

Strengthening the health system response to pneumonia and other childhood illnesses

- Pneumonia — a preventable, treatable and curable disease — remains the leading infectious cause of death among children under five.
- A holistic approach is needed to strengthen the case management of pneumonia alongside other causes of childhood illness.
- A coordinated global effort to tackle pneumonia and other childhood illnesses must be underpinned by rigorous implementation research that answers pressing questions about prevention, diagnosis and treatment.

Background

Pneumonia is an acute respiratory infection that limits oxygen intake and makes breathing painful. While incidence decreased by 14 percent between 2000 and 2019, pneumonia is still the biggest infectious killer in children under five globally, accounting for an estimated 672,000 deaths in 2019.^[1] Three-quarters of those deaths occurred in children under 12 months of age.^[1] Most of the fatalities are clustered in sub-Saharan Africa and South Asia.^[1]

While the large-scale introduction of vaccines over the last 20 years has improved prevention of the disease, pneumonia case management lags behind. Early diagnosis and treatment at all levels of the health system could

prevent more than two-thirds of pneumonia deaths,^[2] but at least 40 percent of children under five with pneumonia are currently incorrectly diagnosed^[3] and only 34 percent receive correct treatment.^[4]

Incorrect diagnosis can lead to over-prescription of antibiotics for children with non-severe respiratory infections and under-treatment of those with pneumonia.^[5] This is concerning given the growing threat of antimicrobial resistance (AMR), which contributes to at least 700,000 deaths globally every year.^[6] Developing capacity to correctly diagnose and treat the disease at all health system levels therefore presents a huge opportunity to reduce childhood mortality.

How we are responding to childhood pneumonia

Our view

Malaria Consortium believes that effectively combating pneumonia requires a health systems strengthening approach, modelled on the World Health Organization's Health Systems Framework (Figure 1).^[7] Such an approach entails improving prevention, diagnostic aids and health worker training, and guaranteeing access to treatment at the community, health facility and hospital levels. Referral of children diagnosed with pneumonia also needs to be improved, such as with support for patient transport and sharing of health records between different levels of the health system.

These interventions should be integrated with child health programmes, including integrated community case management (iCCM) at the community level and integrated management of childhood illnesses (IMCI) at the health facility level. We have experience in implementing large-scale iCCM programmes, including in Uganda (Buikwe, Lango and Acholi), Nigeria (Niger state) and South Sudan (Upper Nile, Northern Bhar El Ghazal and Jonglei).

Pneumonia interventions need to be introduced at all levels of the health system to maximise impact; if hospitals cannot manage referred cases properly, the benefits of improved community-level diagnosis will not be felt. Unfortunately, hospitals in low-resource settings are often under-resourced and overcrowded. As a result, many acutely unwell children and newborns lack access to oxygen supplementation — an essential medical treatment, as low blood oxygen saturation increases the under-five mortality rate six-fold.^[8] Inadequate equipment, weak maintenance, high oxygen costs and poor clinical practices also need to be addressed.^[9]

Evidence to improve pneumonia case management

Over the past 10 years, Malaria Consortium has been at the forefront of pneumonia case management implementation research. We first investigated global understanding of the challenges and development needs for improved pneumonia diagnostic aids through the Pneumonia Diagnostic Project in four countries, where we tested nine devices for performance and usability.^[10] Key to this work was the Acute Respiratory Infection Diagnostic Aid (ARIDA, 2016–2019),^[4] in which we

studied the usability and acceptability of two automated respiratory rate counting aids to help frontline health workers in Ethiopia and Nepal classify fast breathing. In the Breathe study,^[12] we evidenced the difficulty in evaluating the performance of automated respiratory rate counters, and made recommendations on suitable reference standards.^[13]

Currently, we are building on our previous work, as well as on our expertise in health systems strengthening, to support our partner, PATH, to evaluate six pneumonia diagnostic aids for performance^[14] through the Tools for Integrated Management of Childhood Illness (TIMCI) project.^[15]

Our research is part of the global effort to close current knowledge gaps relating to the prevention, diagnosis and treatment of pneumonia. We chair the research group of the Every Breath Counts Coalition, which aims to end preventable child pneumonia deaths by 2030. In partnership with key international stakeholders, the coalition has recently published global research priorities for pneumonia and seeks to focus the pneumonia response on 10 countries that account for 60 percent of pneumonia deaths.^[14]



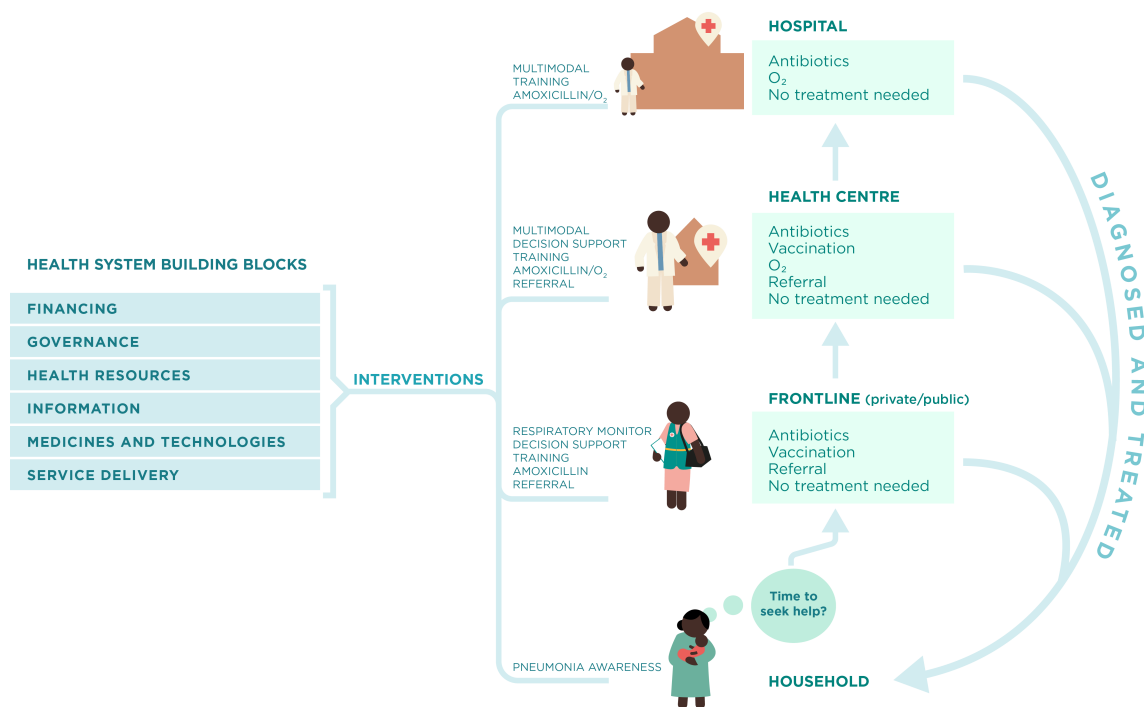
A child is tested for pneumonia with a respiratory monitoring device, Ethiopia

Recommendations

We recommend improving pneumonia case management through the recommendations below.

1. **National governments, with support from technical partners and donors, should adopt comprehensive health systems strengthening approaches to improve pneumonia case management at all levels.** These need to be coupled with strong repair and replacement mechanisms for diagnostic devices, innovations to ensure an uninterrupted power supply to oxygen management systems, and strengthened supply chains for commodities. Integration with existing national and local frameworks, e.g. the national oxygen roadmap, will also be key.
2. **Donors should fund implementation research in line with the priorities set by the Every Breath Counts Coalition.** For example, evidence is needed on the usability of new automated respiratory rate counters at the community level, and on multimodal devices at the health facility and hospital levels. The results of such research should enable decision makers to improve health systems strengthening interventions for pneumonia at the most appropriate settings and levels.
3. **The global community should provide stronger support for pneumonia case management at country level through improved guidelines and appropriate digital tools.** The World Health Organization could provide further guidance on the inclusion of pulse oximetry into the iCCM/IMCI algorithm, for example. A technical consultation is needed to develop global and country-specific guidance for health workers on how to detect, classify and treat or refer children under five with hypoxemia. Accordingly, in Ethiopia, we are working with the Ministry of Health to develop an integrated management of newborn and childhood illnesses (IMNCI) action plan with focus on pneumonia and diarrhoea.
4. **National governments should work with technical partners to strengthen the training and supervision of health workers to improve their ability to correctly diagnose, treat and refer children at each level of the health system.** Training will enable community health workers to provide appropriate counsel to caregivers on preventive behaviours — such as pneumococcal vaccines, exclusive breastfeeding for infants under six months to boost their immunity to infection, and the use of clean cooking fuels to reduce household air pollution. Training will also strengthen health worker capacity to advise communities on correct adherence to antibiotics and to recommend follow-up visits.
5. **Programme implementers should actively engage communities in rural and harder to reach areas in pneumonia prevention and control.** This will ensure that interventions are locally accepted and meet communities' needs.
6. **Donors and the pharmaceutical industry must commit to research investments to prevent AMR.** The prevalence and severity of antibiotic-resistant bacterial pneumonias need to be assessed. Feeding these data into international AMR databases — including the Global Antimicrobial Resistance Surveillance System — will inform clinical decisions, promote the rational use of amoxicillin dispersible tablets and improve international and national policies.

Figure 1: Factors to consider when designing health system strengthening interventions for improved pneumonia case management



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