



Antibiotics Without Borders: Understanding Use and Improving Stewardship Across Cultures

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MDH Virtual Stewardship Conference
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Learning Objectives

- **Explain drivers of empiric antibiotic use in resource-limited settings**
- **Identify adaptable stewardship strategies across global and local settings**
- **Apply culturally responsive approaches to outpatient antibiotic stewardship and patient communication, integrating lessons learned from diverse care settings**



Disclosures (BKT)

Research funding

CDC – Pathogen Genomic Center of Excellence

Merck – Role of respiratory microbiome in respiratory viral infections, Respiratory virus genome sequencing from a regional household Minnesota cohort study

Clinical trials

Phase 1/2 EBV gp350 ferritin nanoparticle vaccine
NCT05683834

Phase 1 PK study of letermovir in pediatric kidney transplant recipients

Honoraria for advisory boards

GSK - Future of Meningococcal Vaccination in US

Sanofi - Meningococcal vaccination among immunocompromised patients

Honoraria for lectures

NICER consortium – vaccinations in immunocompromised patients, DEI panel



Case Presentation

6-month-old infant presents to a district hospital in northern Nigeria

Symptoms: 3-day history of cough, runny nose, difficulty breathing, not breastfeeding well

Vital signs: tachypnea (RR 58), and oxygen saturation of 88% on room air

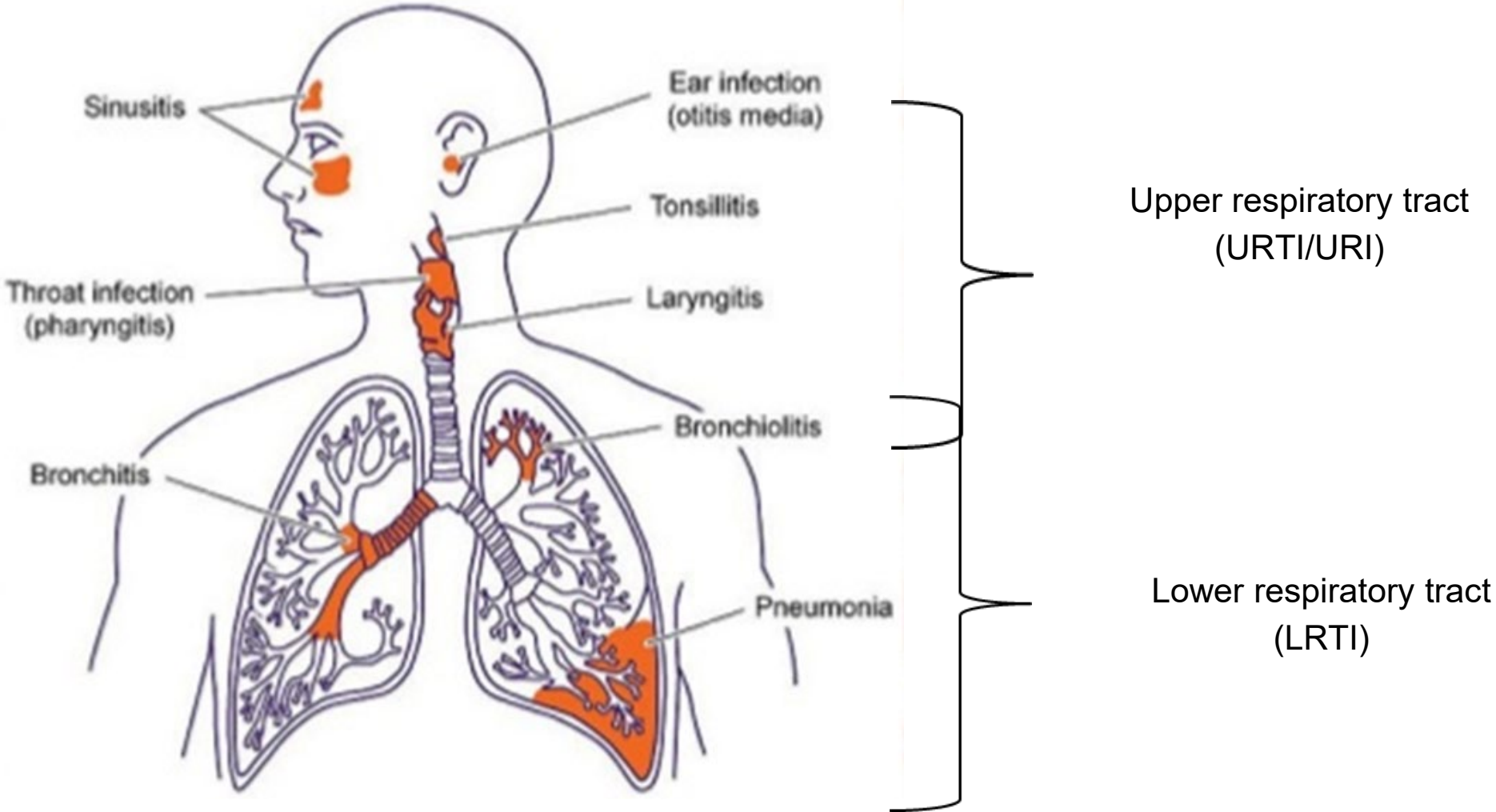
Exam: subcostal retractions, diffuse wheezes and crackles (crepitations)



What do we do next?



Make the diagnosis



Bronchiolitis (LRTI)



Care of severe LRTI in infants is supportive

(Strong recommendations from AAP Clinical Practice Guideline on Bronchiolitis)

Clinicians should diagnose bronchiolitis and assess disease severity on the basis of history and physical examination

Clinicians should not administer albuterol (or salbutamol), epinephrine or corticosteroids to infants and children with a diagnosis of bronchiolitis

Clinicians should not administer antibacterial medications to infants and children with a diagnosis of bronchiolitis unless there is a concomitant bacterial infection, or a strong suspicion of one.

Clinicians should administer nasogastric or intravenous fluids for infants with a diagnosis of bronchiolitis who cannot maintain hydration orally

* Supplemental oxygen if hypoxemic

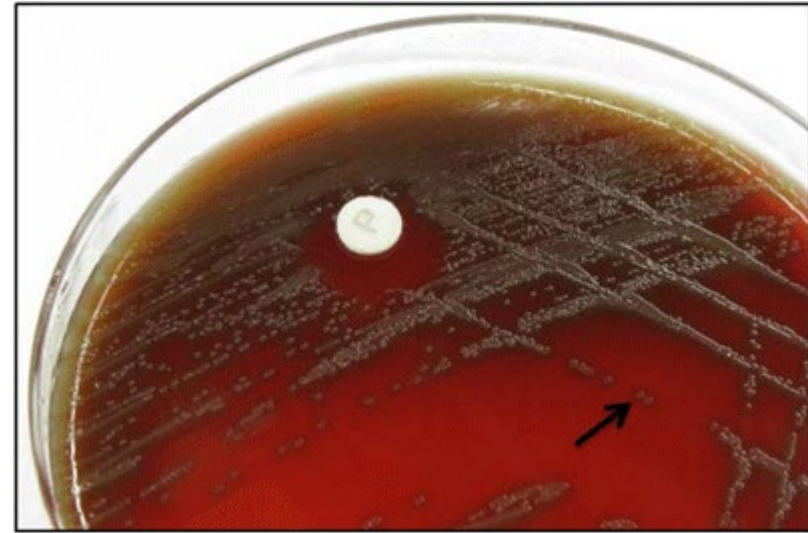
All people should disinfect hands before and after direct contact with patients, after contact with inanimate objects in the direct vicinity of the patient, and after removing gloves



Pneumonia diagnosis incorporates chest radiographs and blood and respiratory cultures



<https://radiopaedia.org/cases/right-upper-lobe-pneumonia-paediatric?lang=us>



<https://www.cdc.gov/meningitis/lab-manual/chpt08-id-characterization-streppneumo.html>

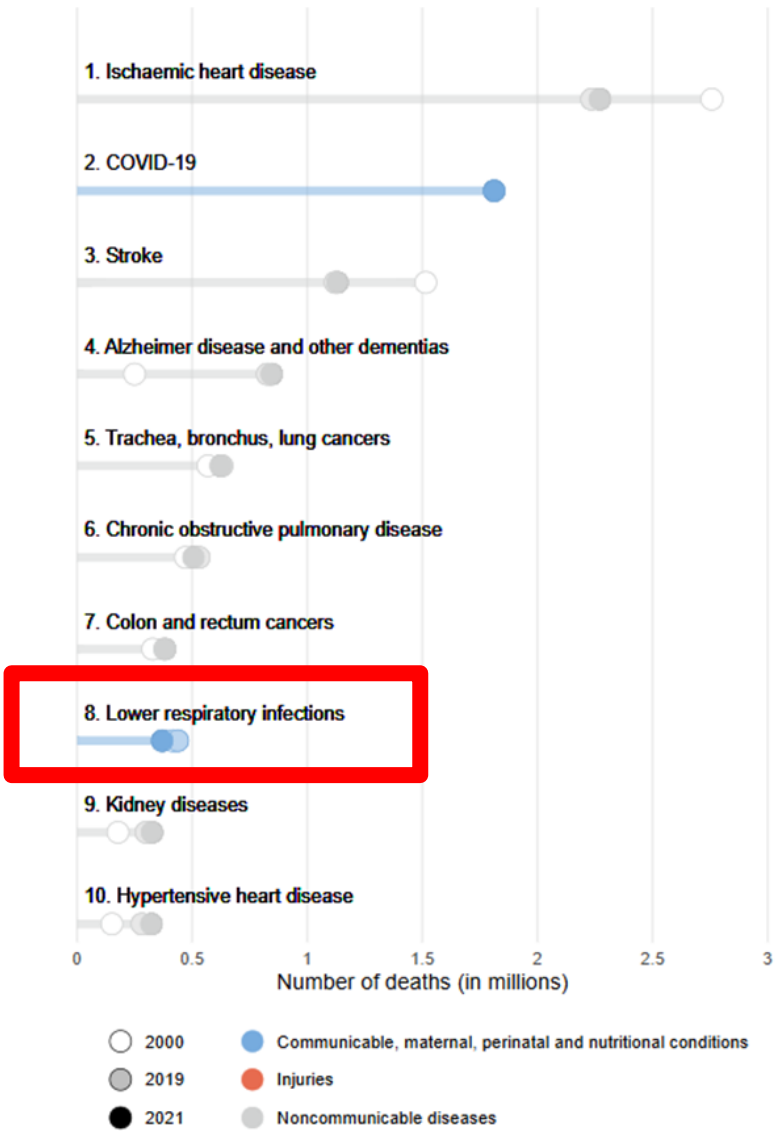


<https://abc30.com/labcorp-pixel-at-home-test-for-coronavirus/6119714/>

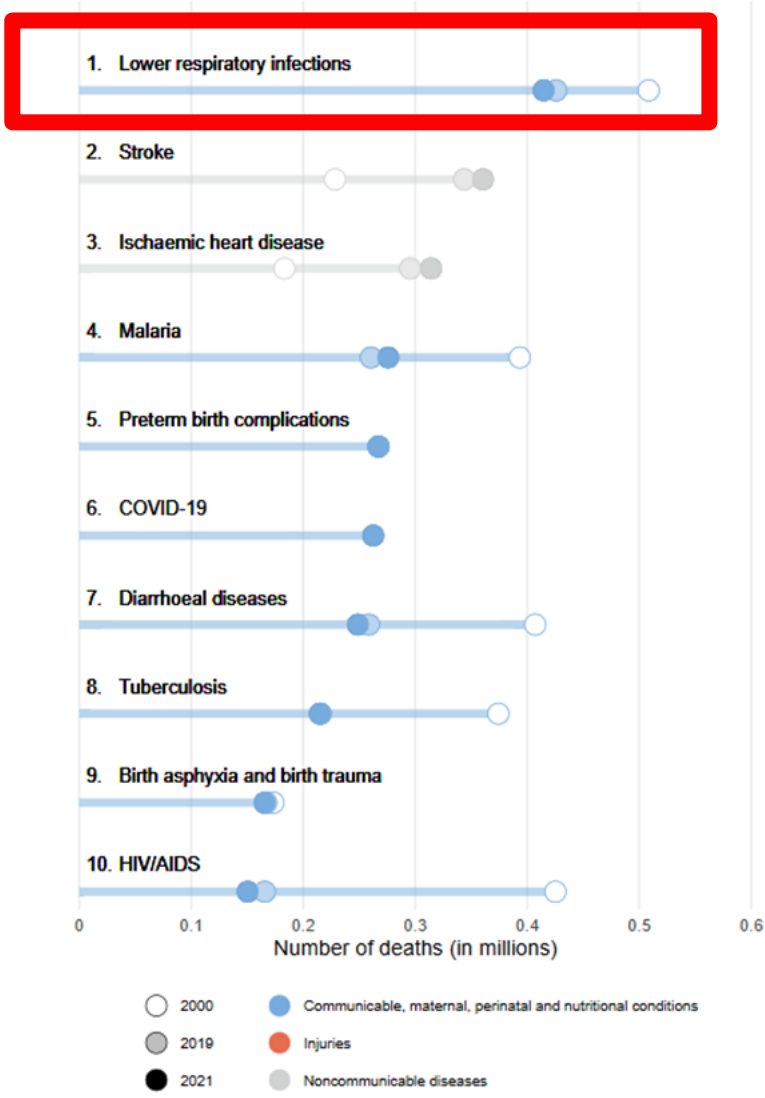


LRTIs disproportionately affect low-income countries

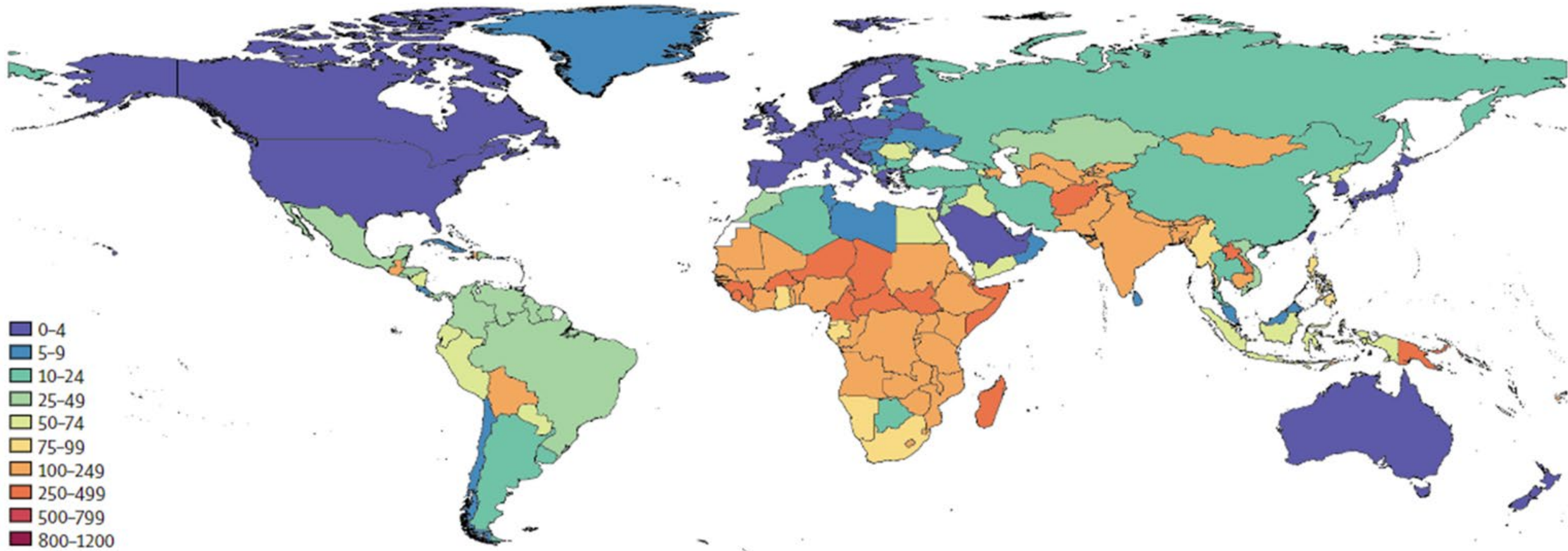
Leading causes of death in 2021 in high-income countries



Leading causes of death in 2021 in low-income countries



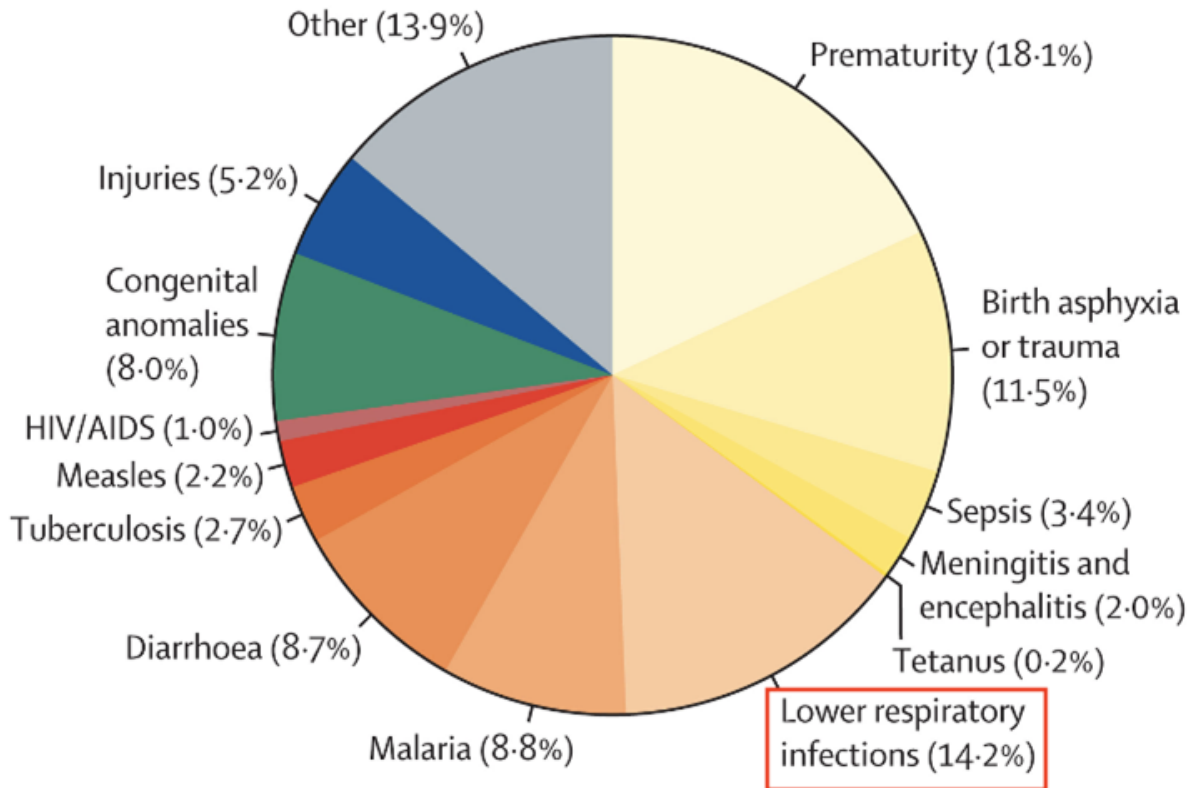
Lower respiratory infection mortality rate per 100,000 children younger than 5 years



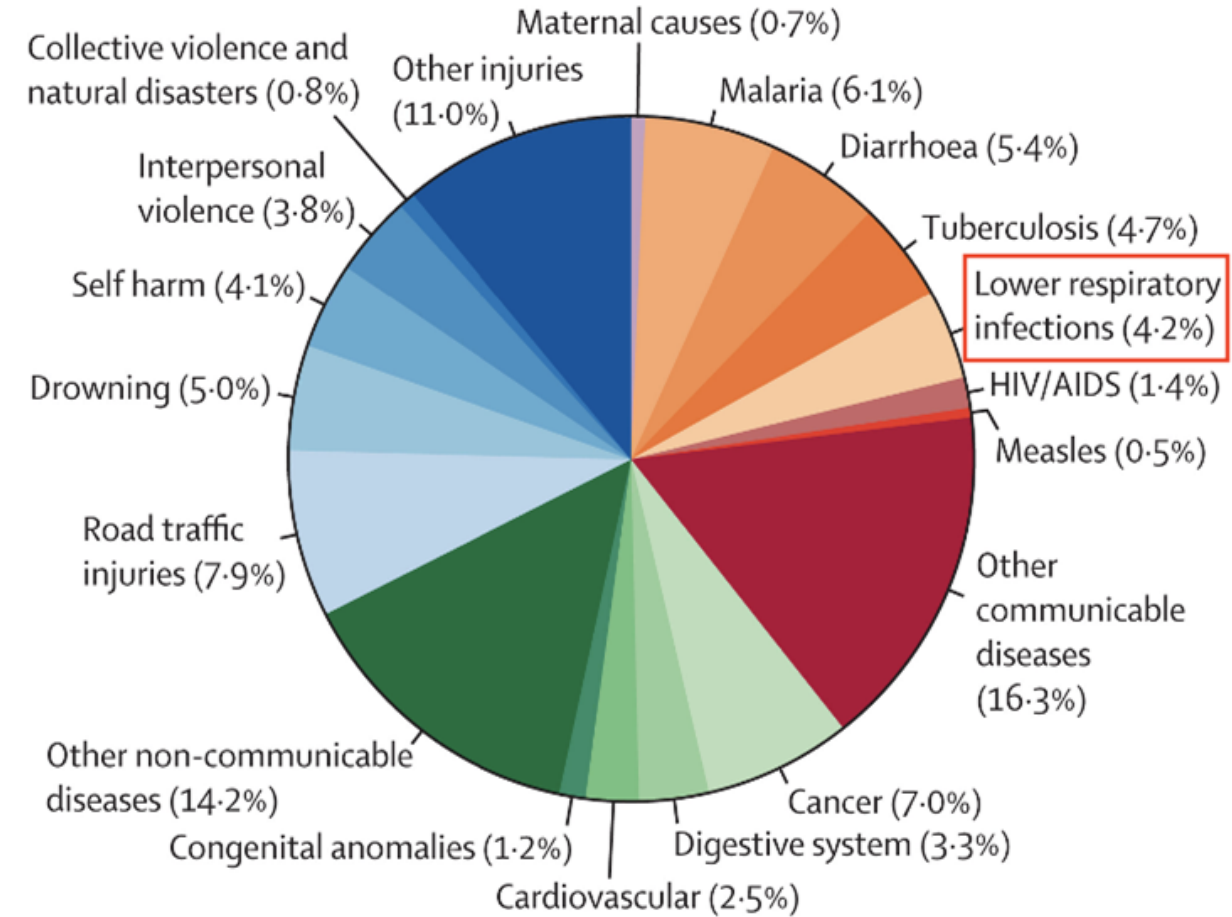
652,572 deaths under 5 (95% UI 586,475–720,612)

LRTI is the 2nd leading cause of death among children under 5

A Causes of death in children younger than 5 years (5.1 million deaths)



B Causes of death in children and adolescents aged 5–19 years (1.4 million deaths)



HOME > THE ISSUES >

Diagnose

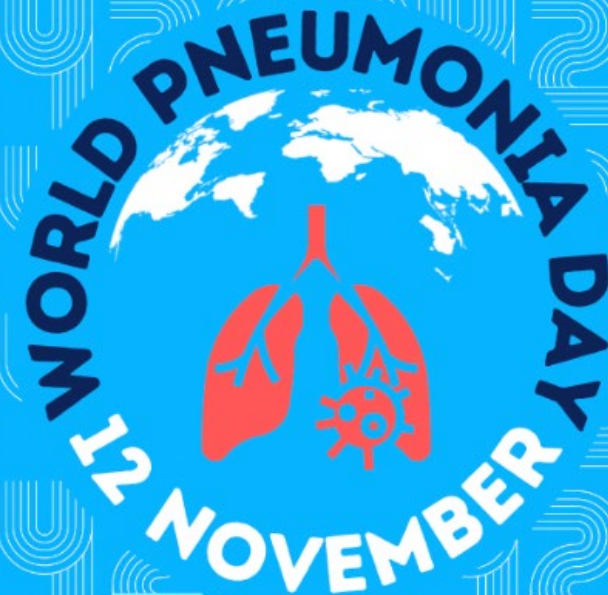
VaccinesWork

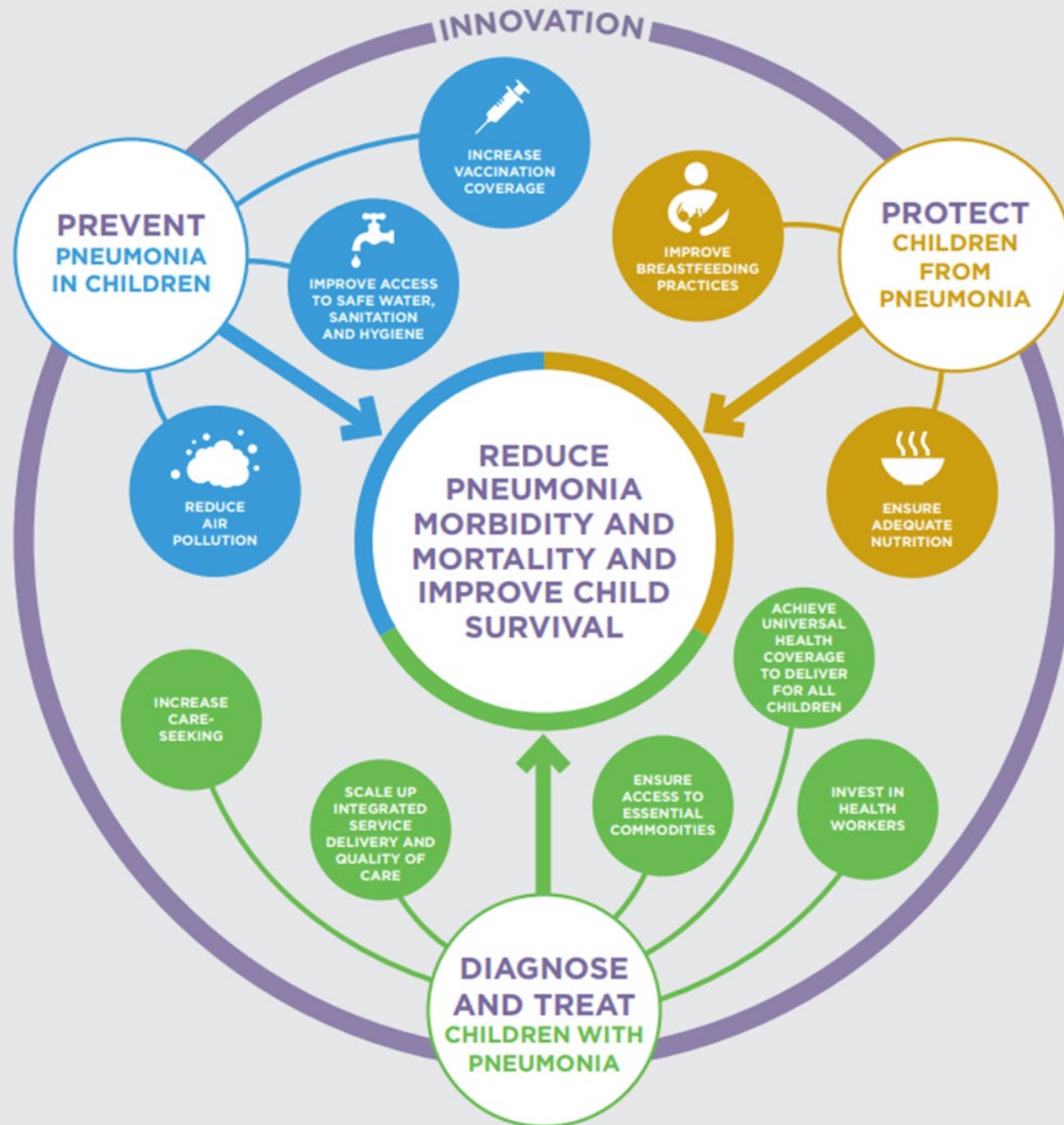
I am working to
#StopPneumonia

#HealthForA

Photo credit: UNICEF/UN0294741/Frank Dejongh

The Every Breath Counts Coalition is the world's first public-private partnership with an ambitious goal: to dramatically reduce the number of children and adults dying from pneumonia by 2030 by closing critical gaps in pneumonia prevention, diagnosis, and treatment.





2013 EDITION

POCKET BOOK
OF
**Hospital care
for children**



GUIDELINES FOR THE MANAGEMENT OF
COMMON CHILDHOOD ILLNESSES

Second edition



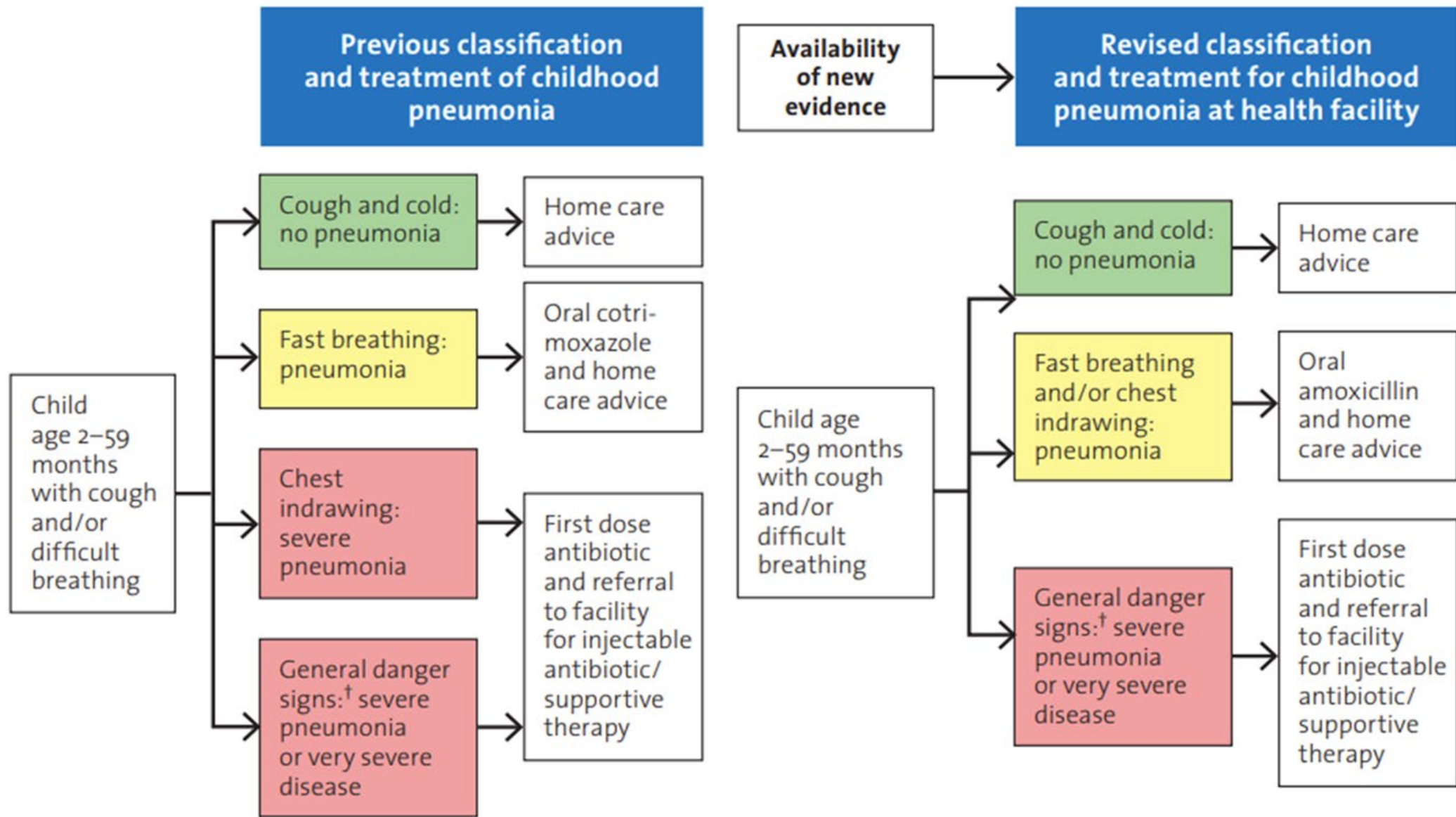
Integrated Management of Childhood Illness

Chart Booklet



March 2014





[†] Not able to drink, persistent vomiting, convulsions, lethargic or unconscious, stridor in a calm child or severe malnutrition.



THEN ASK ABOUT MAIN SYMPTOMS:

Does the child have cough or difficult breathing?

If yes, ask:

- For how long?

Look, listen, feel*:

- Count the breaths in one minute.
- Look for chest indrawing.
- Look and listen for stridor.
- Look and listen for wheezing.

CHILD MUST BE CALM

**Classify
COUGH or
DIFFICULT
BREATHING**

If wheezing with either fast breathing or chest indrawing:

Give a trial of rapid acting inhaled bronchodilator for up to three times 15-20 minutes apart. Count the breaths and look for chest indrawing again, and then classify.

If the child is:

2 months up to 12 months

Fast breathing is:

50 breaths per minute or more

12 Months up to 5 years

40 breaths per minute or more

<ul style="list-style-type: none"> • Any general danger sign or • Stridor in calm child. 	<p>Pink: SEVERE PNEUMONIA OR VERY SEVERE DISEASE</p>	<ul style="list-style-type: none"> ■ Give first dose of an appropriate antibiotic ■ Refer URGENTLY to hospital**
<ul style="list-style-type: none"> • Chest indrawing or • Fast breathing. 	<p>Yellow: PNEUMONIA</p>	<ul style="list-style-type: none"> ■ Give oral Amoxicillin for 5 days*** ■ If wheezing (or disappeared after rapidly acting bronchodilator) give an inhaled bronchodilator for 5 days**** ■ If chest indrawing in HIV exposed/infected child, give first dose of amoxicillin and refer. ■ Soothe the throat and relieve the cough with a safe remedy ■ If coughing for more than 14 days or recurrent wheeze, refer for possible TB or asthma assessment ■ Advise mother when to return immediately ■ Follow-up in 3 days
<ul style="list-style-type: none"> • No signs of pneumonia or very severe disease. 	<p>Green: COUGH OR COLD</p>	<ul style="list-style-type: none"> ■ If wheezing (or disappeared after rapidly acting bronchodilator) give an inhaled bronchodilator for 5 days**** ■ Soothe the throat and relieve the cough with a safe remedy ■ If coughing for more than 14 days or recurrent wheezing, refer for possible TB or asthma assessment ■ Advise mother when to return immediately ■ Follow-up in 5 days if not improving

*If pulse oximeter is available, determine oxygen saturation and refer if < 90%.

** If referral is not possible, manage the child as described in the pneumonia section of the national referral guidelines or as in WHO Pocket Book for hospital care for children.

***Oral Amoxicillin for 3 days could be used in patients with fast breathing but no chest indrawing in low HIV settings.

**** In settings where inhaled bronchodilator is not available, oral salbutamol may be tried but not recommended for treatment of severe acute wheeze.



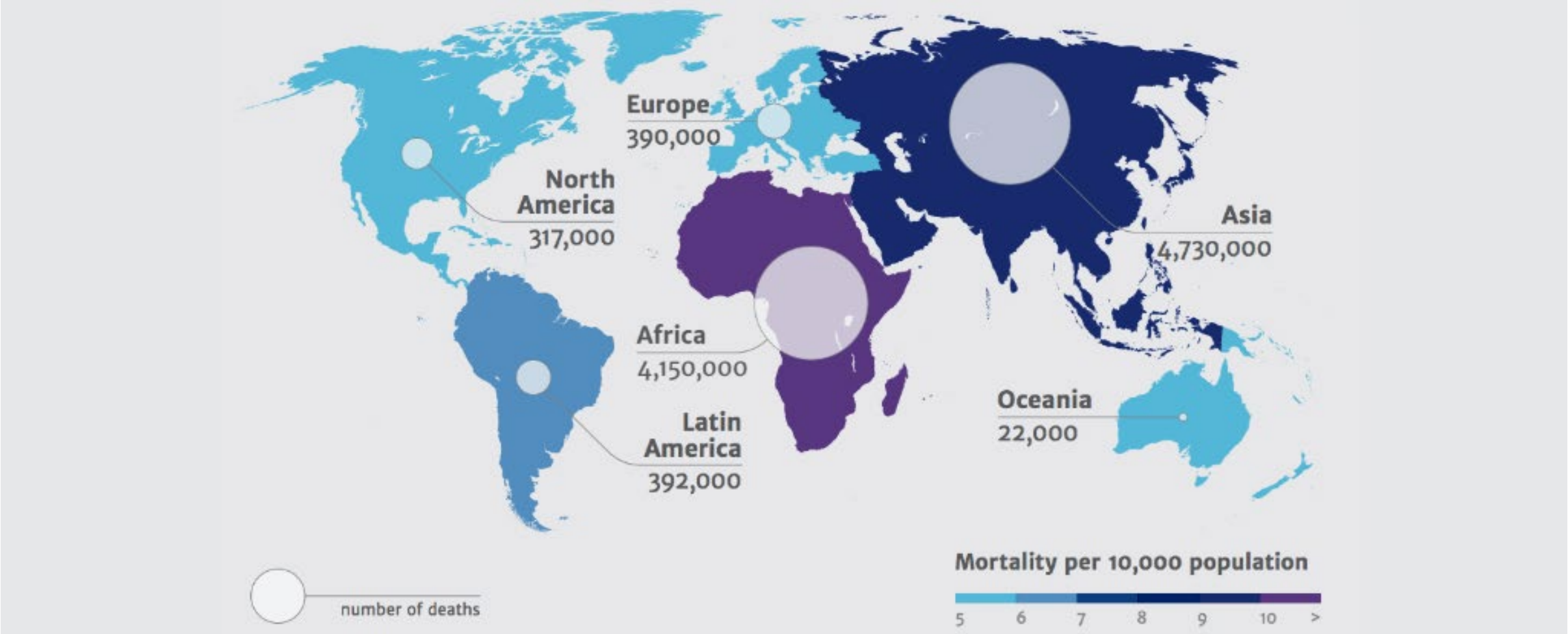
There are problems with presumptive treatment

- Based on limited and often outdated pathogen data
- Antimicrobial resistance may reduce efficiency of guideline recommended therapy
- Non-bacterial pathogens contribute substantially to disease burden
- Difficult to distinguish non-infectious mimics (e.g. asthma)

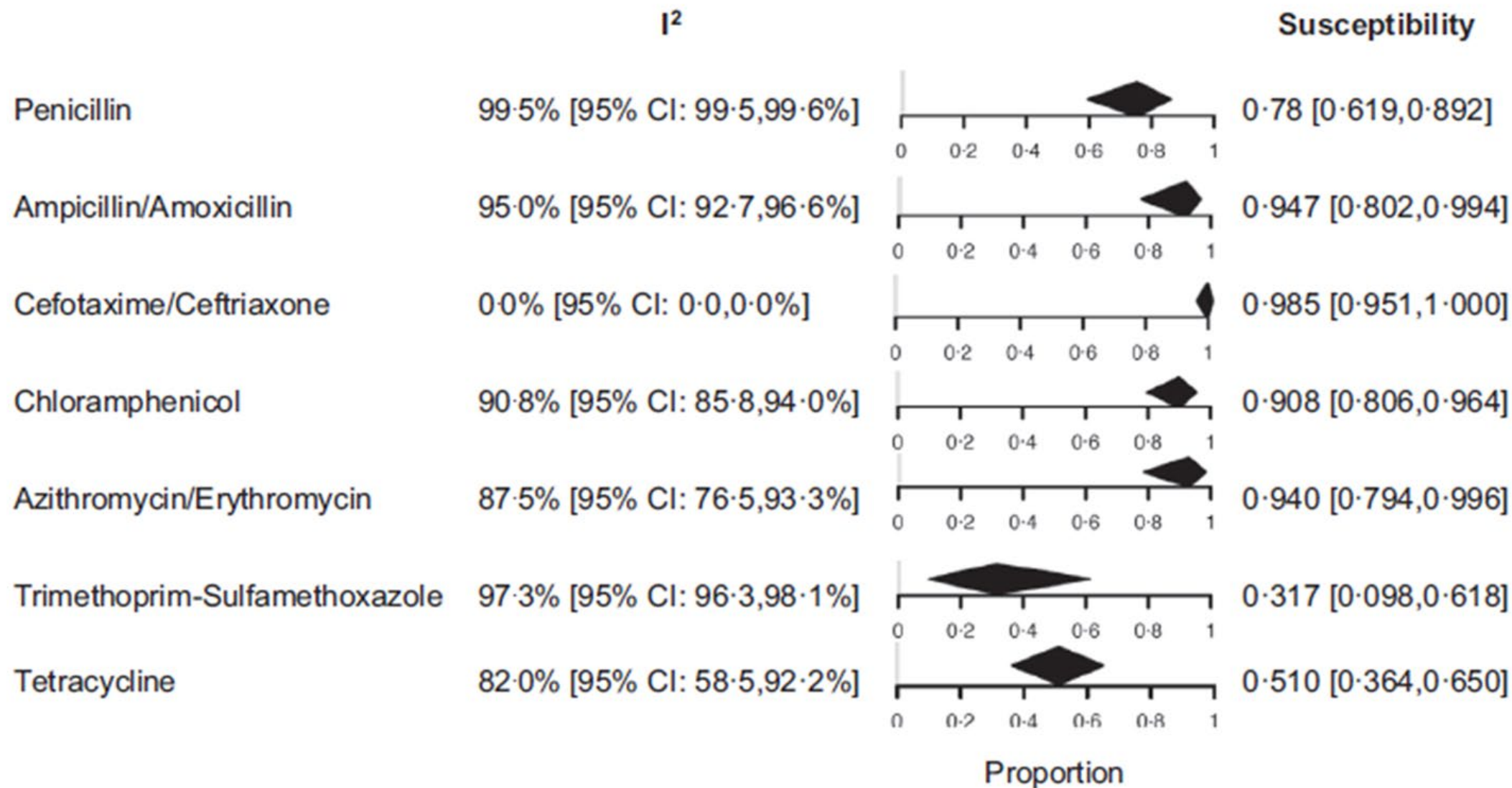
Syndromic management improves survival but lacks specificity, driving antimicrobial overuse where diagnostic capacity is limited.



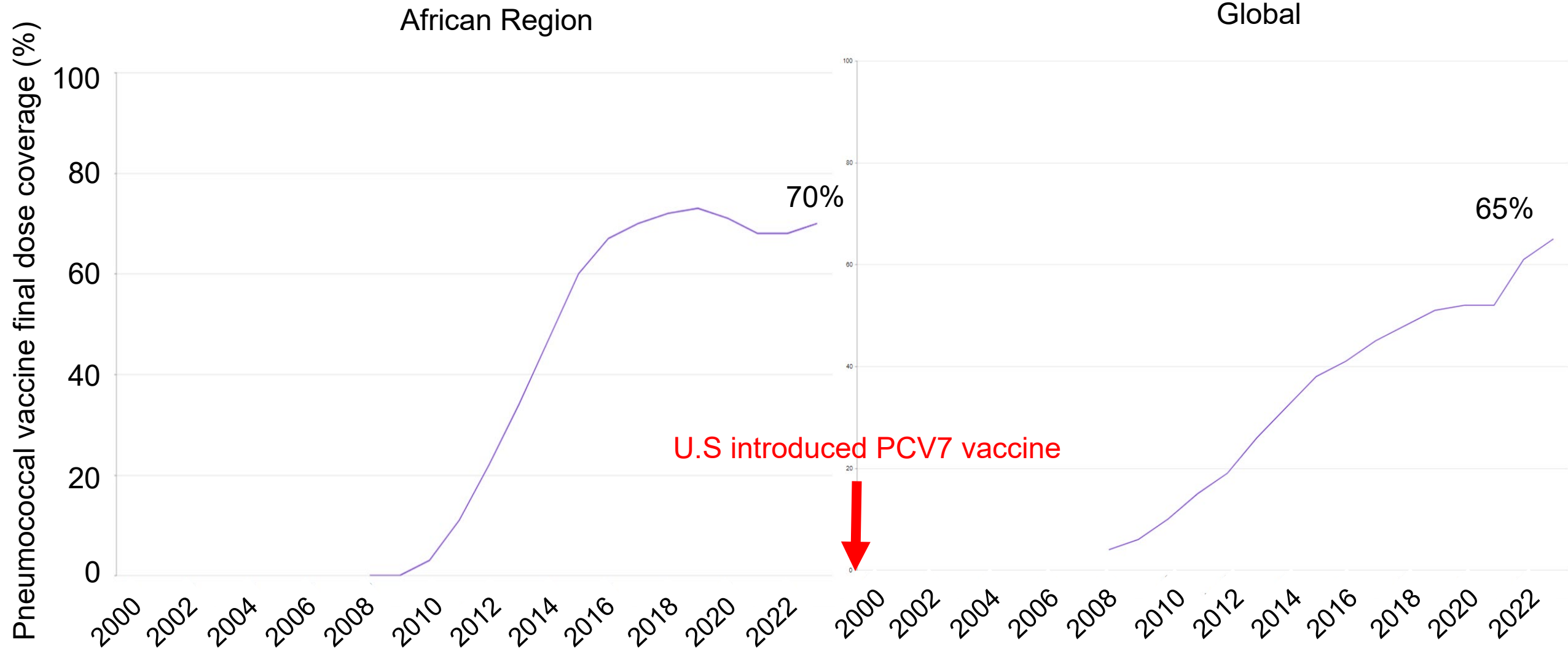
Emerging antimicrobial resistance worldwide



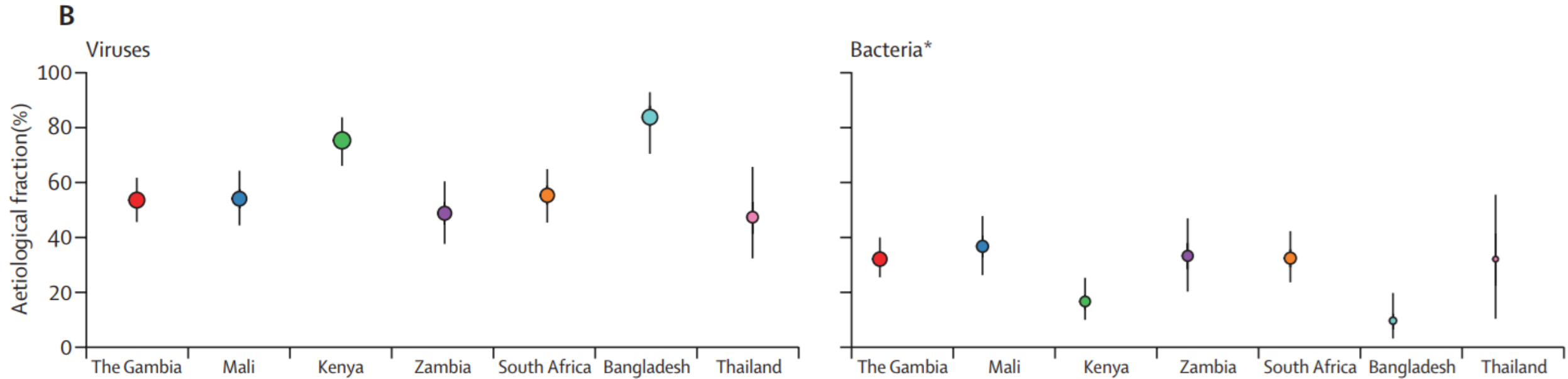
There are high rates of pneumococcal resistance against earlier guideline-recommended antimicrobials



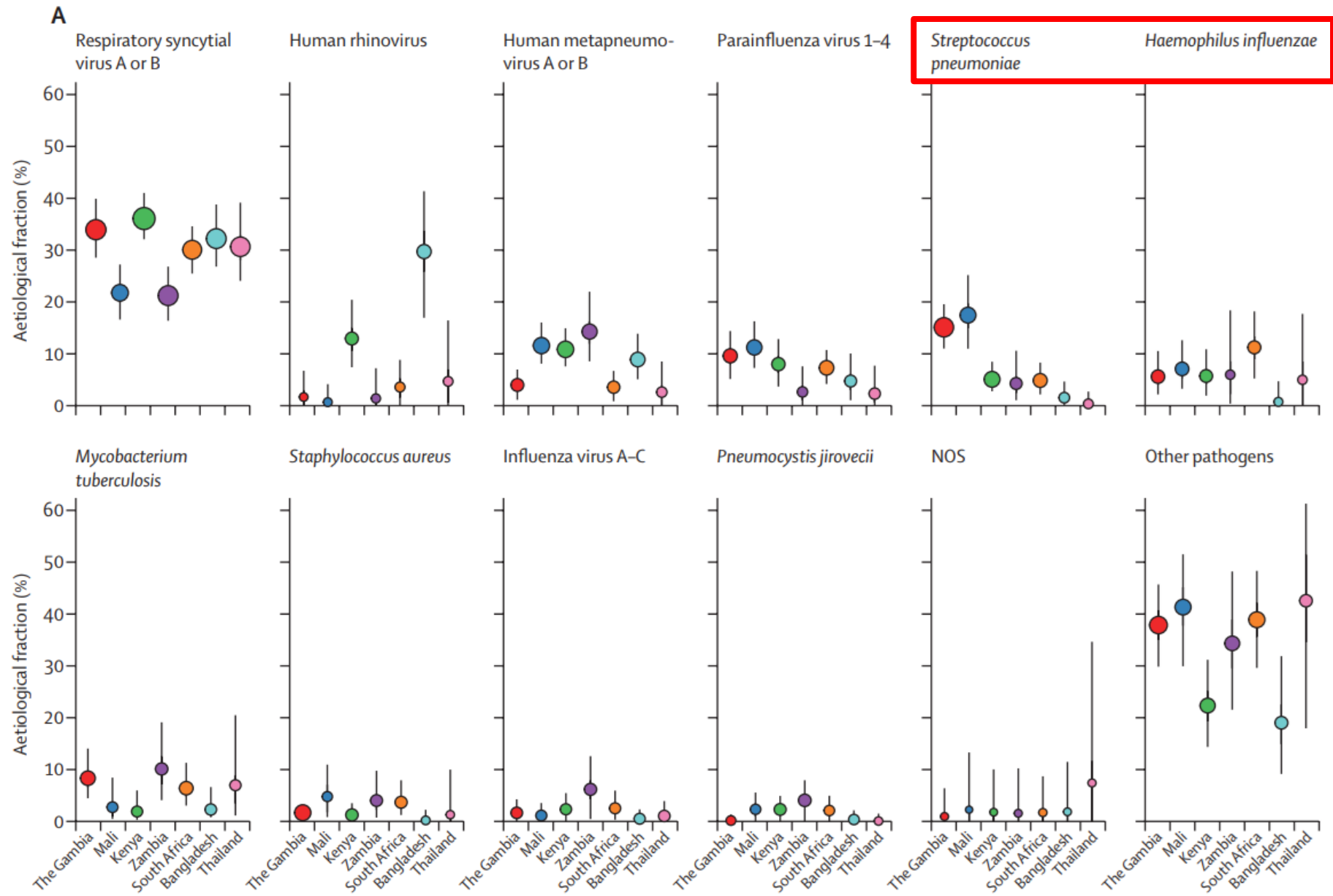
Global update of pneumococcal vaccination has been inadequate



Viral pathogens are more common than bacterial pathogens across multiple sites



Most of the common pathogens are not sensitive to amoxicillin



Only pathogens possibly sensitive to amoxicillin



Can we do better?



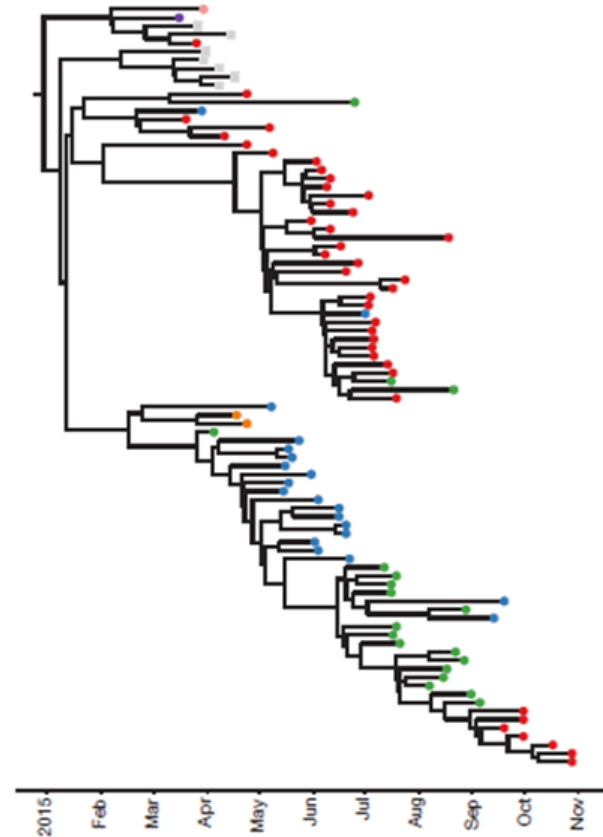
Next-generation sequencing (NGS) improved Ebola surveillance in 2014

LETTER

doi:10.1038/nature.16996

Real-time, portable genome sequencing for Ebola surveillance

Joshua Quick^{1*}, Nicholas J. Loman^{1*}, Sophie Duraffour^{2,3*}, Jared T. Simpson^{4,5*}, Ettore Severi^{6*}, Lauren Cowley^{7*}, Joseph Akoi Bore², Raymond Koundouno², Gytis Dudas⁸, Amy Mikhail⁷, Nobila Ouédraogo⁹, Babak Afrough^{2,10}, Amadou Bah^{2,11}, Jonathan H. J. Baum^{2,3}, Beate Becker-Ziaja^{2,3}, Jan Peter Boettcher^{2,12}, Mar Cabeza-Cabrero^{2,3}

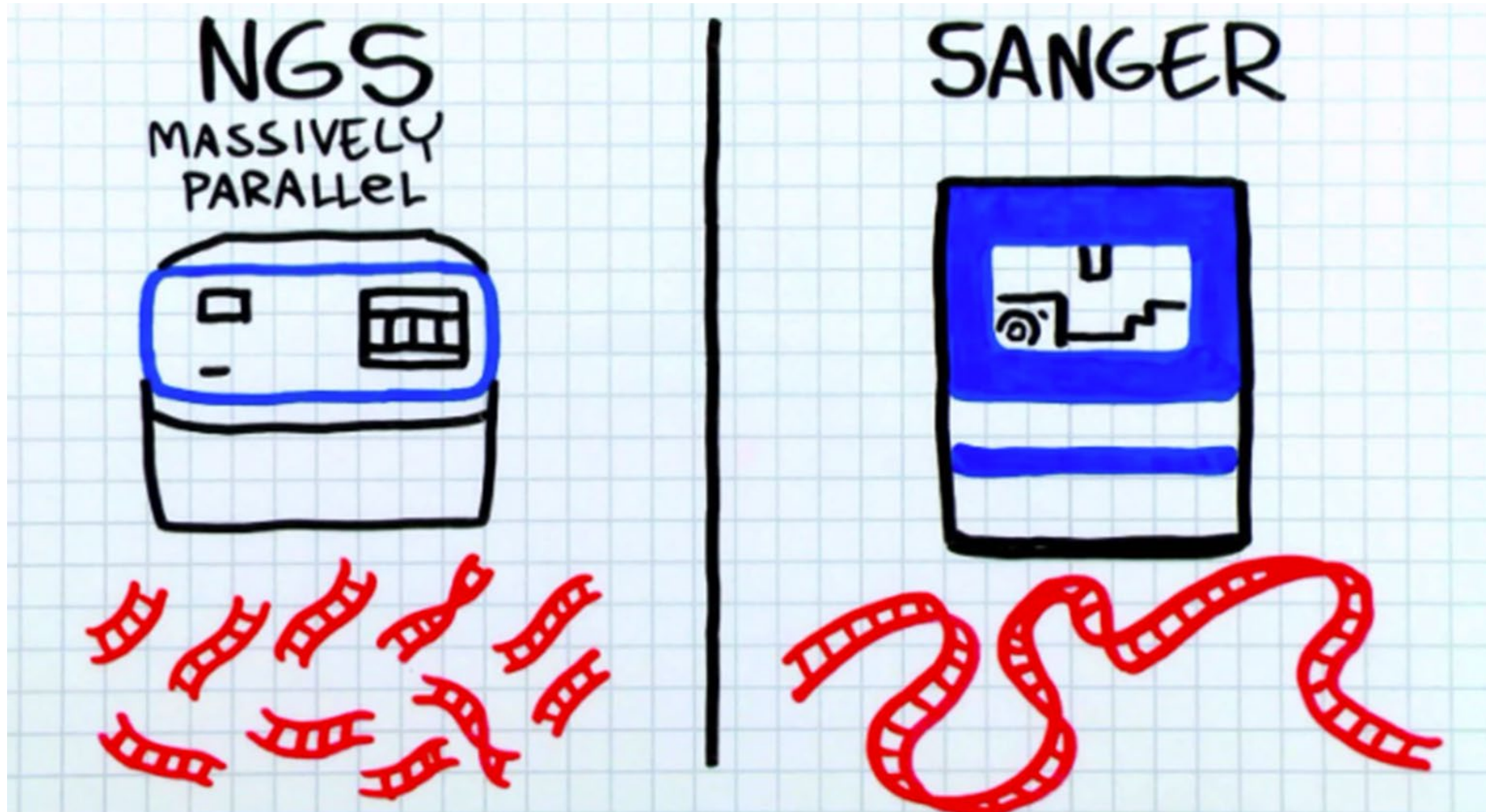


Country
● Guinea
■ Sierra Leone
▲ Liberia

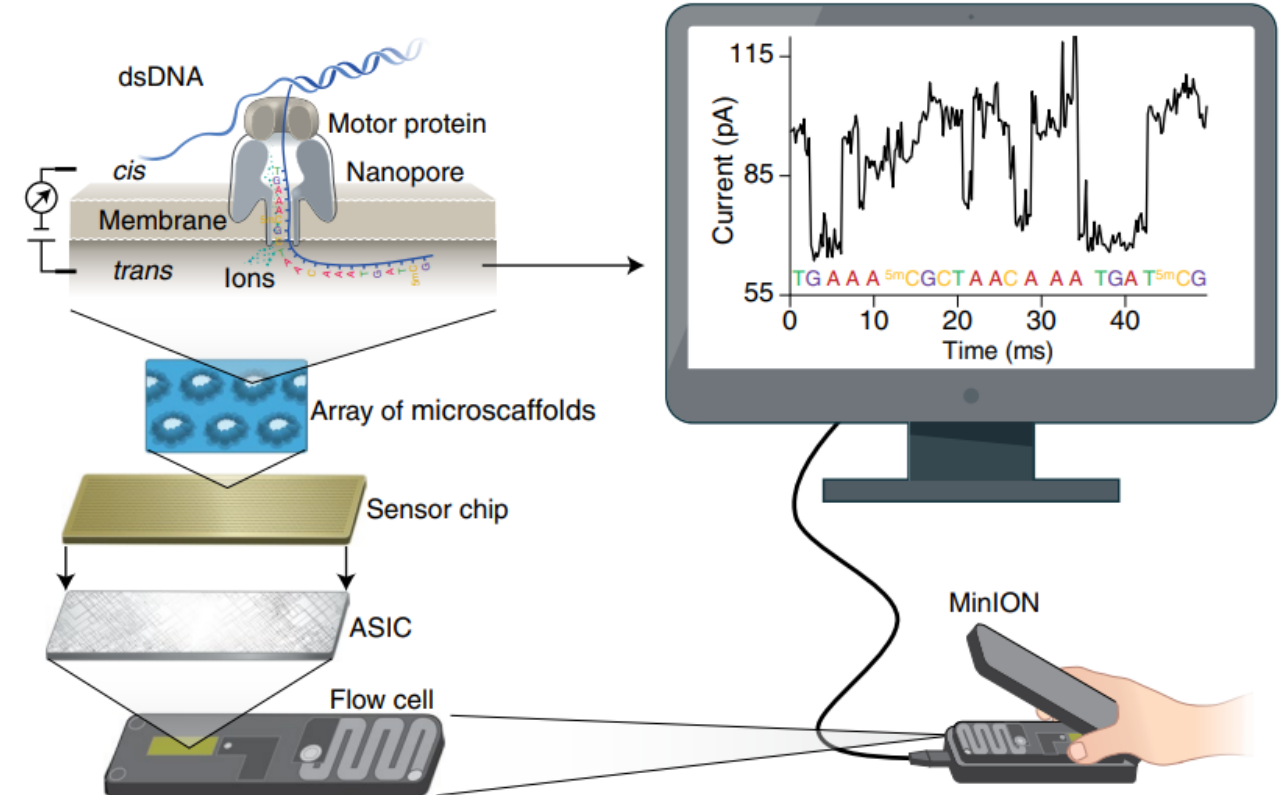
Prefecture
● Siguiré
● Boké
● Fria
● Conakry
● Dubréka
● Coyah
● Forécariah



Next-generation sequencing allows study of millions of DNA molecules simultaneously

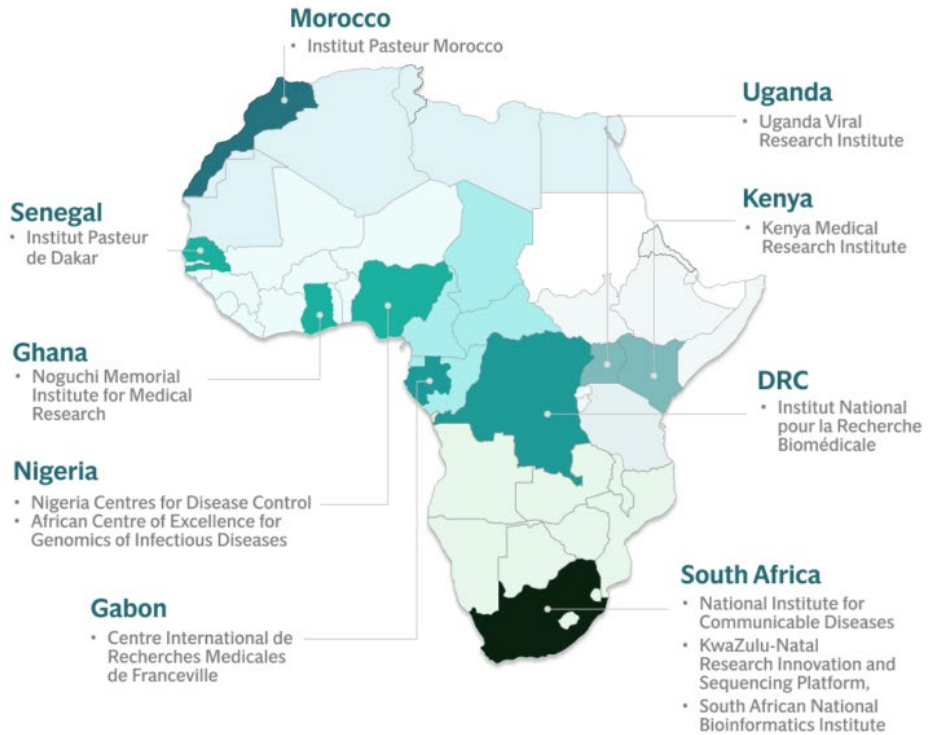


Nanopore sequencing permits direct single molecular sequencing via translocation through a protein pore



Regional Genomic Sequencing Hubs

In September 2020, the WHO and the Africa CDC established 12 labs in nine countries to facilitate genomic sequencing of SARS-CoV-2 across Africa.



Hypothesis

Next generation sequencing approaches could improve accuracy of diagnosis with limited microbiological infrastructure

National Labs serviced by regional sequencing hubs

North Africa	West Africa	Central Africa	East Africa	Southern Africa
Institut Pasteur Morocco	Institute Pasteur de Dakar	CIRMF Gabon	UVRI Uganda	NICD, South Africa
Morocco, Libya, Egypt, Tunisia, Algeria, Mauritania, Sahrawi Republic	Senegal, The Gambia, Mali, Burkina Faso, Guinea, Côte d'Ivoire, Guinea-Bissau, Niger, Cape Verde	Gabon, Sao Tome and Príncipe, Equatorial Guinea	Uganda, Rwanda, South Sudan, Tanzania, Burundi	South Africa, Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, Zambia, Zimbabwe, Mauritius, Madagascar
	NMIMR Ghana	INRB DRC	KEMRI, Kenya	
	Ghana, Benin, Togo, Liberia, Sierra Leone	DRC, Cameroon, Central African Republic, Chad, Congo	Kenya, Djibouti, Eritrea, Ethiopia, Somalia, Seychelles, Comoros	
	Nigeria CDC			
	Nigeria			

Source: Africa CDC



Results of pilot study at Uganda Cancer Institute

Enrollment period:

October 10, 2022 – October 24, 2023

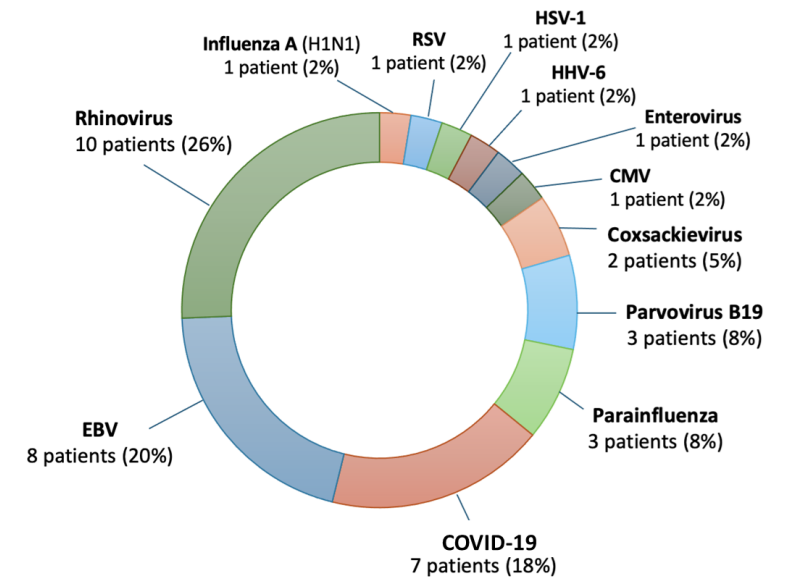
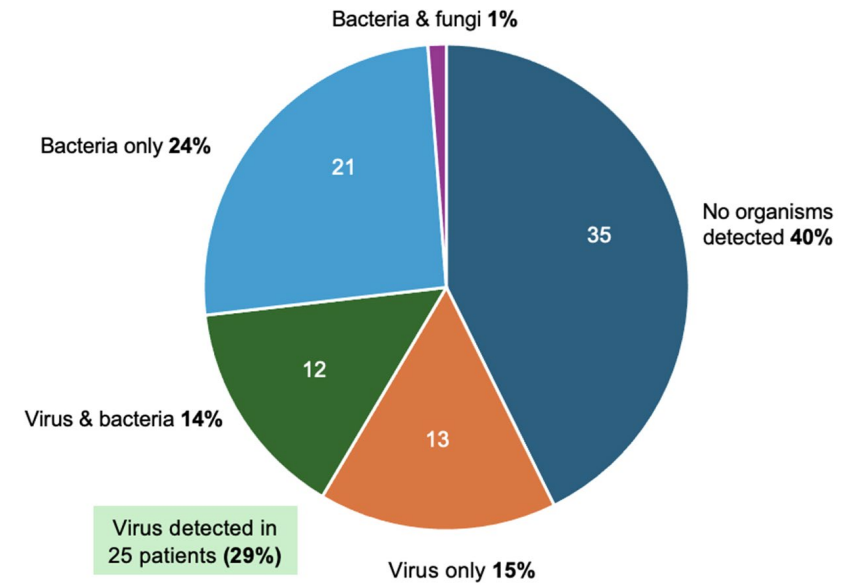
Total number of patients for final analysis: **87**

Sex: 36 female patients, 51 male patients

Age: 3 months to 17 years old (average age 8 years old \pm 5)

Setting: 31 inpatient, 56 outpatient





Utilization of Oxford Nanopore Technology for human infectious disease detection and surveillance in Africa: a scoping review

Kristen Bastug^{1,*†}, Uzal Umar^{2†}, Brooke Olson³, Tina Slusher^{4,5}, Christopher Faulk⁴, Mark Okolo⁷, Stephen Oguche^{8,†} and Beth K. Thielen^{1†}









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ACCESS MICROBIOLOGY
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Short Communication | Open Access

Version 1: Improving local diagnostic capacity for microbiological identification and antimicrobial resistance gene detection in Northern Nigeria using nanopore whole genome sequencing

Kristen A Bastug¹ , Uzal Umar² , Shamsudin Aliyu³ , Bello O Banimoh⁴ , Joseph N Nakah⁵ , Jamilu A Bala⁶ ,

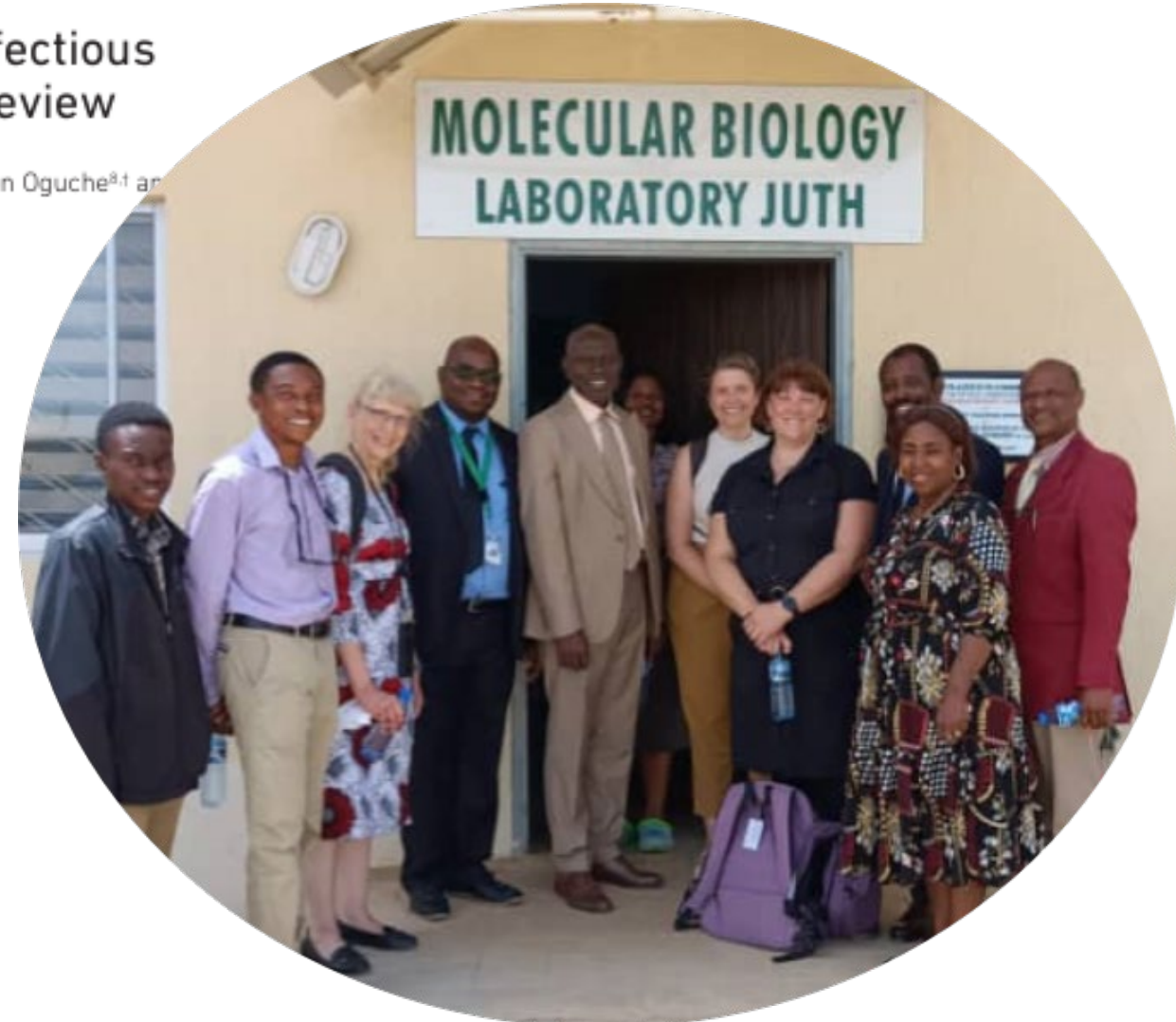
Oludare A Odumade⁷ , Tina Slusher⁸ , Bart JF Theelen⁹ , Evann E Hilt¹⁰ , Christopher Faulk¹¹ , Stephen Oguche¹² ,

Mark Okolo¹³ , and Beth K Thielen¹⁴ 

 View Affiliations

Version Posted: 05 February 2026 | <https://doi-org.ezp1.lib.umn.edu/10.1099/acmi.0.001175.v1>

This is a **preprint**, which is a preliminary version of an article and has not completed peer review.



Understanding Immigrant Communities

- Family decision-making is often collective, with treatment discussions involving multiple caregivers
- Antibiotics may be perceived as “strong treatment,” especially when illness feels severe or prolonged
- Clear explanation of *why antibiotics are not needed* is often more effective than simply stating “not indicated”
- Relational, story-based communication builds trust more effectively than directive counseling
- Community-informed and consistent messaging across visits strengthens acceptance of stewardship practices
- Trust improves when clinicians acknowledge symptoms, validate concerns, and provide a clear care plan



Adaptable Stewardship Approaches

- Delayed prescribing strategies
- Provider prescribing feedback
- Validate caregiver concerns even when antibiotics are not indicated
- Patient education on viral vs. bacterial infections



Stewardship Gaps Are Often Provider-System Driven

- Efforts often focus on educating patients and communities
- Antibiotic use is influenced by provider communication and prescribing practices
- Time constraints can limit clear explanation and shared decision-making
- Healthcare systems are not always designed to meet the needs of immigrant patients
- When patients leave without understanding the plan, they may seek care elsewhere where antibiotics are prescribed
- These gaps reflect system issues in communication and trust not patient noncompliance
- Strengthening provider education is key to improving equity and stewardship outcomes



Reflections from Practice

- In the motherhood circle and field interviews, we often see the same pattern
- A mother leaves the clinic without fully understanding why antibiotics were not given
- Later, she seeks care elsewhere not from lack of trust, but from lack of clarity
- When education is shared early, clearly, and with respect, families make confident decisions
- Stewardship is strongest when patients feel informed, heard, and supported



Key takeaways

Lower respiratory tract infections remain a leading cause of global mortality, particularly among children

Global guidelines promote early empiric antibiotic use to reduce mortality, but this approach contributes to significant overuse

Expanding access to accurate microbiologic diagnostics is essential to enable more targeted and judicious antimicrobial therapy



Thank you



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