

Prevention and Control of Childhood Pneumonia and Diarrhea



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KEYWORDS

• Pneumonia • Diarrhea • Vaccines • Global burden • Etiology

KEY POINTS

- Pneumonia and diarrhea are the 2 major preventable causes of childhood deaths in young children in low- and middle-income countries.
- Public health interventions, including nutritional rehabilitation, zinc supplementation, exclusive breastfeeding, and water-sanitation-and-hygiene strategies, have all contributed toward marked reductions in mortality; however, current coverage of these cost-effective interventions remains low.
- Respiratory syncytial virus, *Streptococcus pneumoniae*, and *Haemophilus influenzae* are the leading causes of childhood pneumonia; the last two can be prevented through vaccination.
- Vaccines against diarrheal pathogens include that against cholera and rotavirus; development of vaccines against other leading causes of diarrhea, such as norovirus, *Cryptosporidium*, *Shigella*, *Campylobacter*, and enterotoxigenic *Escherichia coli*, are urgently needed.
- Successful implementation of the World Health Organization/United Nations Children's Fund's Integrated Global Action Plan for the Prevention and Control of Pneumonia and Diarrhea will need strong commitment from national governments, the private sector, and other stakeholders.

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INTRODUCTION

Pneumonia and diarrhea are the 2 leading infectious causes of death in children younger than 5 years worldwide, responsible for more than 1.5 million deaths annually. They accounted for 15% and 9%, respectively, of the 6.3 million deaths in children younger than 5 years that occurred globally in 2013.^{1,2} There are an estimated 1.7 billion episodes annually of diarrhea and more than 150 million episodes of pneumonia. Marked decreases in mortality due to pneumonia and diarrhea over the past decade have been noted.³ Between 2000 and 2013, there was an estimated 44% reduction in deaths due to pneumonia and 54% reduction in deaths due to diarrhea among children younger than 5 years.² Despite this, pneumonia and diarrhea continue to cause significant morbidity and mortality in young children worldwide, particularly those in Asia and Africa. Thus, efforts at optimizing prevention and control are needed. In this review, the authors describe strategies aimed at preventing and controlling childhood pneumonia and diarrhea.

GLOBAL BURDEN

The World Health Organization (WHO) estimates that each year, there are greater than 150 million cases of pneumonia in children younger than 5 years, including 20 million cases that require hospitalization. Most of the morbidity and mortality worldwide due to pneumonia occur in low- and middle-income countries (LMICs). Using vital registration and verbal autopsy data, the Child Health Epidemiology Reference Group estimated the total number of pneumonia deaths in children younger than 5 years worldwide to be approximately 935,000.³ Up to half of the deaths from pneumonia occurred in sub-Saharan Africa and approximately a third in Southern Asia. There were regional variations in the percentage of deaths attributable to pneumonia: from 5% of deaths in developed regions to 16% of deaths in sub-Saharan Africa. Most notably, 96% of episodes of pneumonia, and 99% of deaths from pneumonia, take place in LMICs.⁴

Although second to pneumonia in mortality burden, diarrheal illnesses occur more frequently. Children in LMICs who are younger than 5 years have an average of 2.9 episodes per year of diarrhea, accounting for nearly 1.7 billion episodes of diarrhea yearly,⁵ resulting in more than 578,000 deaths per year.³ The peak age of diarrheal disease incidence is during , from 6 to 11 months of age⁵; most of the deaths due to diarrhea occur in the first 2 years of life.⁶

CAUSES OF PNEUMONIA

Because of logistical and ethical limitations, direct sampling of infected lung tissue is not commonly performed; our knowledge of the causes of pediatric pneumonia is based mostly on studies using various indirect sampling methods, such as nasopharyngeal swab, blood cultures, or induced sputum (**Box 1**). A large 10-country study conducted more than 25 years ago revealed respiratory viruses, especially respiratory syncytial virus (RSV), to be the leading cause of childhood pneumonia,¹² with the most common bacterial causes being *Streptococcus pneumoniae*, followed closely by *Haemophilus influenzae*. More contemporary studies have continued to identify RSV as the most common respiratory virus responsible for pneumonia worldwide, though improved molecular diagnostics have also implicated rhinovirus, influenza virus, human metapneumovirus, and adenovirus, with significant geographic variations.⁷⁻⁹ Although viruses are detected in most cases of pneumonia, given the high frequency of copathogen isolation, their contribution to severe pneumonia is unclear. Notably,

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