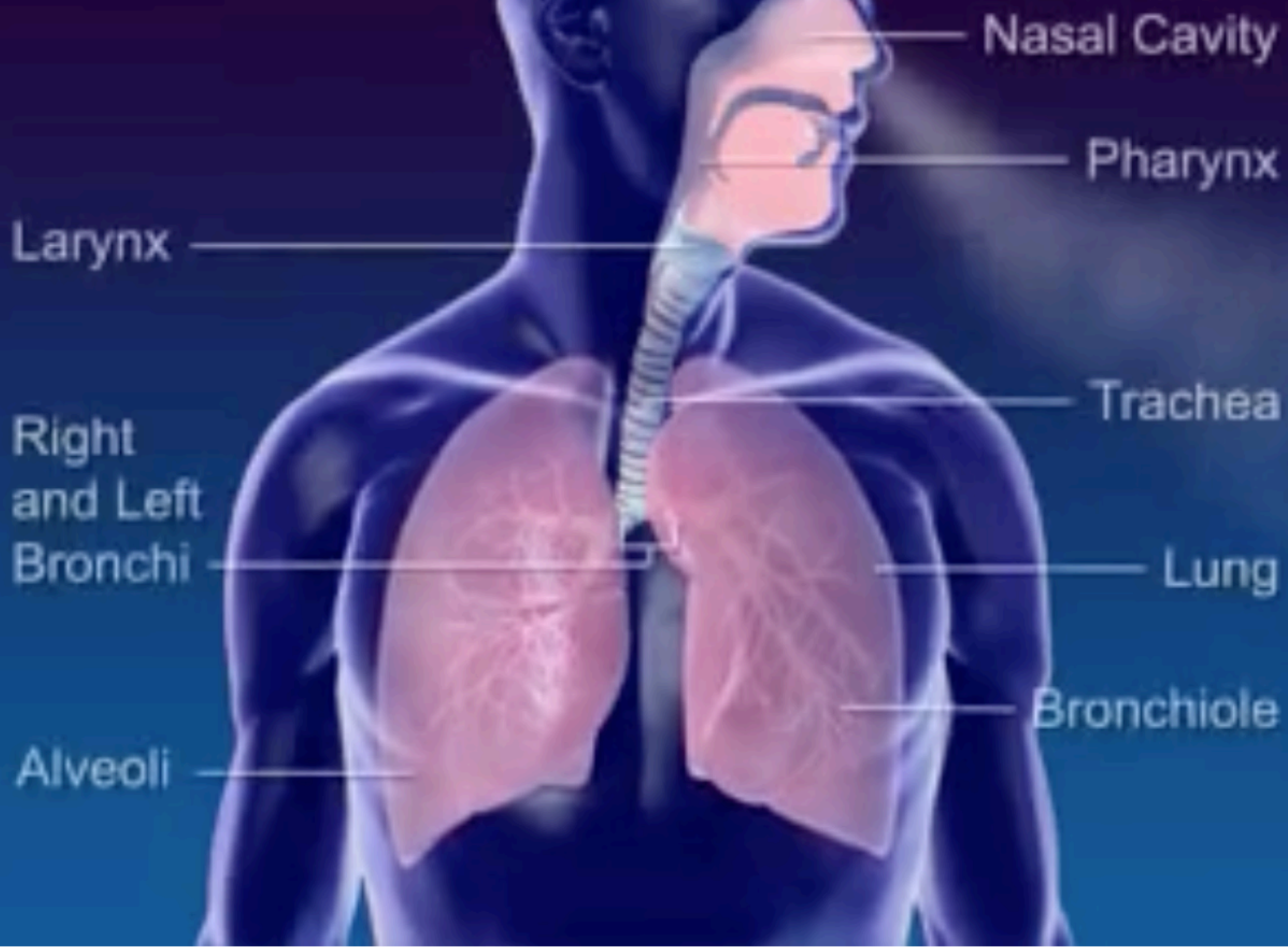


# **Respiratory Infections in Children living in resource limited-countries**



Dr. Gianluca Russo, MD, PhD

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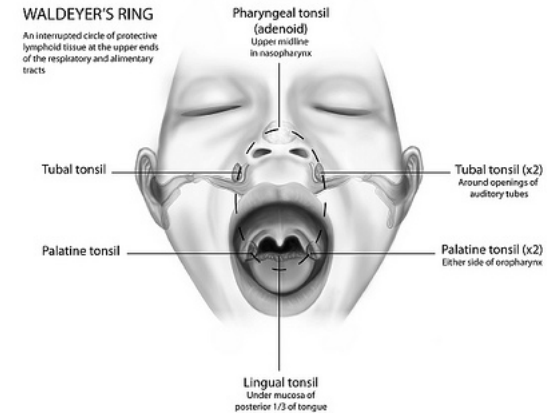
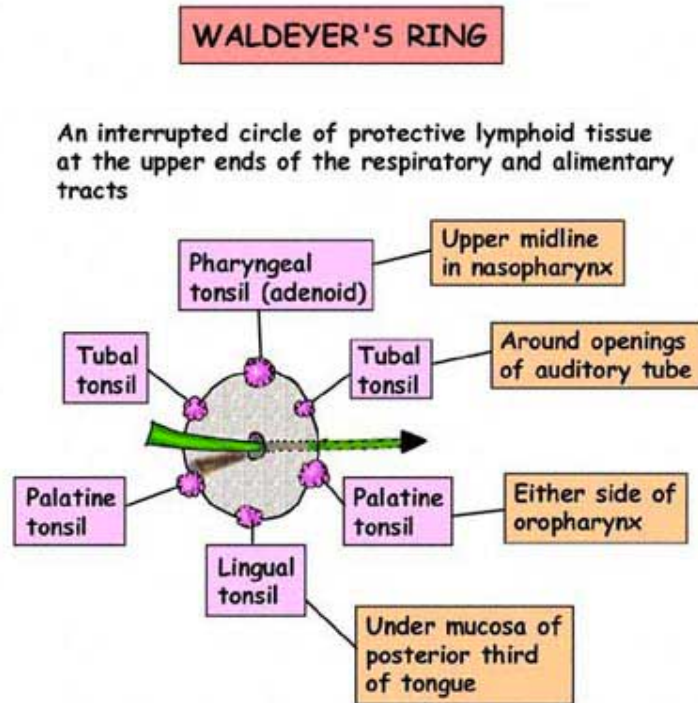
## Notes on Lung physical Exam in Children

Type of breathing, dyspnea, prolongation of expiration, cough, expansion, fremitus, flatness or dullness to percussion, resonance, breath and voice sounds, rales, wheezing.

### **\*Practical notes:**

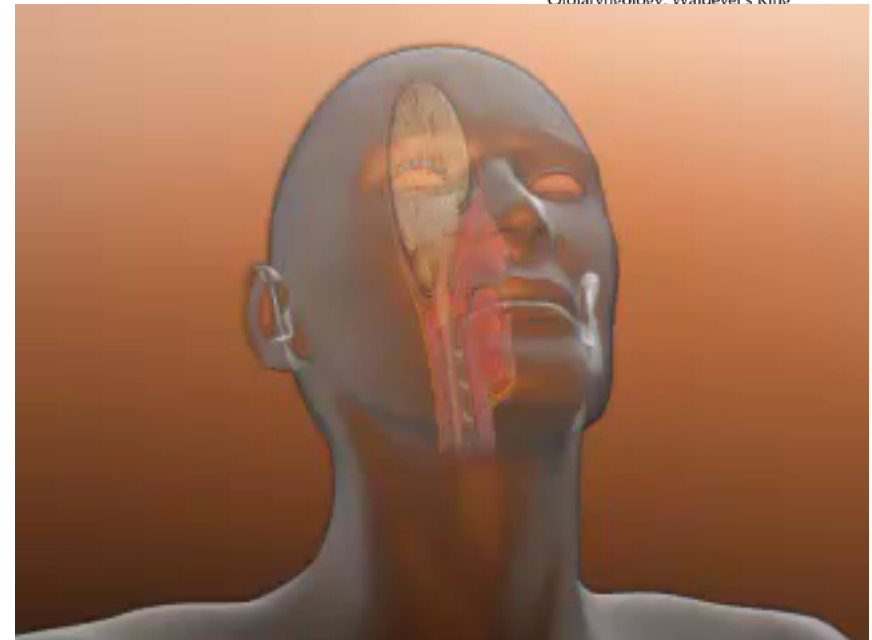
- A. Breath sounds in infants and children normally are more intense and more bronchial, and expiration is more prolonged, than in adults.
- B. Most of the young child's respiratory movement is produced by abdominal movement; there is very little intercostal motion.
- C. If one places the stethoscope over the mouth and subtracts the sounds heard by this route from the sounds heard through the chest wall, the difference usually represents the amount produced intrathoracically.

# The Waldeyer ring is lymphoid tissue able to realize a first defensive action against respiratory pathogens



Otolaryngology: Waldeyer's Ring

In the respiratory tract the production of mucus and the movement of cilia help have the primary function to remove foreign substances and microbes from the respiratory apparatus



# Tonsillitis

Tonsils play a role in the juvenile period of disease-fighting. Studies have shown that the amygdala directly kills pathogens and contains natural killer cells. Moreover, the tonsil tissue can secrete an immune globulin called IgA, while white blood cells within the amygdala can differentiate into antibody-secreting cells.

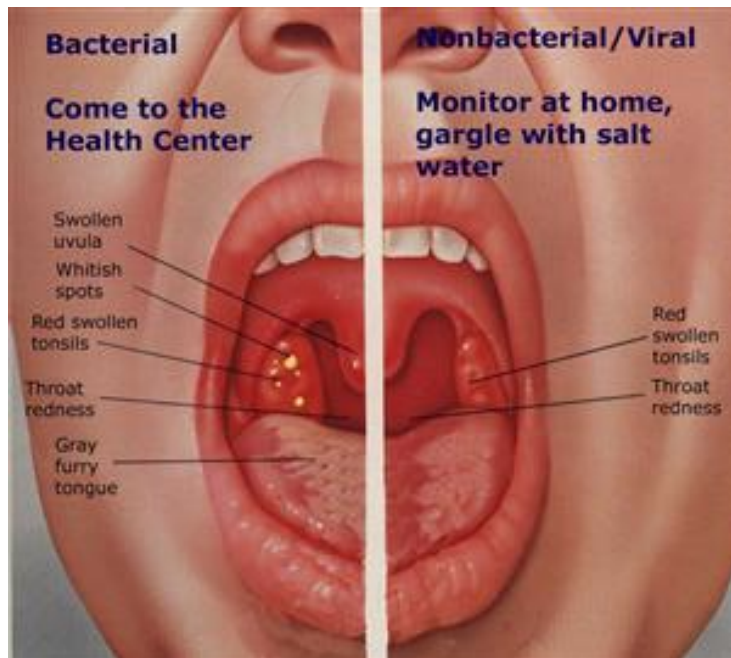
Typically, pre-school children are susceptible to viral tonsillitis, older children and adults are susceptible to bacterial tonsillitis.

Virus infection can lead to secondary bacterial infections. Many viral upper respiratory tract infections (such as influenza viruses, parainfluenza viruses, rhinovirus) also often lead to viral tonsillitis. The most common bacterial infections are beta-hemolytic streptococcus, pneumococcus and Staphylococcus aureus.

## **Note:**

Until the first year of life, tonsils are hypoplastic. Afterwards, especially after the entry into the life community, thanks to the exchanges of microbes with coetaneous and following repeated higher respiratory infections, the tonsils become physiologically hypertrophic.

# Acute tonsillitis



Symptoms	Streptococcal	viral
Sore throat	severe	Mild
Fever	High (> 39°C)	Moderate (37.5°-38 ° C)
Tonsils hypertrophy	severe	Mild
Exudate	Frequent	Absent
Cervical Lymphadenopathy	Frequent	Rare
Cough	Rare	Frequent
G.i. symptoms	Rare	frequent

In case of bacterial aetiology there is also leucocytosis neutrophila

In case of involvement of adenoidal tonsil there is also nasal obstruction

In consideration of the tonsil's size, the children can develop:

- difficult to breathe because of restriction of respiratory space
- difficult to eat because of space restriction for food passage



Viral tonsillitis



Viral tonsillitis (Coxsackie virus)



Streptococcal tonsillitis

## Medical Treatment

- In case of bacterial aetiology:

Erythromycin 10 mg/kg every 6 h for 3-5 days

Or

Amoxicillin 40-50 mg/kg every 8 h for 3-5 days

- Anti-inflammatory treatment can be indicated in case of severe tonsil's hypertrophy with consequent breathe or swallow

- In case of tonsillitis without fever gargle with water and salt are indicated



# Laryngitis

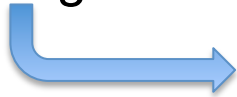
- Upper-glottis
- Under-glottis

Generally is  
caused by  
virus



# Symptoms

- Modification of the voice (raucous)
- Moderate fever
- Frequently associated with rhinitis
  
- “Barking cough”
- Acute dyspnoea with inspiratory stridency (“cornage”)
- Transpiration
- Tachycardia
- “Tirage”



The **treatment** is symptomatic with steroids during acute phase

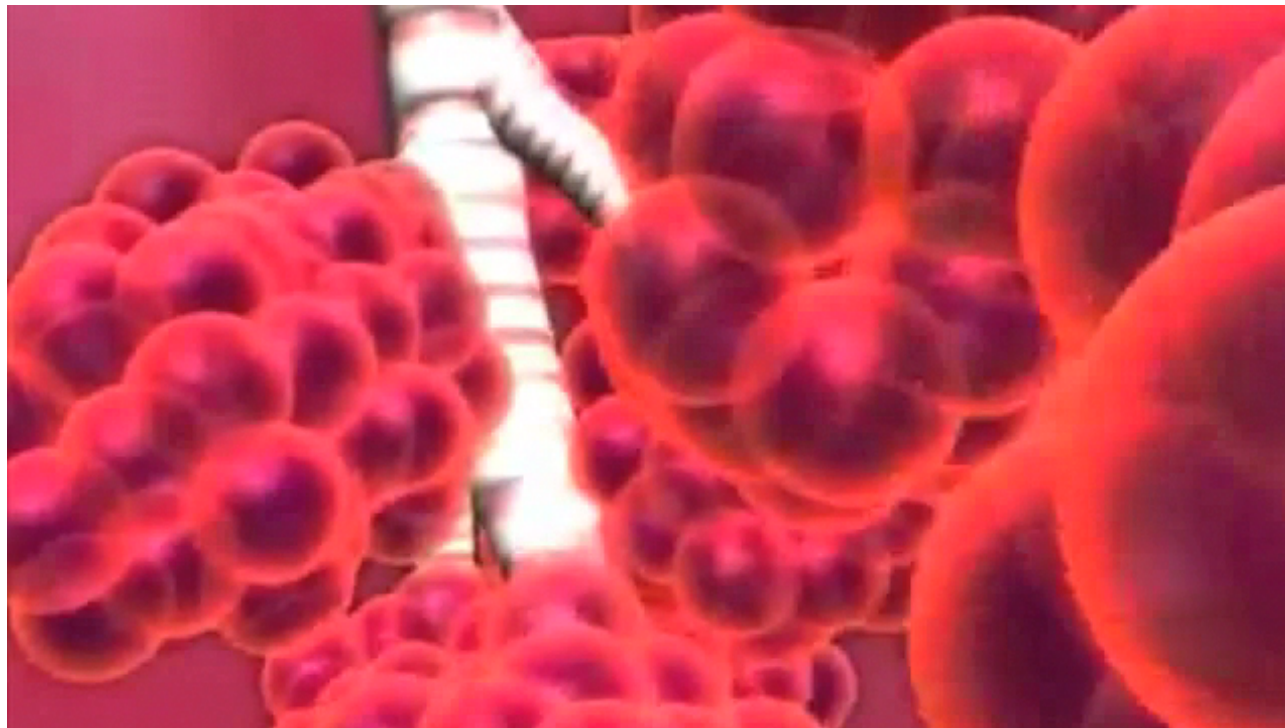
# Bronchial Asthma

Asthma is a common condition that often starts in childhood, but it can happen for the first time at any age.

If you have asthma, your airways become irritated and inflamed. As a result, they:

- become narrower and thicker
- produce extra mucus

This makes it more difficult for air to flow into and out of your lungs.



## Causes of asthma

The cause of asthma isn't always clear. However, there are often triggers that can result in a flare up of symptoms.

**Common triggers** include:

- respiratory infection - such as a cold or flu
- irritants - such as dust, cigarette smoke and fumes
- chemicals (and other substances) found in the workplace
- allergies to pollen, medicines, animals, house dust mites or certain foods
- exercise - especially in cold, dry air
- emotions - laughing or crying very hard or “stress”
- some medicines

In children asthmatic attacks are more frequent because the bronchial diameter is smaller. In children, asthma is more common in boys than in girls but in adults, women are more likely to have asthma.

Asthma often runs in families.

Premature or low birth weight babies are also more likely to develop asthma.

## Symptoms of asthma

Asthma symptoms may be mild, moderate or severe.

They may include:

- Coughing
- Wheezing
- Shortness of breath

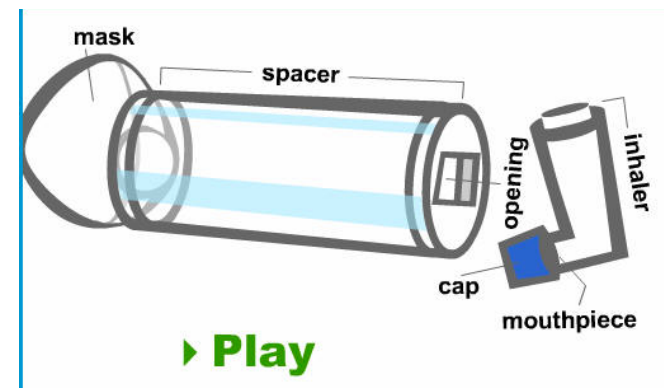
These symptoms tend to be variable and may stop and start.

They are often worse at night.

## Treatment of asthma

There is no curative treatment for asthma, but only therapy for asthma attack using inhaler  $\beta$ -2 selective stimulant (ex. Salbutamol)  $\pm$  Steroid

If you use a gas propelled inhaler, you may also be given a spacer. A spacer is a long tube which clips onto the inhaler. Spacers are devices particularly helpful for children, for babies and very young children thanks to the possibility to insert a face mask. You breathe in and out of a mouthpiece at the other end of the tube.



# Bronchiolitis

Acute viral (RSV: respiratory syncytial virus) infections of the bronchioles affecting children under-two years old, especially around 6-months of age. The infection cause obstruction of bronchioles and severe respiratory symptoms

## Clinical aspects

- Dyspnea (rapidly severe)
- Tachypnea
- Cough
- Irritability
- Fever
- “Tirage” (indrawing)
- Cyanosis

*Bronchiolitis is a severe and life-threatening disease*

<b>If the child is:</b>	<b>Fast breathing is:</b>
2 months up to 12 months	50 breaths per minute or more
12 months up to 5 years	40 breaths per minute or more

- Thin rale at the end of inspiration + wheeze at the begin of expiration
- In severe cases, there is the respiratory silence (“respiratory exclusion”)

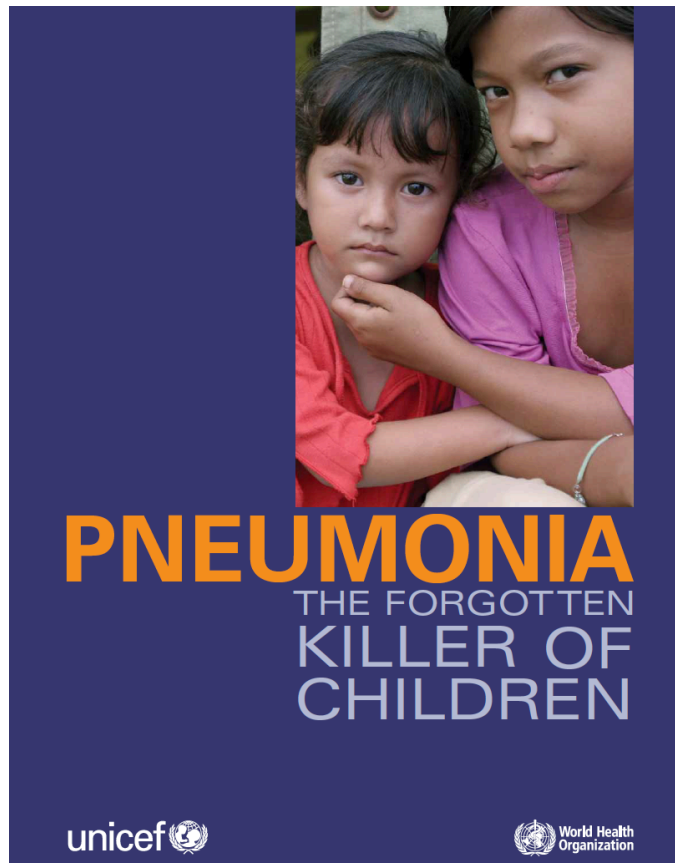
The clinical condition can rapidly worsening with prolonged apnoea, respiratory acidosis and dehydration.

After the first 72h generally there is a rapid good evolution of the clinical picture

## Treatment

The treatment is supportive and not etiologic and is represented by oxygen and rehydration

# **Epidemiology of Pneumonia**



-Only about 1 in 5 caregivers knows the danger signs of pneumonia;

- Only about half of children sick with pneumonia receive appropriate medical care;

and, according to the limited data available, < 20% of children with pneumonia received antibiotics, the recommended treatment.



FIGURE 7  
ESTIMATED INCIDENCE OF CHILDHOOD PNEUMONIA WORLDWIDE, 2004

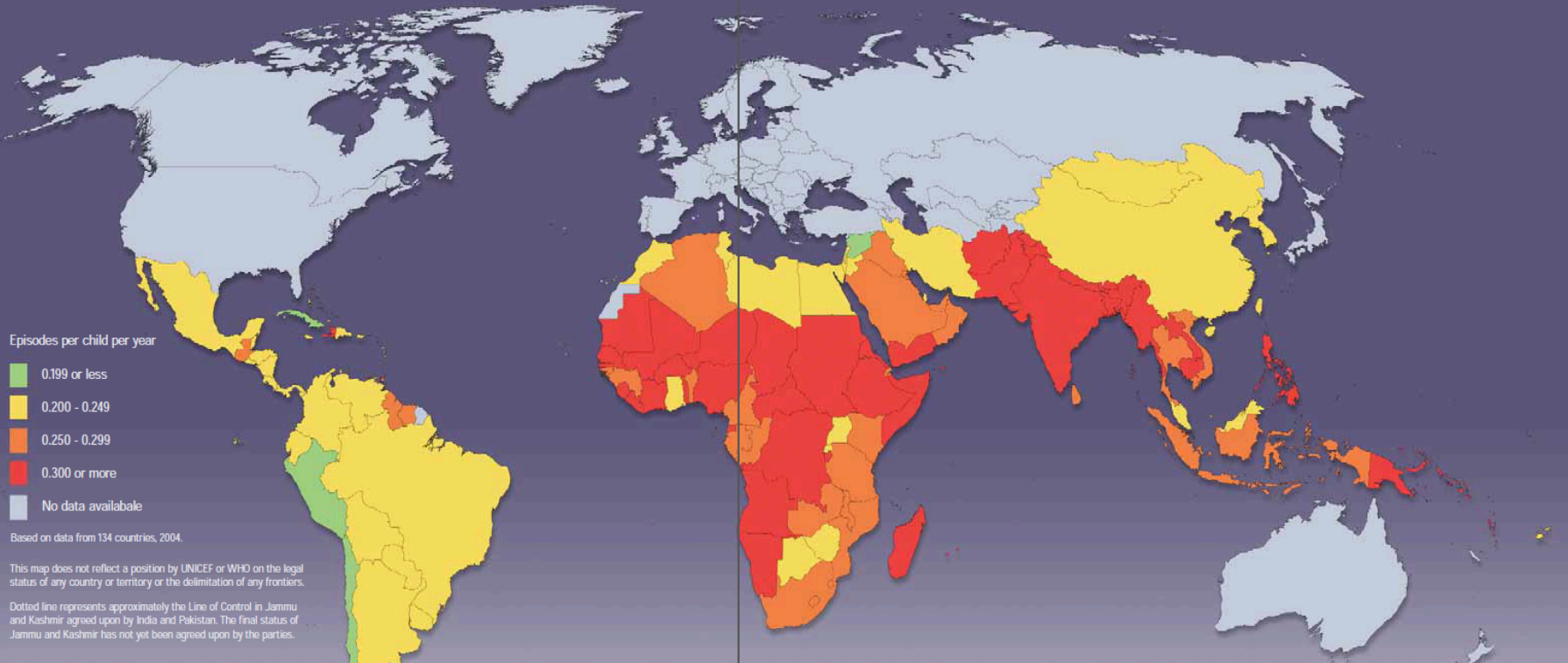
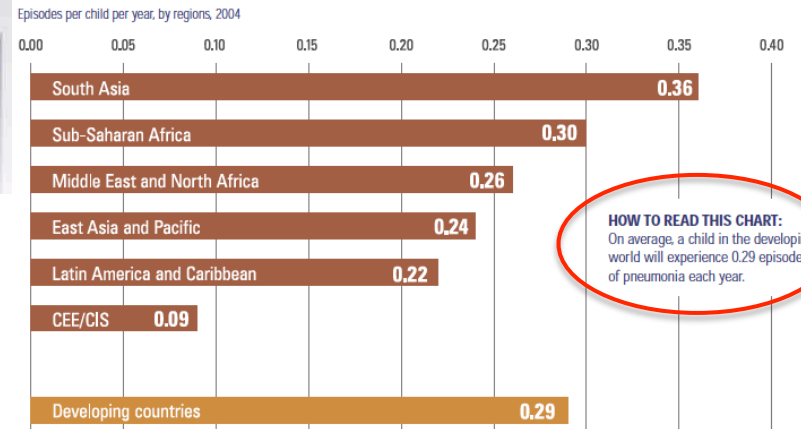


FIGURE 6  
INCIDENCE OF PNEUMONIA IS HIGHEST IN SOUTH ASIA AND SUB-SAHARAN AFRICA

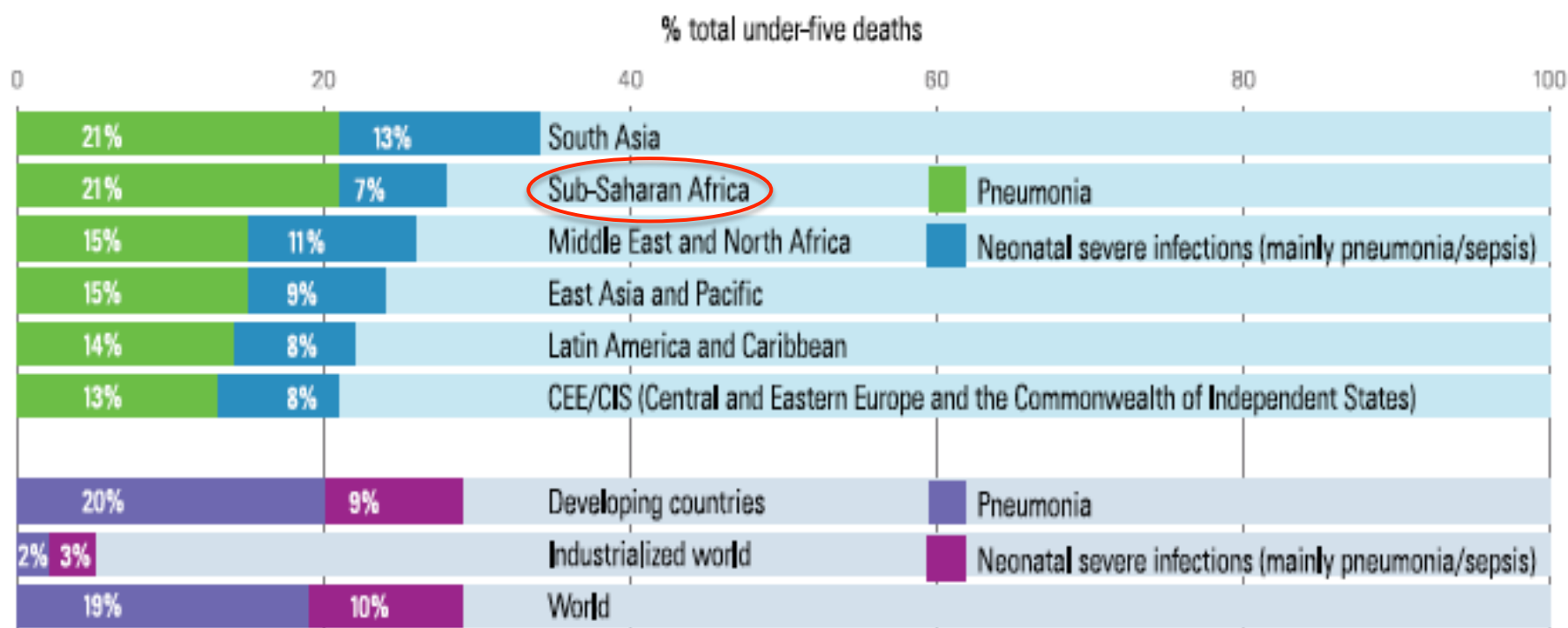


**HOW TO READ THIS CHART:**  
On average, a child in the developing world will experience 0.29 episodes of pneumonia each year.

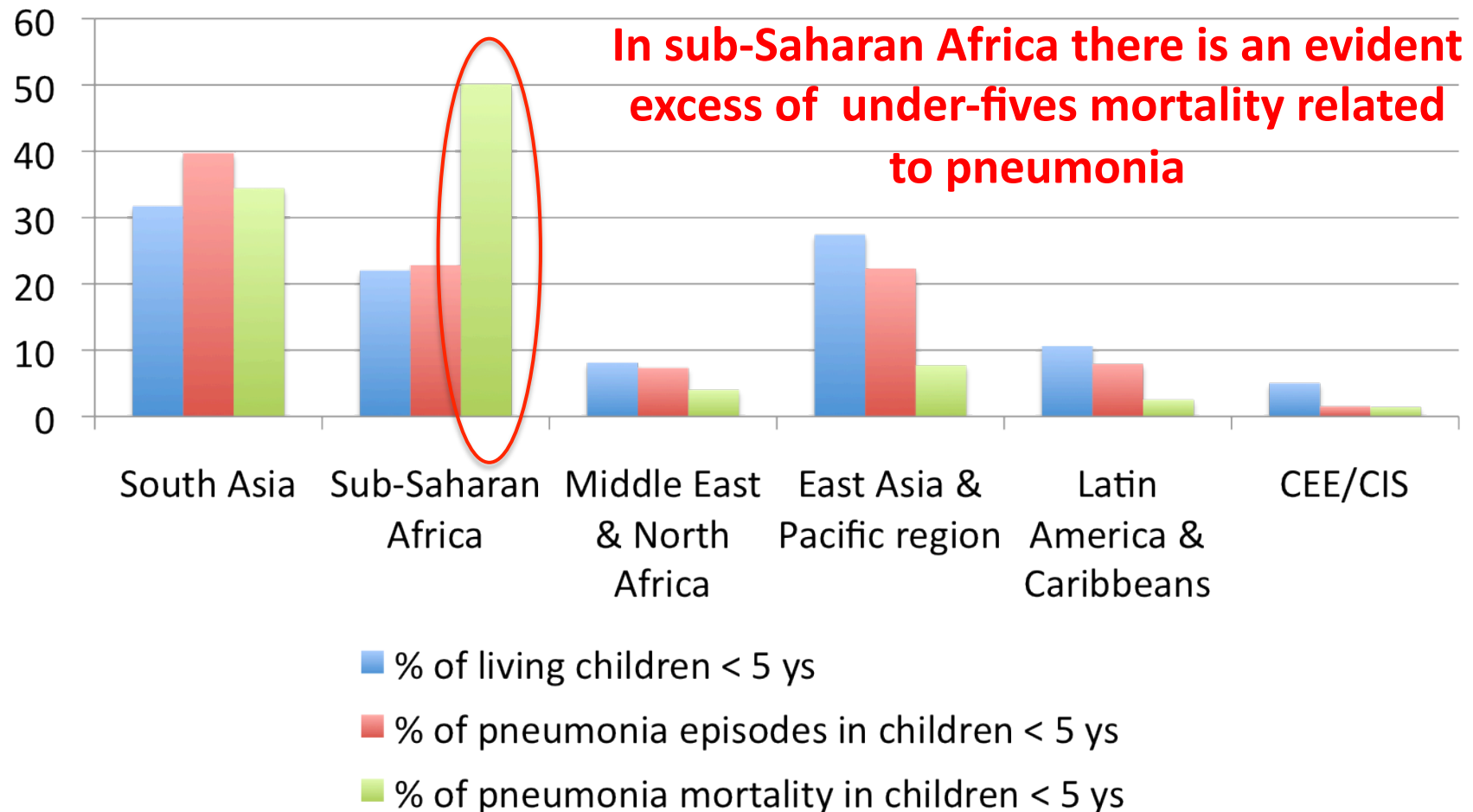
It is estimated that more than 150 million episodes of pneumonia occur every year among children under five in developing countries, accounting for more than 95% of all new cases worldwide.

# PNEUMONIA IS A MAJOR CAUSE OF CHILD DEATHS IN EVERY REGION

% under-five deaths due to pneumonia, by UNICEF region, 2004



# Pneumonia: UNICEF Regions vs Totality of developing Countries



## FEW CAREGIVERS RECOGNIZE THE TWO KEY DANGER SIGNS OF PNEUMONIA

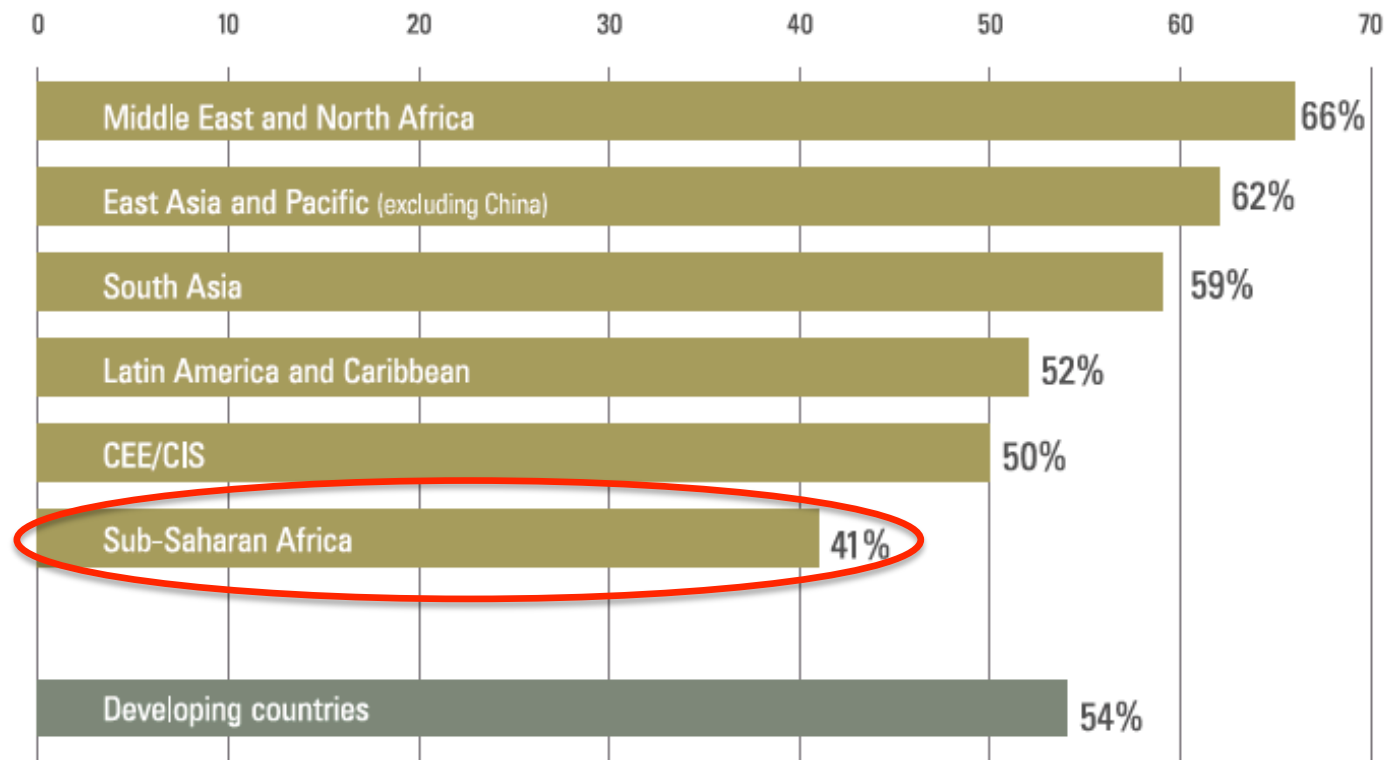
% caregivers who know that difficult or fast breathing is a sign to seek care immediately



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

## ONLY HALF OF CHILDREN WITH PNEUMONIA TAKEN TO AN APPROPRIATE PROVIDER

% under-fives with pneumonia taken to an appropriate health care provider, by UNICEF region, 1998-2004



# WHO LACKS APPROPRIATE CARE? DISPARITIES IN SEEKING CARE FOR PNEUMONIA

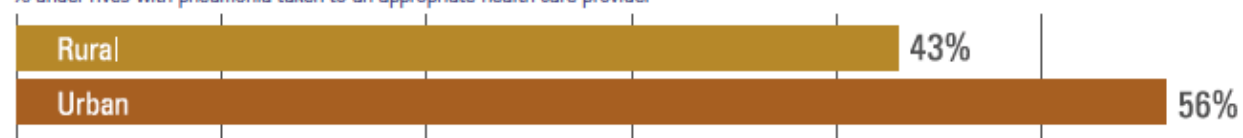
## BOYS AND GIRLS SIMILARLY TAKEN TO APPROPRIATE CARE

% under-fives with pneumonia taken to an appropriate health care provider



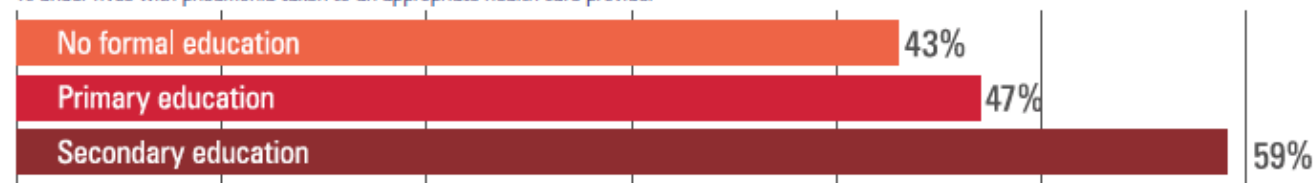
## RURAL CHILDREN MORE OFTEN LACK APPROPRIATE PROVIDER

% under-fives with pneumonia taken to an appropriate health care provider



## CHILDREN OF POORLY EDUCATED MOTHERS MORE OFTEN LACK APPROPRIATE CARE

% under-fives with pneumonia taken to an appropriate health care provider



## POORER CHILDREN MORE OFTEN LACK APPROPRIATE CARE

% under-fives with pneumonia taken to an appropriate health care provider



Data from 67 DHS and MICS, 1996-2003, except wealth index from 32 MICS, 1999-2003 (see statistical table 2).

## **WHAT ARE THE symptoms OF PNEUMONIA?**

Children with pneumonia may have a range of symptoms depending on their age and the cause of the infection.

Some **common symptoms of pneumonia in children and infants** include:

- rapid (“tachypnea”) or difficult breathing (“dyspnea”),
- cough,
- fever,
- chills,
- headaches,
- loss of appetite and
- wheezing.

Children under five with severe cases of pneumonia may struggle to breathe, with their chests moving in or retracting during inhalation (known as ‘lower chest wall indrawing’).

Young infants may suffer convulsions, unconsciousness, hypothermia, lethargy and feeding problems.

Bacterial pneumonia usually causes children to become severely ill with high fever and rapid breathing. Viral infections, however, often come on gradually and may worsen over time.

## WHAT causes PNEUMONIA?

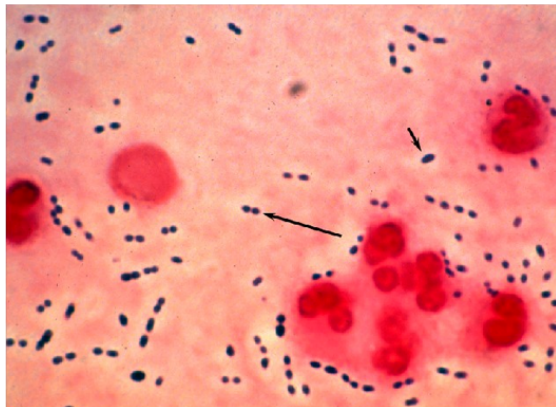
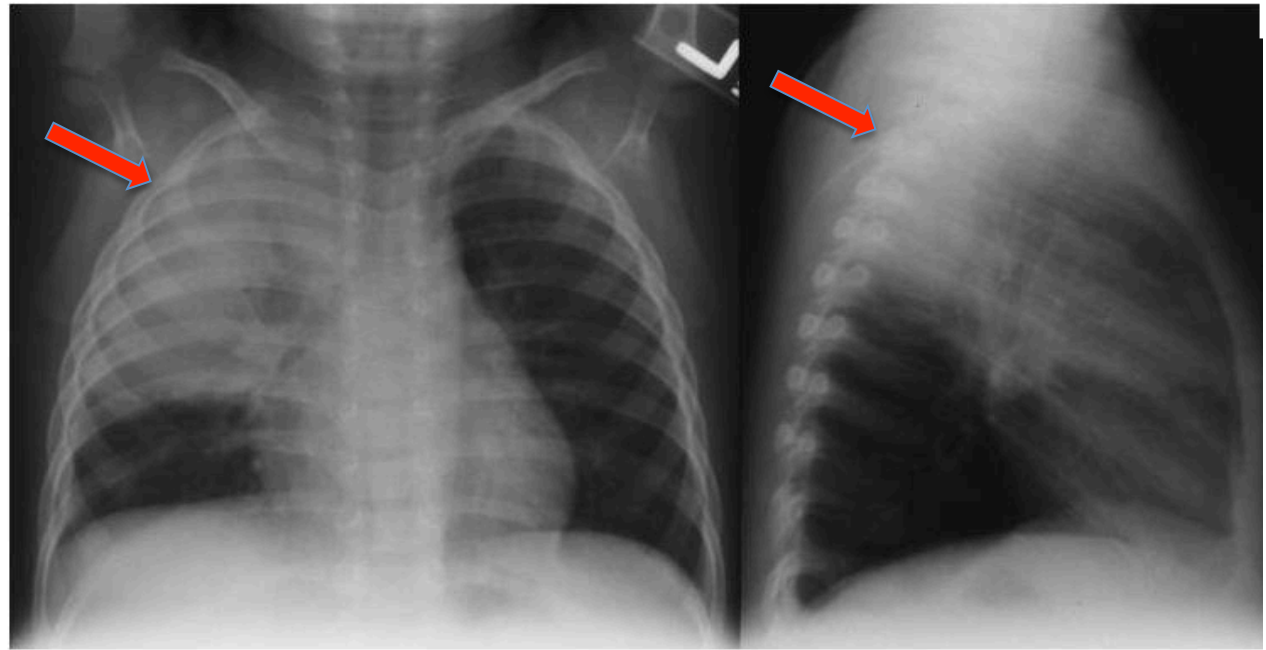
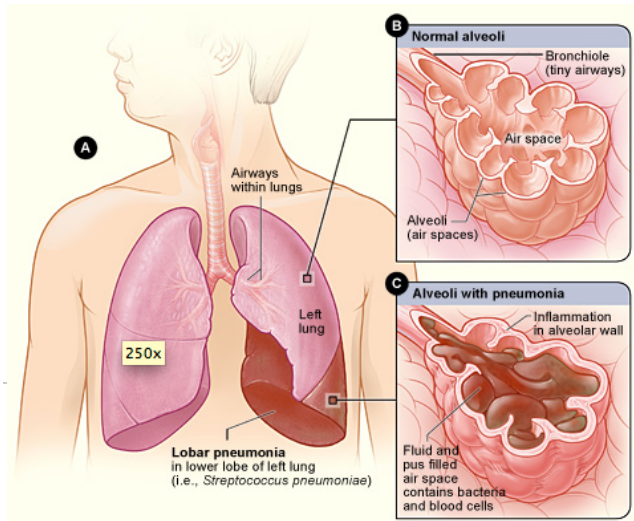
Data on the pathogen-specific causes of pneumonia are limited, and available information is often difficult to interpret.

It is known that the bacterial pathogen ***Streptococcus pneumoniae*** is the leading cause of severe pneumonia among children across the developing world. Bacteria also contribute to non-severe pneumonia cases, but to a lesser extent, and more cases are probably of **viral** origin.

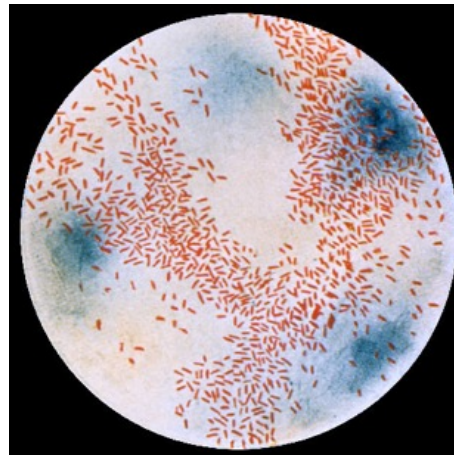
Another major cause is the bacterial pathogen ***Haemophilus influenzae type b*** (Hib).

Other pathogens include important viruses, less common bacteria (*Mycoplasma pneumoniae*) and fungi.

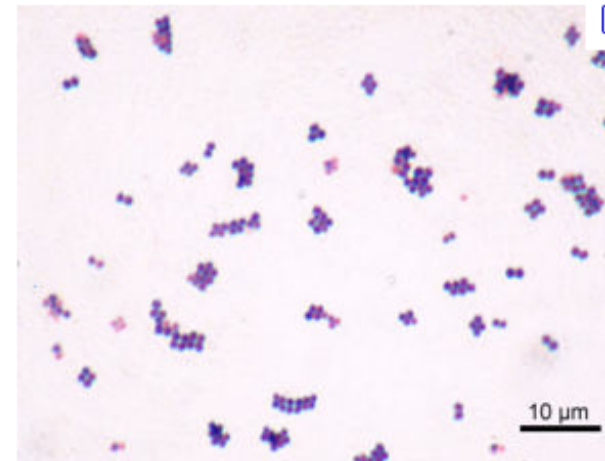
# Lobar pneumonia:



*Streptococcus pneumoniae* (Gram+)



*Haemophilus influenzae* (Gram neg)



*Staphylococcus spp* (Gram+)



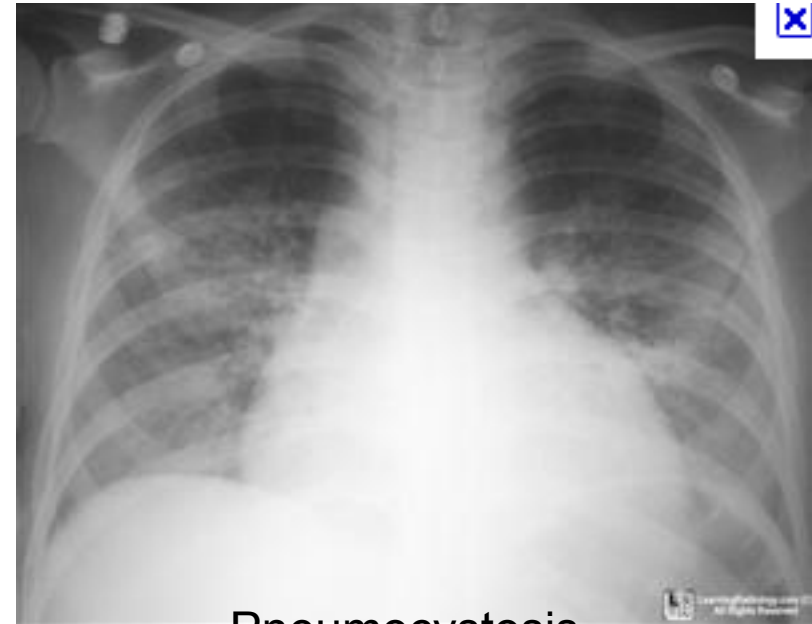
## Interstitial pneumonia:



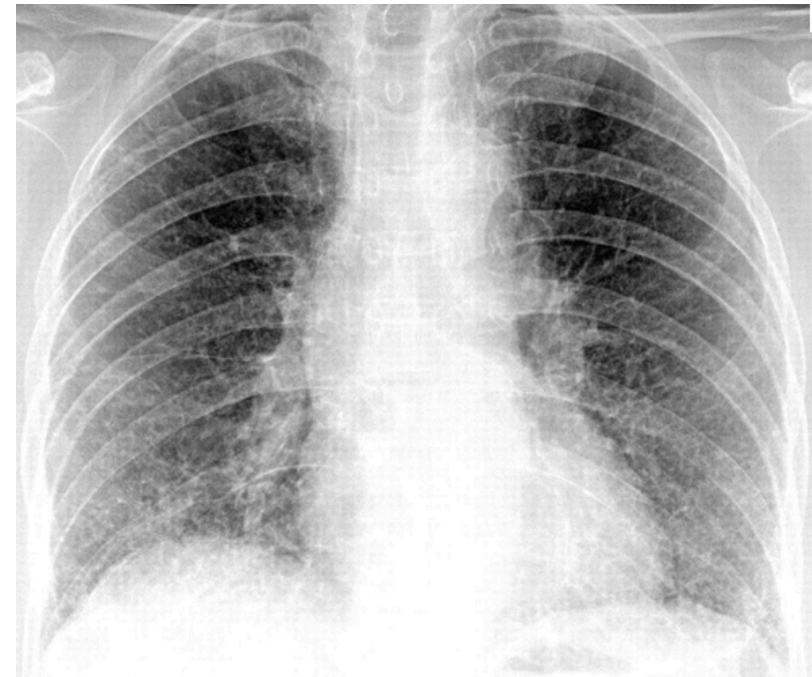
Viral pneumonia

In case of interstitial pneumonia, the dyspnea is more evident

Physical chest exam silent



Pneumocystosis



# Pneumonia Treatment

Supportive treatment (steroid, oxygen, etc) depend on the severity of the clinical picture

**Antibiotics** (active only in case of bacterial aetiology):

- Amoxicillin 50 mg/kg every 8h for 5-7 days (or more)

Or

- Erythromycin (10 mg/kg every 6 h)  
or Clarithromycin (7.5 mg/kg every 12 h) for 5 days

- In case of suspicion of *Mycoplasma pneumoniae*, remember that beta-lactamics are not efficacious

- The length of antibiotic administration depend on the severity of the clinical picture at the entry and the clinical response observed

- Others antibiotic useful are ceftriaxone, vancomycin (in case of staphylococcal aetiology), doxycycline (only in children aged 8 years or older)

- In case of PCP suspicion, the only treatment is high dose of Bactrim for 3 weeks