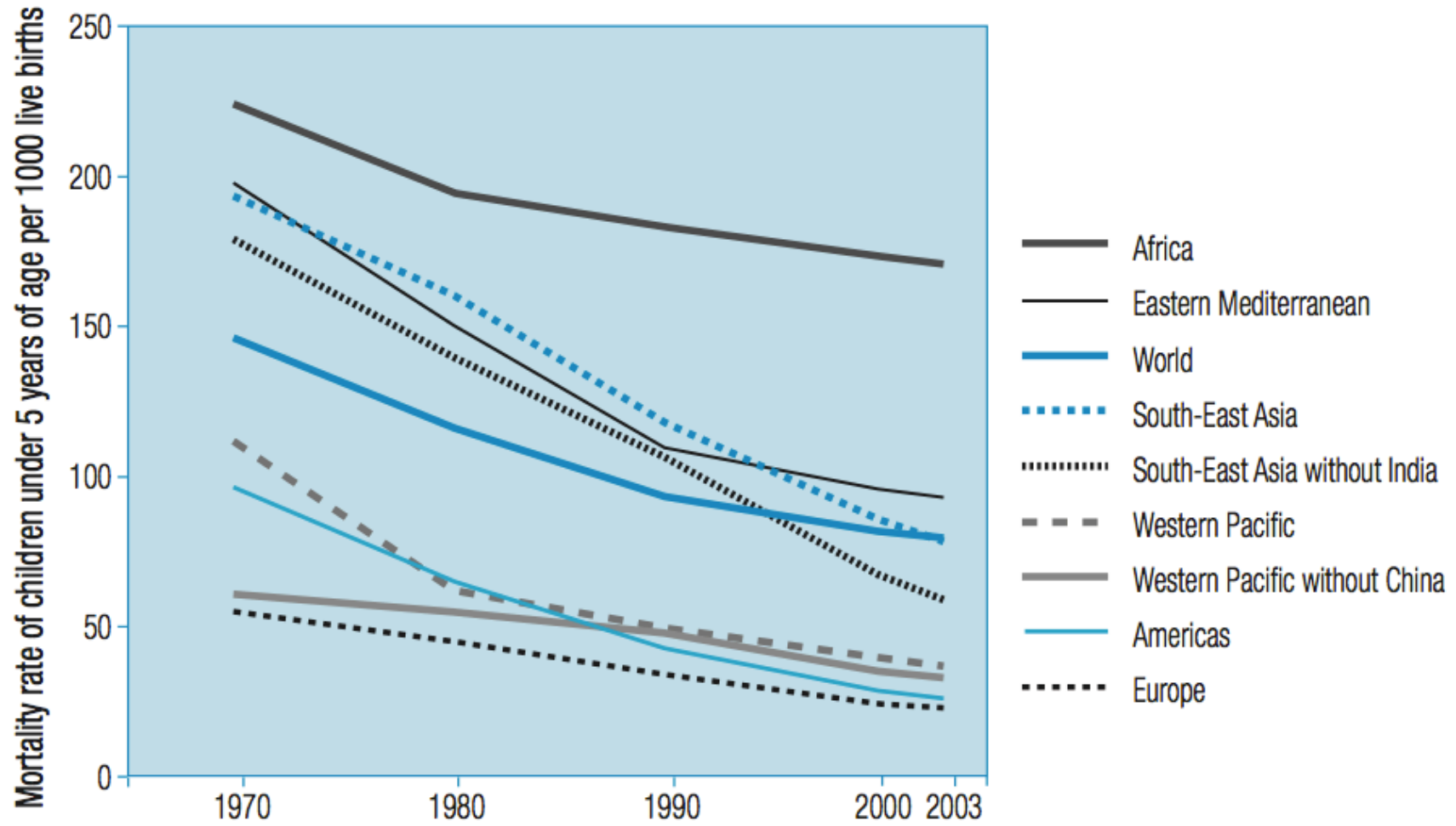
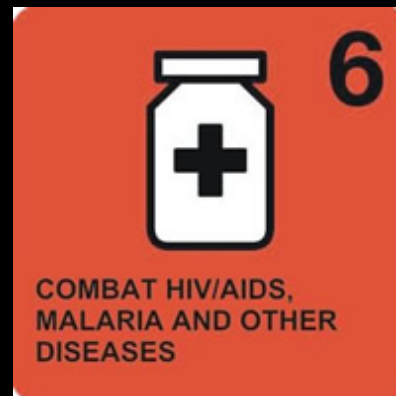
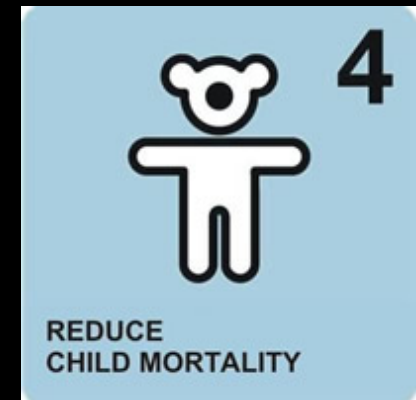
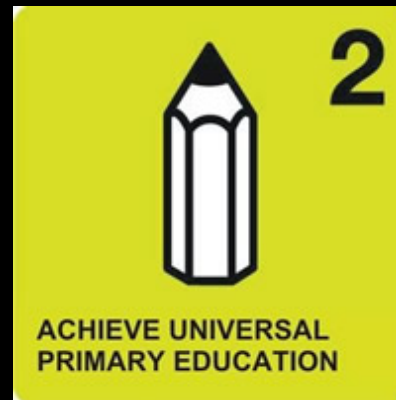
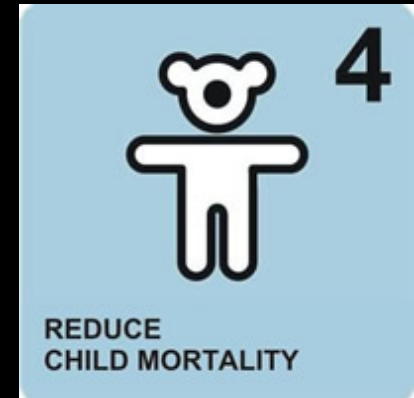


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Millennium Development Goals



Millennium Development Goals

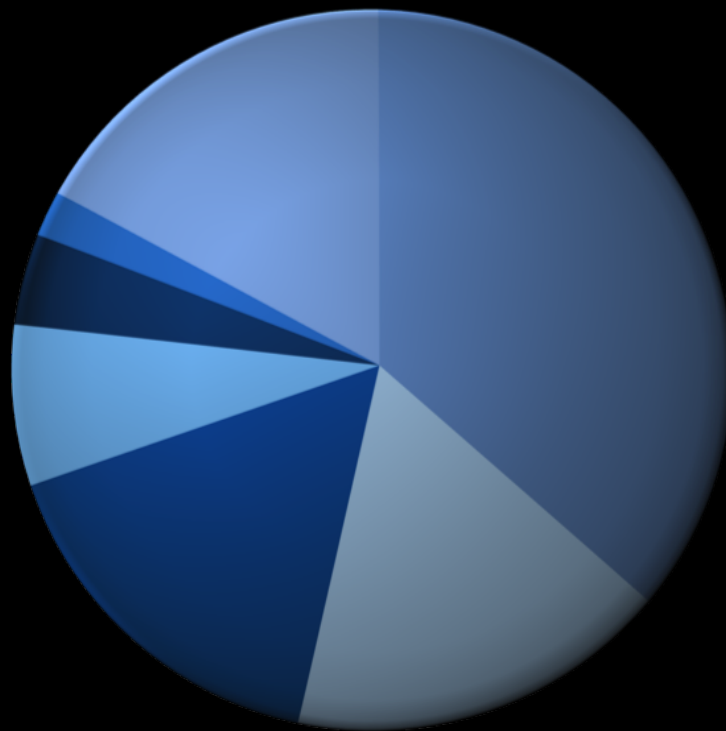


UN MDG #4

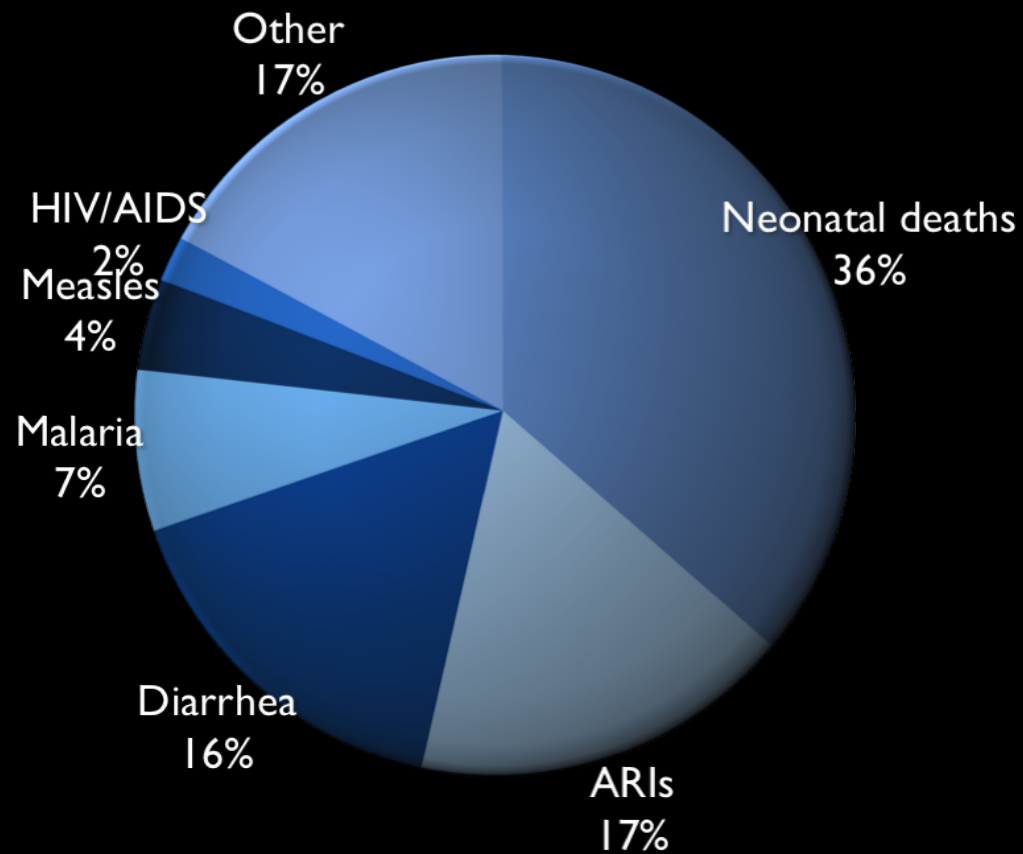
*Reduce U5MR by 2/3 between 1990-2015
(from 93 to 31 of every 1,000 children)*

- Most off-track of any MDG
 - 91 countries likely won't meet goal
 - Many have had increased mortality

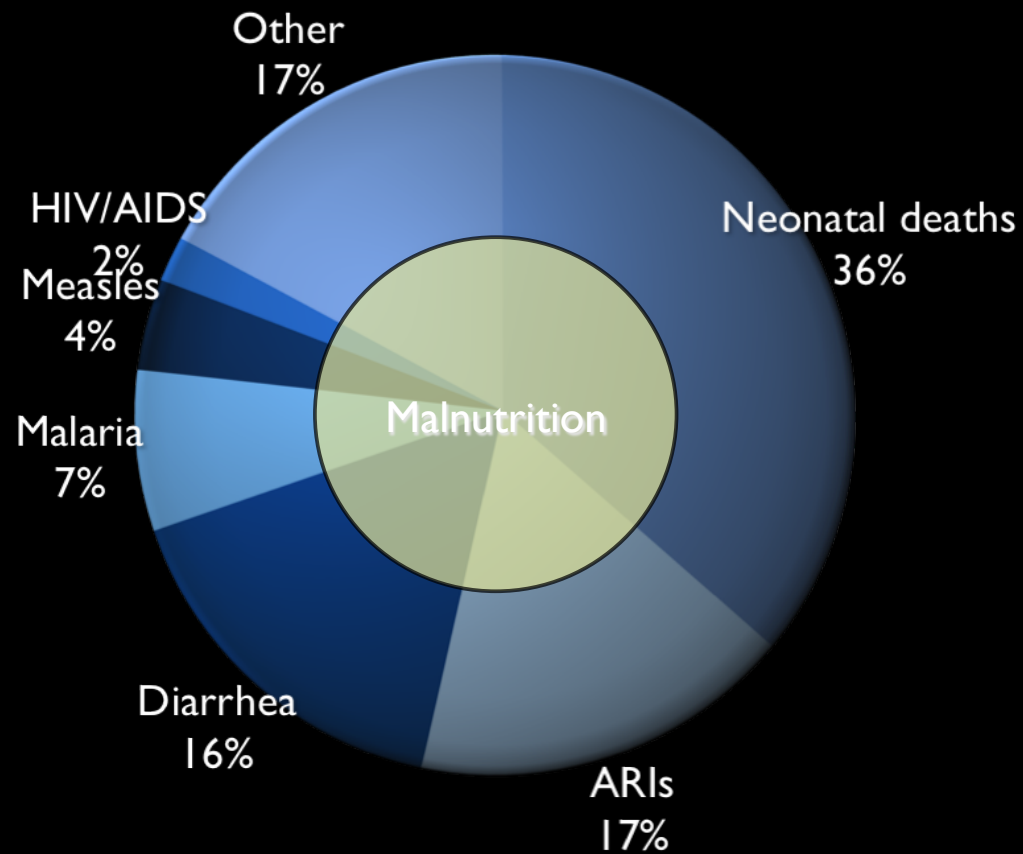
Causes of U5MR



Causes of U5MR



Causes of U5MR



Causes of U5MR

1. Neonatal deaths
 2. Acute respiratory infections (ARIs)
 3. Diarrheal illnesses
 4. Malaria
 5. Measles
 6. HIV/AIDS
- + Malnutrition

II. Essentials in the management of U5MR



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Neonatal mortality (#1)



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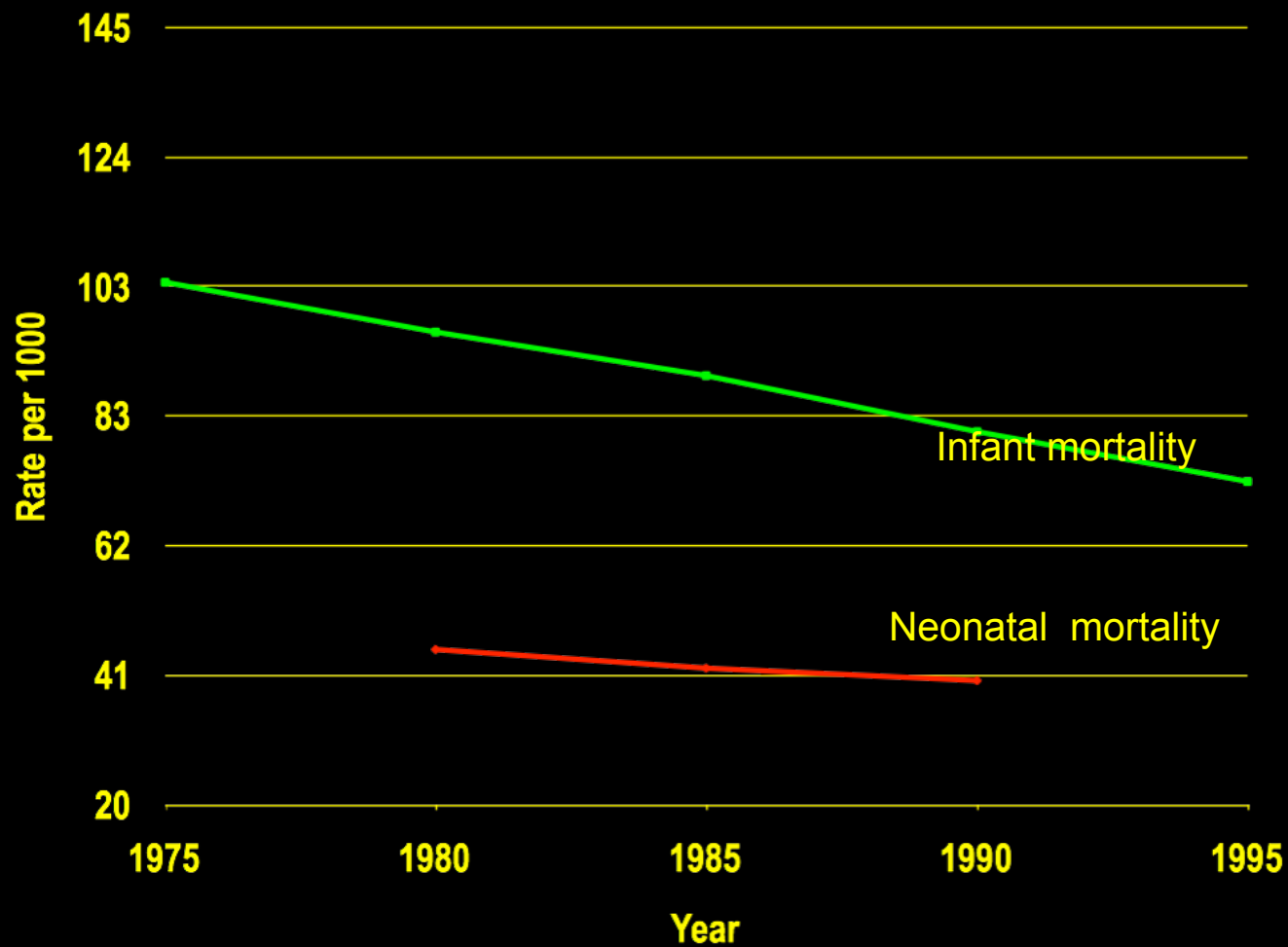
Neonatal mortality

- Of nearly 9 million under-five deaths annually...
 - Over 3 million occur within neonatal period
 - Vast majority could be prevented with low-tech, low-cost interventions
- These numbers don't include additional 3.3 million stillbirths

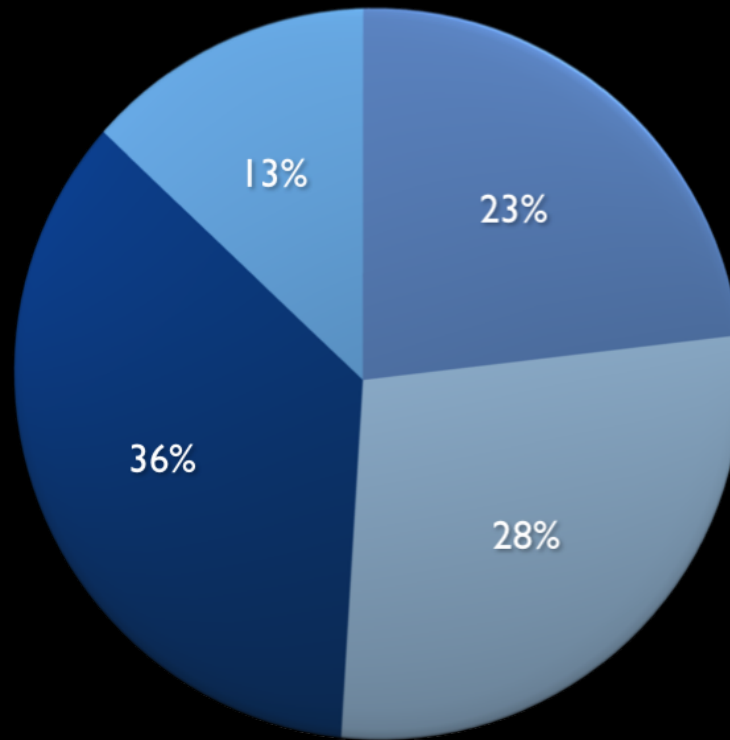
Neonatal mortality

- In most of world, infant and under-five mortality rates have declined substantially in past 4 decades
- Neonatal mortality has declined less rapidly
- Neonatal deaths now account for 40-70% of all infant mortality

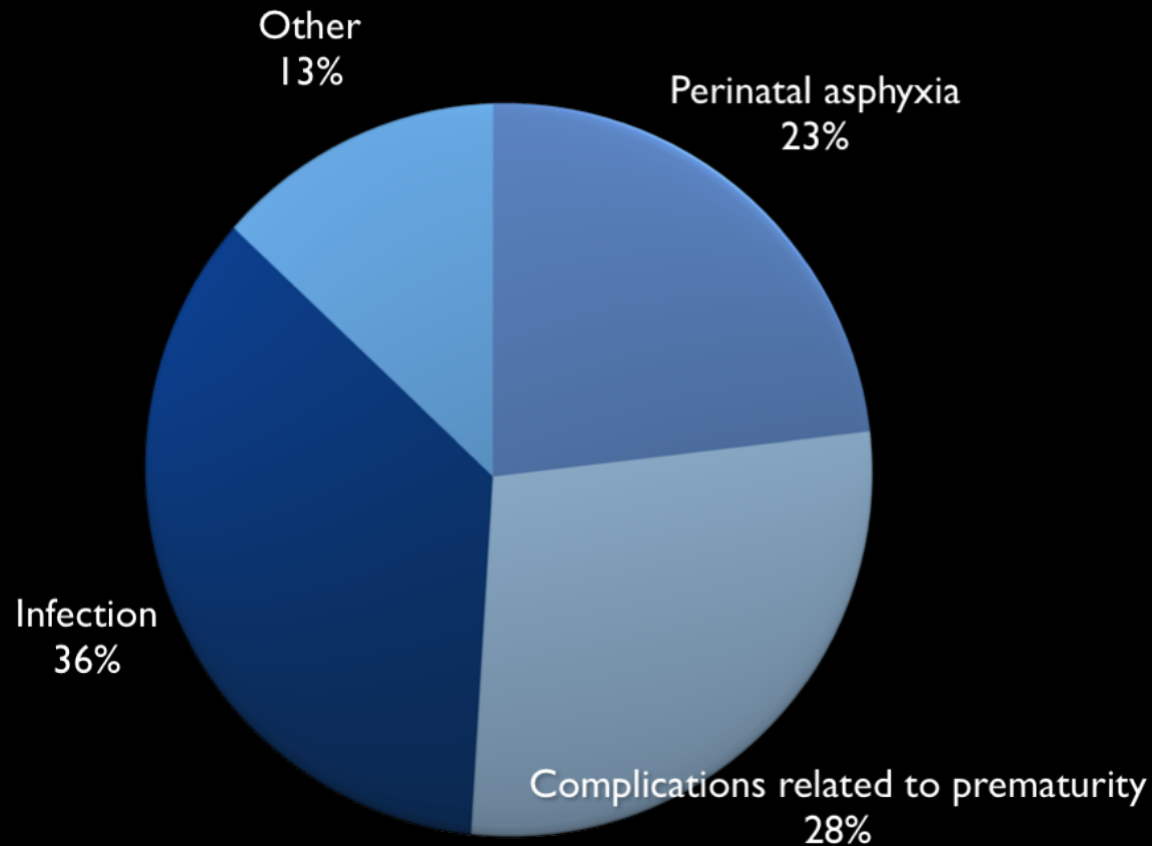
Infant and neonatal mortality in Ghana 1975-1995



Causes of neonatal mortality



Causes of neonatal mortality



Neonatal mortality

- Simple preventive practices can save many!
- Existing interventions can prevent 35-55% neonatal deaths worldwide, including:
 - Interventions for pregnant women
 - Interventions for newborns

Interventions for pregnant women

- A. Tetanus toxoid immunization
- B. Iron supplementation
- C. Folate supplementation
- D. Treatment of maternal malaria
- E. Treatment of maternal syphilis



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A. Tetanus

- Caused by *Clostridium tetani*
 - G+, anaerobic bacterium w/ spores in soil and animal GI
- Spore inoculation occurs through dirty wounds
 - Once inside, spores germinate and produce tetanospasmin (very potent neurotoxin)
 - Tetanospasmin disseminates to nerves
 - Toxin blocks inhibitory neurotransmitter release and causes unopposed muscle contraction

A. Tetanus: presentation

- Shortest peripheral nerves are affected first
 - facial distortion
 - back and neck stiffness
- Autonomic nervous system may also be affected
- Seizures may occur

A. Tetanus: epidemiology

- Tetanus kills ~70,000 newborns in Africa each year
 - 6% of all neonatal deaths
- Very hard to treat neonatal tetanus(!)
 - Preventing disease by immunizing mothers critical

A. Tetanus: prevention

- Can be prevented with tetanus-toxoid (TT)-containing vaccines
- Mothers should receive at least 2 TT vaccines during pregnancy
- Protects mother and her baby
- Also important to have clean care of umbilical cord

B. Iron supplementation

- Iron-deficiency anemia affects ~50% of women
 - Contributes significantly to maternal mortality, causes an estimated 10,000 deaths/year
- Maternal anemia also causes neonatal mortality
 - Newborns more likely LBW, premature, or perinatal death
 - Newborns also at greater risk for cognitive impairment

C. Folate supplementation

- Folate supplements before and around conception can reduce neural tube defects by 72% (42-87%)



Image retrieved from <http://www.cdc.gov/ncbddd/folicacid/recommendations.html>. Image in public domain.

D. Treatment of maternal malaria

- Malarial infection causes 400,000 cases/year of severe maternal anemia
- Causes 75,000-200,000 infant deaths/year
- Effects on fetus:
 - Fetal loss, prematurity, IUGR, LBW

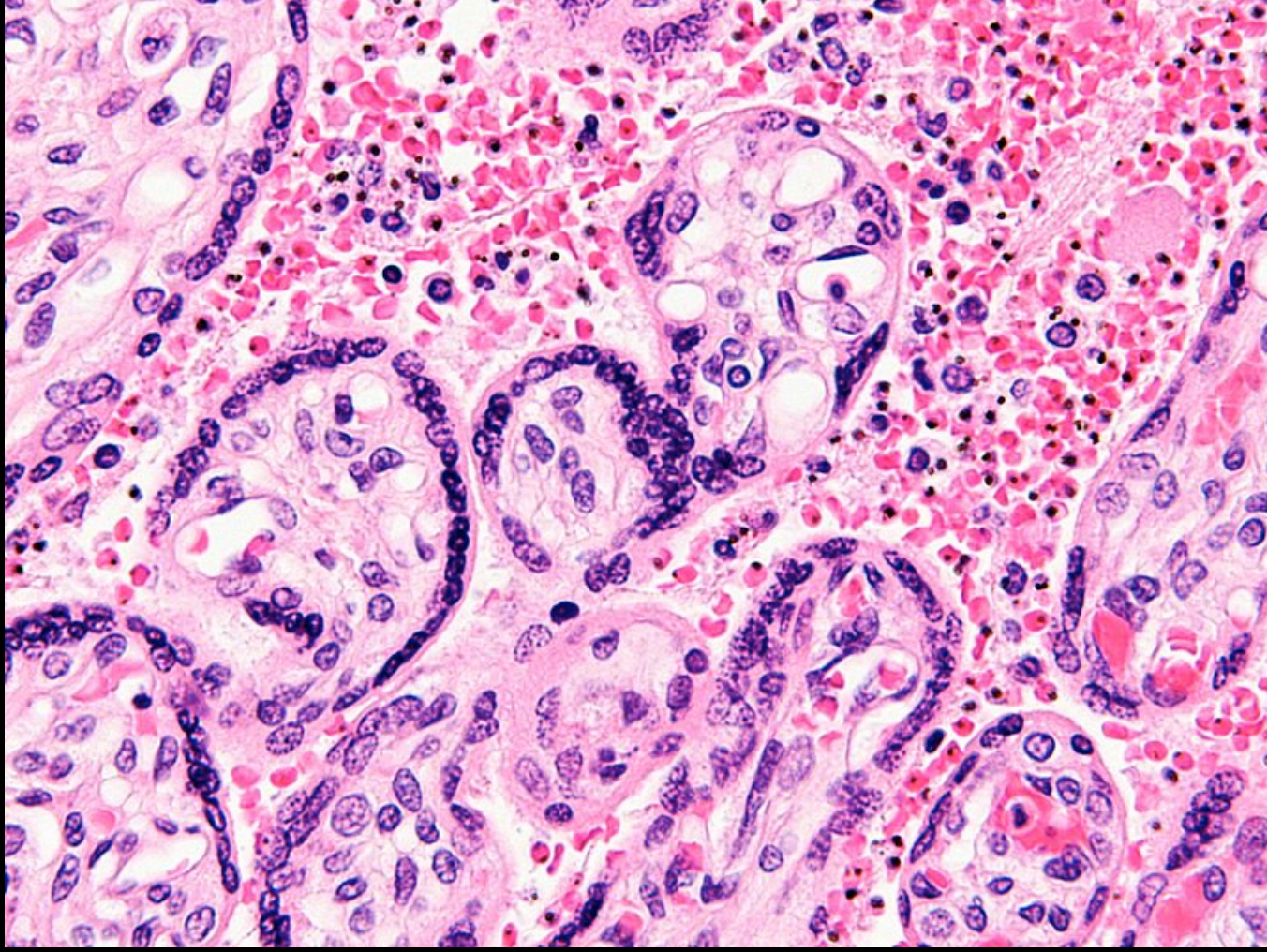


Image retrieved from http://commons.wikimedia.org/wiki/File:Maternal_malaria_placenta_-_cropped_-_very_high_mag.jpg. Image in public domain by Nephron and used under a Creative Commons license.

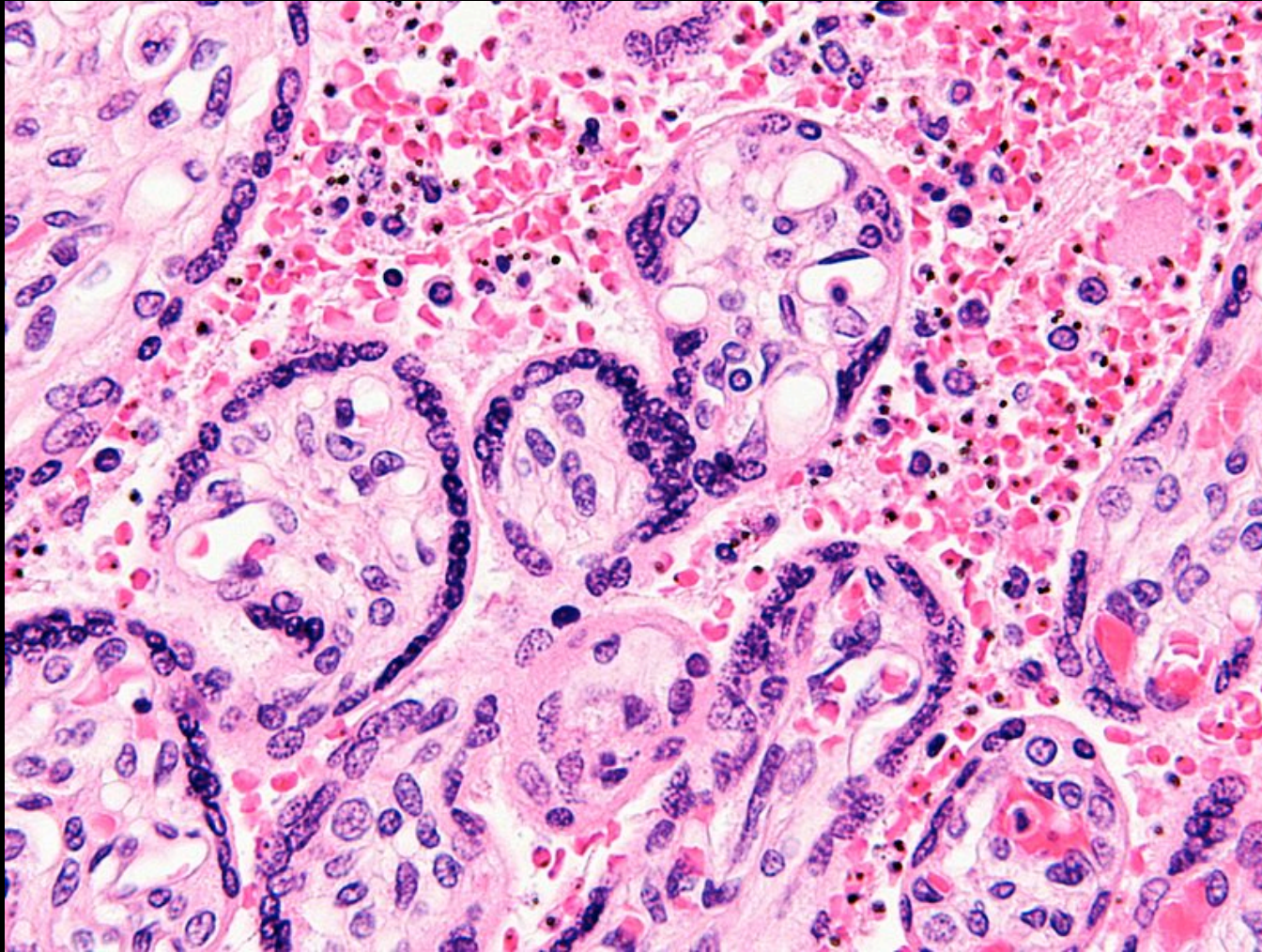


Image retrieved from http://commons.wikimedia.org/wiki/File:Maternal_malaria_placenta_-_cropped_-_very_high_mag.jpg. Image in public domain by Nephron and used under a Creative Commons license.

Malaria-infected human placenta examined under microscope. Intervillous spaces (central area of picture) are filled with red blood cells, most of which are infected with *Plasmodium falciparum* malaria parasites.

D. Treatment of maternal malaria: ITNs

- Insecticide-treated bed nets (ITNs):
 - Provide to pregnant women as early in pregnancy as possible
 - Encourage use throughout pregnancy and during postpartum period

D. Treatment of maternal malaria: IPT

- Intermittent preventive treatment of malaria
 - Give IPT with each scheduled antenatal visit after quickening
 - Goal of at least 2 doses, not more frequently than monthly
 - Best drug is sulfadoxine-pyrimethamine (SP) because of safety during pregnancy, (16-36wks), effectiveness, and feasibility

E. Treatment of maternal syphilis

- STI caused by a spirochete, *Treponema pallidum*
- Can cause miscarriages, premature birth, stillbirth, or death of newborn babies
 - 40% of births to syphilitic mothers are stillborn
 - 40-70% of surviving infants will be infected
 - 12% of infected infants will subsequently die

E. Treatment of maternal syphilis: s/sx

- Systemic sx:
 - FTT, fever, irritability
- Skeletal:
 - no bridge to nose (saddle nose), Hutchinson teeth, frontal bossing, saber shins
- Rashes:
 - blisters (infectious) then lesions on palms and soles
- Other:
 - severe congenital pneumonia, watery discharge from nose, blindness / clouding of cornea, decreased hearing or deafness



Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=2246>. Image in public domain.



Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=3510>. Image in public domain.

E. Treatment of maternal syphilis: rx

- One dose of penicillin will cure a mother who has had syphilis for <1 year
- More doses are needed to cure a mother who has had it for >1 year
- A baby born with syphilis needs daily penicillin treatment for 10 days

Interventions for newborns

- Clean deliveries
- Newborn resuscitation
- Exclusive breastfeeding
- Kangaroo / skin-to-skin care
- Oral polio and BCG injections

Neonatal resuscitation

- Most newborns will do well without assistance
- However, approximately 10% will need some intervention
 - 13 million neonates worldwide every year
- Fortunately, simple and effective steps

Neonatal resuscitation

Warm, dry, bulb suction, stimulate

Add PPV if apnea or HR < 100

Add compressions if HR < 60

...

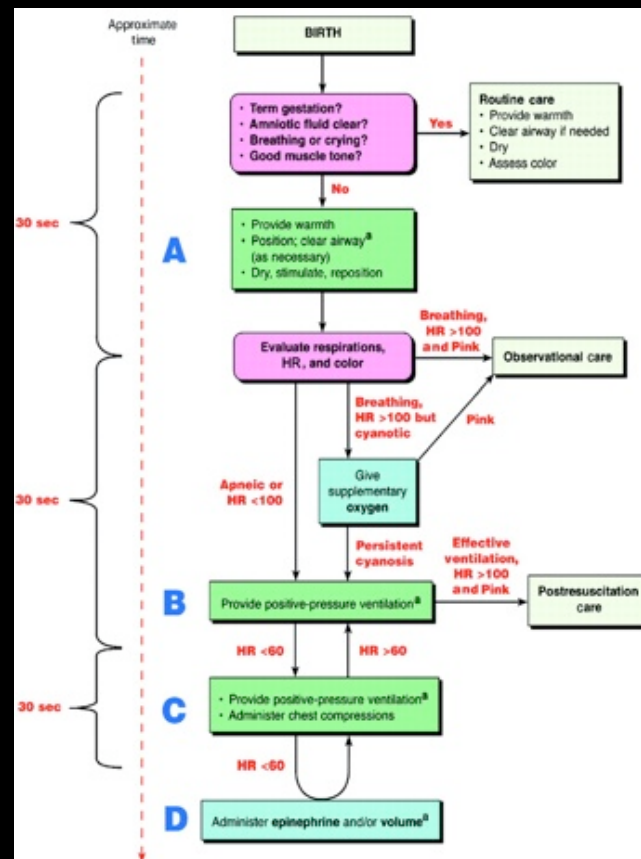


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Simple, cost-effective innovations

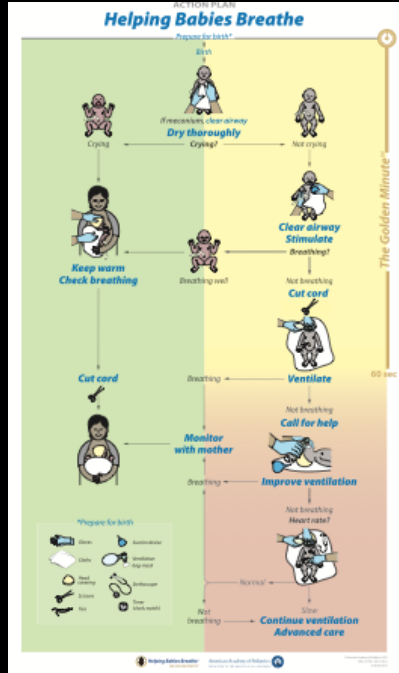


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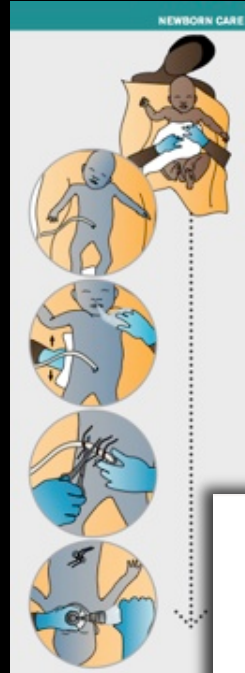
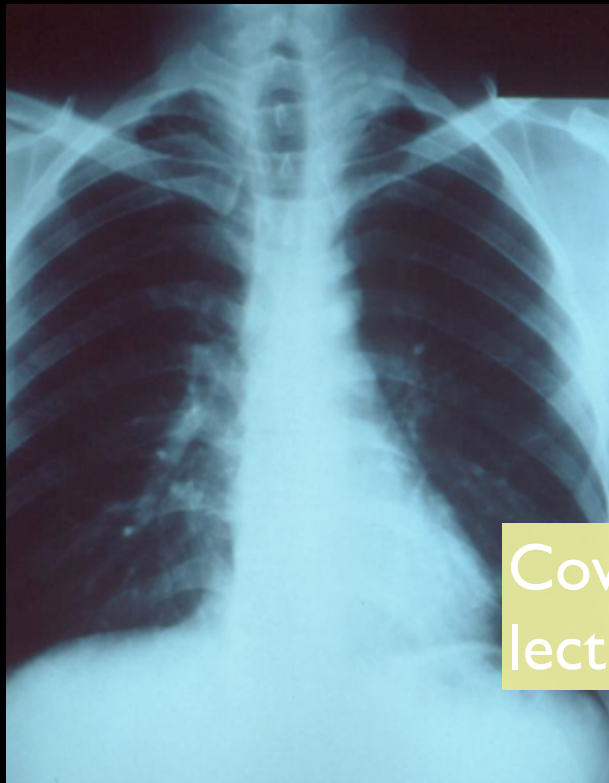


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Acute respiratory infections (#2)



Covered in another lecture. Brief review.....

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ARIs

- Leading cause of death in children 1-4yo
 - 2 million deaths each year, nearly one in five child deaths globally
 - Plus additional deaths in neonatal period
- ~60% of significant ARIs in developing world caused by bacteria
 - Majority are viral in developed world

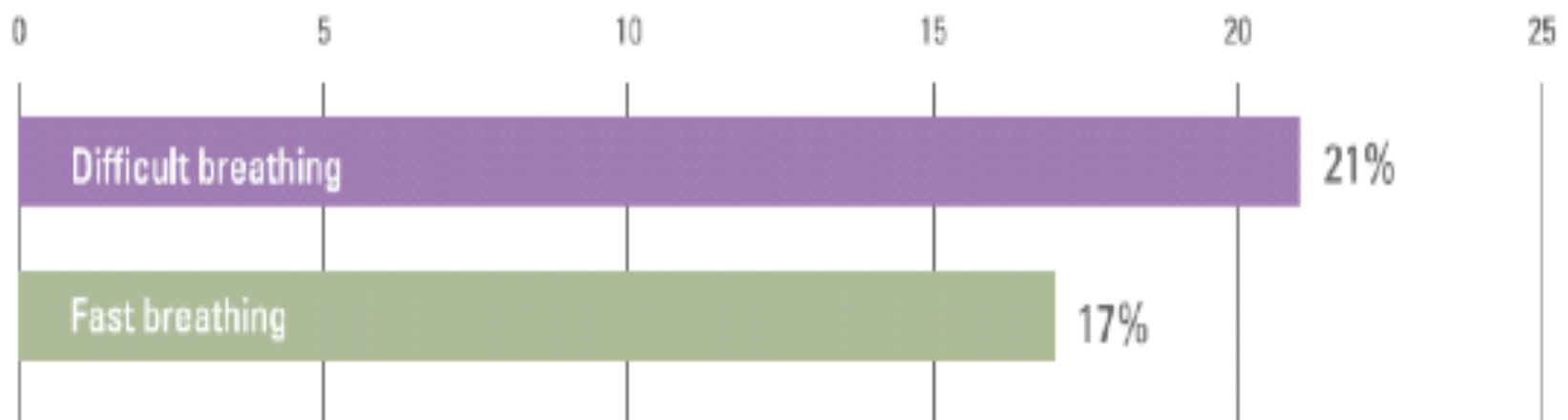
Recognition of respiratory distress

Two major obstacles to reducing mortality from pneumonia is care-giver awareness of:

- 1) signs and symptoms of respiratory infection
- 2) when to seek medical attention

FIGURE 8 FEW CAREGIVERS RECOGNIZE THE TWO KEY DANGER SIGNS OF PNEUMONIA

% caregivers who know that difficult or fast breathing is a sign to seek care immediately



Data from 33 MICS, 1999-2001 (see statistical tables 3 and 4).

Pneumonia is a clinical diagnosis

- Suggested by the following:
 - Cough
 - Fever
 - Respiratory distress (tachypnea, retractions, flaring, grunting)
- On auscultation:
 - Crackles, decreased breath sounds, pleural rub, abnormal vocal resonance

[WHO figure of child chest indrawing.
Available at: https://apps.who.int/chd/publications/referral_care/chap3/chap3fr.htm]

CXR needed abroad?

- CXR usually not needed for diagnosis of pneumonia (and infrequently available)
- CXR only recommended:
 - Very severe pneumonia (to look for complications)
 - After 2 days of treatment if condition has not improved or has gotten worse
 - In cases of acute unexplained worsening

Supplemental oxygen

- Assess oxygen saturation with pulse oximetry
- If available, give oxygen if SpO₂ <90% or respiratory distress



Philips Respironics Oxygen Concentrator.
Image retrieved from http://en.wikipedia.org/wiki/Oxygen_concentrator. Image in public domain and used under a Creative Commons license.

Diarrheal illnesses (#3)

Covered in another lecture.
Brief preview.....

Scope of diarrheal illnesses

- In developing countries, children typically have 2-6 diarrheal illnesses each year
 - ~2.2 million children under age 5 die each year (8,000 children/day)
 - 1/20 children die before age 5
- Impaired nutrition, growth, development, fitness, cognitive, and school performance
- Susceptibility to other acute infections

Differential diagnosis

[WHO table: Table 11. Differential diagnosis of the child presenting with diarrhoea (Page 111). WHO Pocket book of hospital care for children in resource-limited settings. Available at: Image retrieved from <http://whqlibdoc.who.int/publications/2005/9241546700.pdf>]

Diarrhea: management

- Early replacement of fluid losses
 - Oral rehydration solution (ORS)....
- Continue/increase feeding and breastfeeding
- Recognize signs of dehydration or other concerning symptoms
- Antibiotic use only when appropriate
- Zinc x10-14 days

Oral rehydration solution (ORS)

Sodium and glucose solution for
management of acute diarrhea

*“Potentially the most important
medical advance of this [20th]
century”*

Water with sugar and salt [editorial]. Lancet 1978;2(8084):300-1.

[Image of ORS sachet.
Available at: [http://
www.unicef.de/projekte/
themen/nothilfe/nothilfe-
medizinische-versorgung/](http://www.unicef.de/projekte/themen/nothilfe/nothilfe-medizinische-versorgung/)]

Malaria (#4)



Covered in another lecture. Brief preview.....

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Malaria

- 1.5 billion live in endemic areas
- Over 500 million infected annually
- 1-2 million deaths annually

[Image: world map of malarial infections.
Available at: http://www.cdc.gov/malaria/malaria_worldwide/impact.html]

Malaria

- Caused by protozoa in *Plasmodium* genus:
- *P. falciparum*, *vivax*, *ovale*, *malariae*, *knowlesi*
- Transmitted by female *Anopheles* mosquito

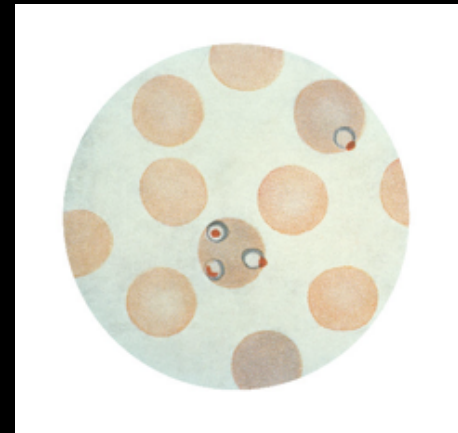


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Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=7862>. Image in public domain.

Plasmodium life cycle

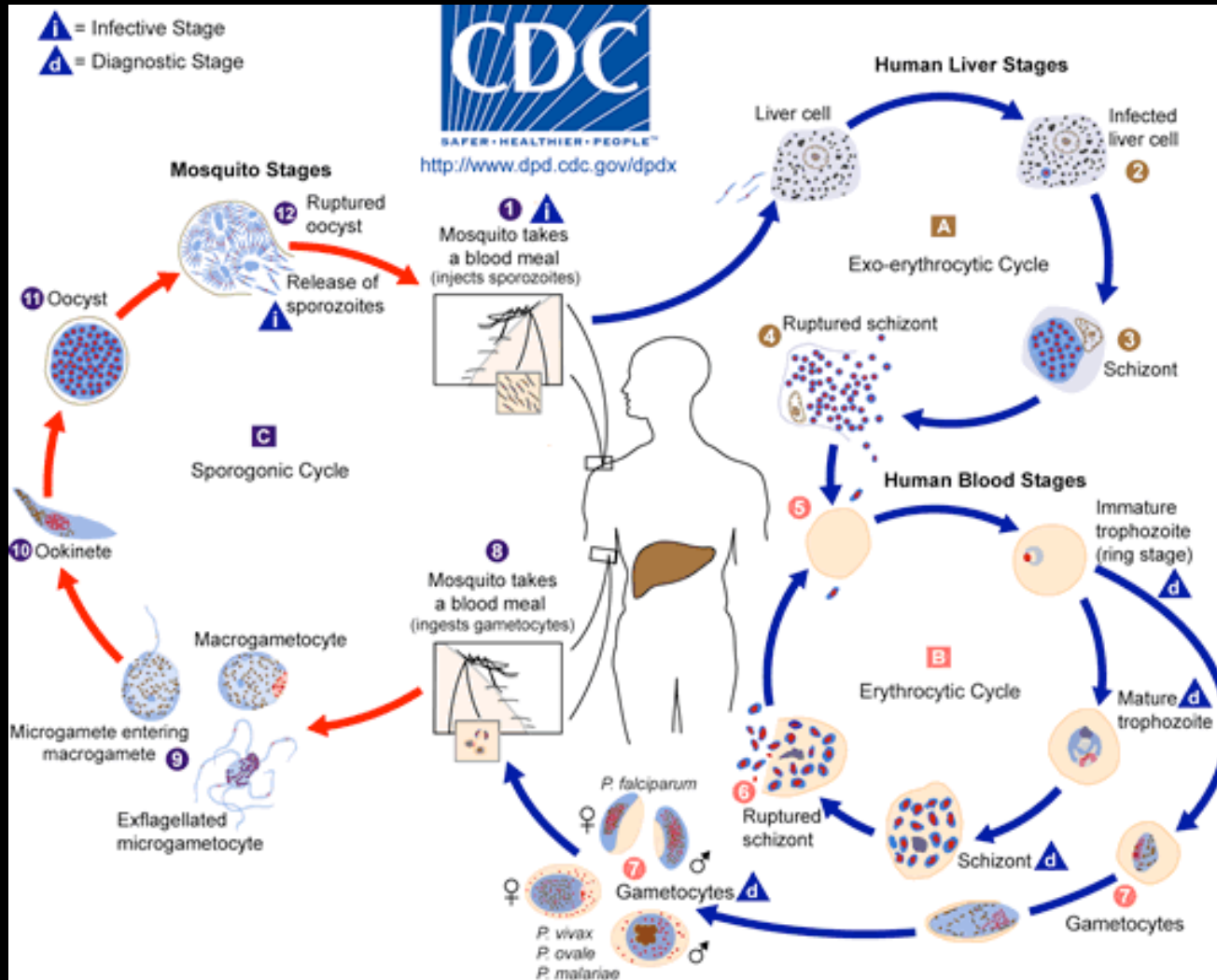


Image retrieved from <http://dpd.cdc.gov/dpdx/html/Malaria.htm>. Image in public domain.

Malaria presentation

- Systemic symptoms
 - Malaise, headache, chills, emesis, fever
- Severe malaria
 - Prostration, shock, metabolic acidosis
 - Hypoglycemia
 - Severe anemia, jaundice, hepatosplenomegaly
 - Organ failure (pulmonary edema, hemoglobinuria, etc)
 - Cerebral malaria

Malaria diagnosis

- Clinical diagnosis not always accurate
- But may treat empirically, esp children in high-endemic areas
- Thick and thin blood smears
- Rapid tests also available

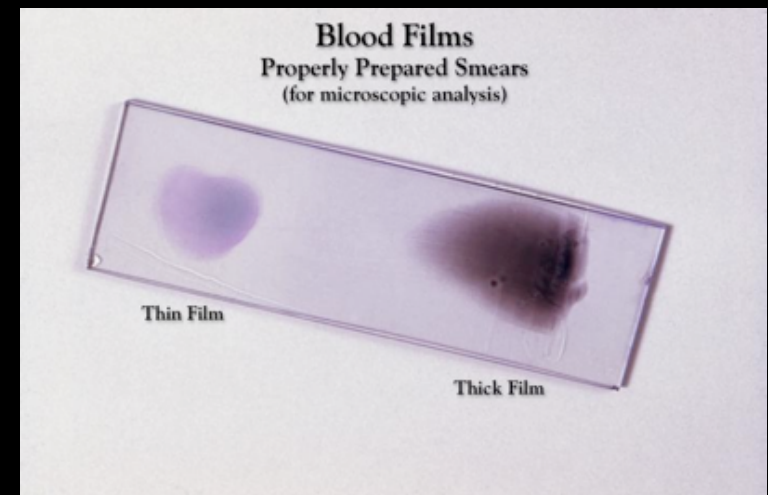


Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=5905>. Image in public domain.

Malaria treatment

- Varies by region, but commonly....
 - Chloroquine: first-line agent for all non-falcip malaria and for non-severe falcip in parts of Africa
 - Artemesinins: very effective against all (x3 days in combo or x6 days alone)
 - Quinine: for severe falcip
- Blood transfusion prn and other supportive care

Measles (#5)



Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=10458>. Image in public domain.

Measles

- RNA myxovirus
- Spread via respiratory droplets
 - Attack rate 90%
- 30-40 million cases annually
- 242,000 deaths in 2006

Measles presentation

- Incubation: 14 days
- Fever + three C's:
 - Cough, Coryza, Conjunctivitis
- [C]Koplik spots
- Malaise (very miserable)
- Rash: head-toe spread



Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=990>. Image in public domain.



Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=3187>. Image in public domain.



Image retrieved from <http://phil.cdc.gov/phil/details.asp?pid=6571>. Image in public domain.

Measles mortality

- Developed countries: 0.02%
- West Africa: 12%
- Displaced populations: up to 30%
- Risk factors: overcrowding, poor nutrition, Vit A deficiency, lack of immunization, immunocompromised

Measles vaccine coverage

[Image: map of measles vaccine coverage. Available at:
[http://www.who.int/immunization_monitoring/diseases/
big_measles_map_coverage.jpg](http://www.who.int/immunization_monitoring/diseases/big_measles_map_coverage.jpg)]

Measles treatment

- Supportive care
 - Antipyretics, hydration, isolation
- Vitamin A
 - 0-6 months: 50,000 IU x1
 - 6-12 months: 100,000 IU x1
 - >12 months: 200,000 IU x1
 - If eye complications: 200,000 IU daily x2

Malnutrition



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Covered in another
lecture.....

Summary (I)

- Nearly 8 million children die each year
- Leading causes of child mortality:
 - Neonatal mortality, ARIs, diarrheal illnesses, malaria, measles, HIV/AIDS
 - Malnutrition contributes to >50%

Summary (2)

- Neonatal mortality is a huge component of childhood mortality, particularly in developing world
- Most common causes are infections, asphyxia, and prematurity
- Simple, inexpensive interventions are currently available and remarkably effective

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