

Pushing the Pace

Progress and Challenges in
Fighting Childhood Pneumonia



Foreword by Keith Klugman,
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Pushing the Pace: Progress and Challenges in Fighting Childhood Pneumonia examines recent gains in reducing child deaths from pneumonia. This report advances our understanding of the burden of childhood pneumonia and its toll within the context of the leading killers of children; global trends in funding to address pneumonia; and health system factors involved in the effective prevention, diagnosis, and treatment of pneumonia. With a special focus on countries with the highest number of child pneumonia deaths, this report shows the data and evidence that we currently have – and continue to need – to make pneumonia a disease that no child dies from, in any corner of the world.

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Childhood Pneumonia

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Acronyms

ABCE	Access, Bottlenecks, Costs, and Equity project
DAH	Development assistance for health
DFID	United Kingdom's Department for International Development
DPT	Diphtheria-pertussis-tetanus
DRC	Democratic Republic of the Congo
FCE	Gavi Full Country Evaluations
GAPPD	Integrated Global Action Plan for the Prevention and Control of Pneumonia and Diarrhoea
GBD	Global Burden of Disease study
Hib	<i>Haemophilus influenzae</i> type b
iCCM	Integrated community case management
IHME	Institute for Health Metrics and Evaluation
LRI	Lower respiratory infection
MCPA	Malaria Control Policy Assessment project
MDG	Millennium Development Goal
PCV	Pneumococcal conjugate vaccine
UNICEF	The United Nations Children's Fund
WHO	World Health Organization



Terms and definitions

Bilateral agency: a donor-country funding organization that directly provides development assistance for health to a developing country.

Care-seeking for suspected pneumonia: the percentage of children under 5 years old for whom care was sought at a health facility after experiencing symptoms indicative of suspected pneumonia (cough), as reported by caregivers.

Child deaths: the number of children who died under the age of 5 years old. In this report, the terms child deaths and child mortality are used interchangeably.

Childhood underweight: the proportion of children between the ages of 6 and 59 months who are two or more standard deviations below the international reference population median of weight for age.

Development assistance for health (DAH): all financial or in-kind contributions from global health channels that aim to improve health in developing countries.

Funding channels: the institutions that oversee the distribution and delivery of development assistance for health to recipients. Funding channels either directly provide financial support to recipients or deliver funds provided by funding sources to recipients.

Funding sources: the origins of development assistance for health, typically consisting of national treasuries or private holdings of corporations or foundations. Funding sources transfer funds to funding channels, which then direct development assistance to specific countries, projects, or implementing organizations.

Household air pollution: indoor air contamination that results from using solid or unclean fuel sources, such as coal or wood, for cooking or heating purposes. Exposure to smoke and particulate matter emitted from burning these fuels in settings with poor ventilation can cause or heighten the risk for serious health complications.



Integrated community case management (iCCM): a health service delivery approach in which trained medical personnel, often community health workers, provide basic diagnostic and treatment services for a subset of common childhood illnesses at the community level. These health workers are trained to determine whether vague symptoms, such as fever, are due to pneumonia, diarrheal diseases, or malaria, and then treat the ailment accordingly. Some programs include nutrition support.

Pentavalent vaccine: a single vaccine for which five separate vaccines are combined to provide protection against diphtheria-pertussis-tetanus (DPT), hepatitis B, and *Haemophilus influenzae* type b (Hib). In most developing countries, the Hib vaccine is not provided as a single immunization but rather as part of the pentavalent vaccine.

Pentavalent vaccine coverage: the proportion of children between the ages of 12 and 24 months who have received the pentavalent vaccine, as determined by immunization cards or caretaker recall.

Pneumococcal conjugate vaccine (PCV): a vaccine that provides protection against various strains of *Streptococcus pneumoniae*, a main cause of childhood pneumonia.

Pneumonia: a severe form of an acute respiratory infection. In this report, pneumonia deaths are based on estimates of lower respiratory infections (LRIs), which encompass a full range of pneumonia etiologies.



Pneumonia at a glance

In higher-income countries, pneumonia is a disease that most frequently strikes the elderly or people who are already sick. Elsewhere, children under 5 are the main victims of pneumonia. In 2013, a child died from pneumonia every 35 seconds.

Pneumonia is a severe acute respiratory infection, a condition where fluids fill the lungs and disrupt how oxygen is absorbed. Breathing can become very difficult, especially for young children. Other symptoms can include intense coughing, a high fever, and chills. As pneumonia progresses, children can experience convulsions, unconsciousness, feeding problems, and without timely treatment, often death.

Streptococcus pneumoniae is the bacterium responsible for much of the pneumonia that harms children in developing countries. *Haemophilus influenzae* type b (Hib) is another, though less widespread, type of bacteria that causes pneumonia. Children can be exposed to these lethal pathogens through contaminated air droplets (via coughing) or blood-borne infections. Vaccines exist to protect children against both pathogens: the pneumococcal conjugate vaccine (PCV) and the pentavalent vaccine, which includes protection against Hib. These immunizations are already widely available in higher-income countries, and with support from development partners such as Gavi, the Vaccine Alliance, these vaccines are increasingly being scaled up in lower-income countries with the largest pneumonia burdens.

In addition to immunization, reducing risks that heighten susceptibility to pneumonia can improve child health outcomes. Exposure to household air pollution, largely from the use of solid fuel sources such as coal, and poor nutrition are considered the leading risk factors for childhood pneumonia. Increasing the use of improved fuel sources in households and promoting exclusive breastfeeding during the first six months of life can reduce a child's risk for pneumonia. Studies in some countries also suggest that access to clean water and improved sanitation may lower risk for pneumonia.

Even with the best prevention and risk reduction efforts, children can still get pneumonia. Having access to a health facility or health worker within a short travel time and then receiving prompt diagnosis and treatment are essential. Pneumonia is often diagnosed by chest X-rays and laboratory tests in higher-income countries, but these technologies are often not available in resource-poor areas, particularly at lower levels of care. In these settings, a clinical diagnosis should be made by a skilled health worker. A full course of antibiotics is needed to treat bacterial pneumonia in children. Oxygen therapy is often necessary as well, especially for younger children and those with severe cases. Pulse oximetry is a relatively inexpensive and noninvasive method to monitor a patient's oxygen levels. This is done through a small device placed on a fingertip or earlobe.

Foreword

Pushing the Pace: Progress and Challenges in Fighting Childhood Pneumonia draws attention to the need for a better alignment between disease burden and the allocation of development assistance for health in the battle to reduce newborn and child deaths from pneumonia, the leading infectious disease killer of children under 5.

Pneumonia caused the death of an estimated 905,059 children in 2013, with most deaths concentrated among countries in sub-Saharan Africa and South Asia, especially in India, Nigeria, Pakistan, Democratic Republic of the Congo, Ethiopia, Indonesia, China, Tanzania, Afghanistan, and Kenya. These 10 countries are responsible for 60% of pneumonia deaths among children under 5.

Globally, child pneumonia deaths fell 58% between 1990 and 2013, a success in many ways. Nonetheless, this pace of decline lags behind the two-thirds decrease required to achieve the Millennium Development Goals (MDGs) by 2015. It is also slower than the mortality reductions achieved for other childhood killers, including measles (83%) and diarrhea (68%).

Highly cost-effective tools exist to prevent and treat pneumonia in children. Vaccines, especially the pneumococcal and Hib vaccines, can prevent the leading causes of pneumonia. Antibiotics, alongside oxygen where required, can successfully treat most pneumonia cases if care is sought quickly.

Why then are so many small children still dying from pneumonia?

By quantifying the large disparity between the disease burden and the level of development assistance allocated to prevent, diagnose, and treat childhood pneumonia, this report by IHME sheds some light.

It points to a level of underinvestment that contributes to the low levels of coverage of vaccines, antibiotics, and oxygen, especially among the populations where disease burden is greatest, no doubt exacerbated by the lack of access

to simple tools that can accurately and quickly diagnose a child in need of antibiotics and/or oxygen therapy.

With about 400 days to the MDG deadline, these gaps in prevention, diagnosis, and treatment coverage can be closed with the technologies we have. At the same time, the world has an opportunity to accelerate the search for innovative tools and focused efforts that strengthen services to the populations where child deaths are concentrated.

It is essential that the delivery of existing and innovative pneumonia technologies is integrated with other areas of child survival, especially efforts to reduce diarrhea, malnutrition, and malaria, as part of integrated community case management (iCCM) of childhood illnesses.

I am hopeful that this report will persuade the global health investment community to mobilize additional support to expand access to existing pneumonia-fighting technologies as well as to invest in innovation and integrated service delivery to accelerate declines in child deaths.

Without a sustained and focused effort to improve the prevention, diagnosis, and treatment of the major childhood illnesses, including pneumonia, we will not achieve the new global child survival goal of ending preventable child deaths by 2030.

Keith Klugman

Director, Pneumonia

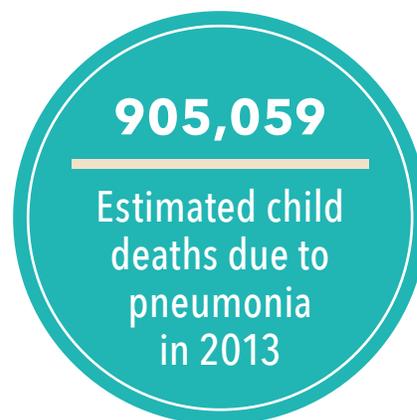
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Report highlights

Charting the global burden of childhood pneumonia

- Pneumonia is a leading cause of child mortality, killing an estimated 905,059 children in 2013.
- In 2013, 14% of all child deaths worldwide were caused by pneumonia – exceeding the proportion of child deaths from HIV/AIDS, malaria, and measles combined.
- Globally, strong progress was made in reducing child pneumonia deaths between 1990 and 2013. Child pneumonia mortality fell 58% worldwide during this time.
- These gains have been unevenly distributed, with most of the global progress in decreasing child pneumonia deaths driven by countries outside sub-Saharan Africa.
- Child pneumonia deaths have decreased at a slower pace than other leading causes of child mortality, especially in comparison to measles (an 83% decline) and diarrheal diseases (a 68% drop).



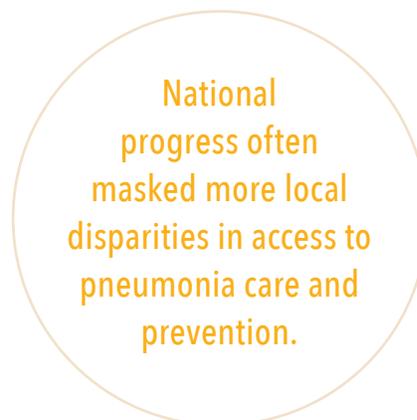
The funding landscape to address pneumonia

- Development assistance targeting pneumonia represents a very small portion of overall global health financing, 2% of the \$30.6 billion spent in 2011.
- Funding for pneumonia has recently increased, more than doubling from about \$306 million in 2008 to over \$663 million in 2011. As a funding channel, Gavi was the main driver of heightened funding for pneumonia.
- The majority of these funds were allocated to countries with a high number of child pneumonia deaths in sub-Saharan Africa and South Asia.



Strengthening efforts to fight childhood pneumonia

- Many countries have made marked gains in increasing access to health services for pneumonia care, expanding immunization programs targeting pneumonia, and reducing risks associated with childhood pneumonia. Nonetheless, many gaps remain, particularly in terms of the prompt diagnosis and treatment of pneumonia.
- A more comprehensive approach to addressing childhood pneumonia, purposely linking vaccination programs and risk-reduction initiatives with improving the timely provision of effective pneumonia diagnosis and treatment, is likely needed to move closer to ending child pneumonia deaths.

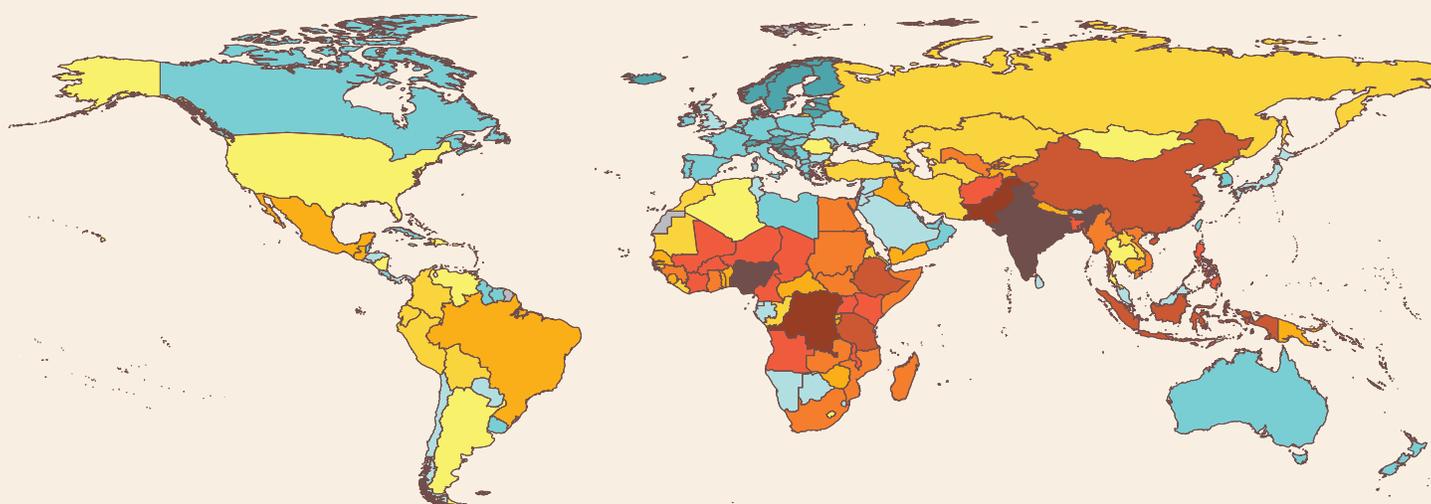


Charting the global burden of childhood pneumonia

In 2013, 85% of all child pneumonia deaths took place in 30 countries. More than half of these lives were lost in 10 countries, including India, Nigeria, and Pakistan.

Pneumonia deaths for children under 5 years old, 2013

> 100,000 50,000-100,000 25,000-50,000 10,000-25,000 5,000-10,000 2,500-5,000 1,000-2,500 500-1,000 100-500 < 100 < 10



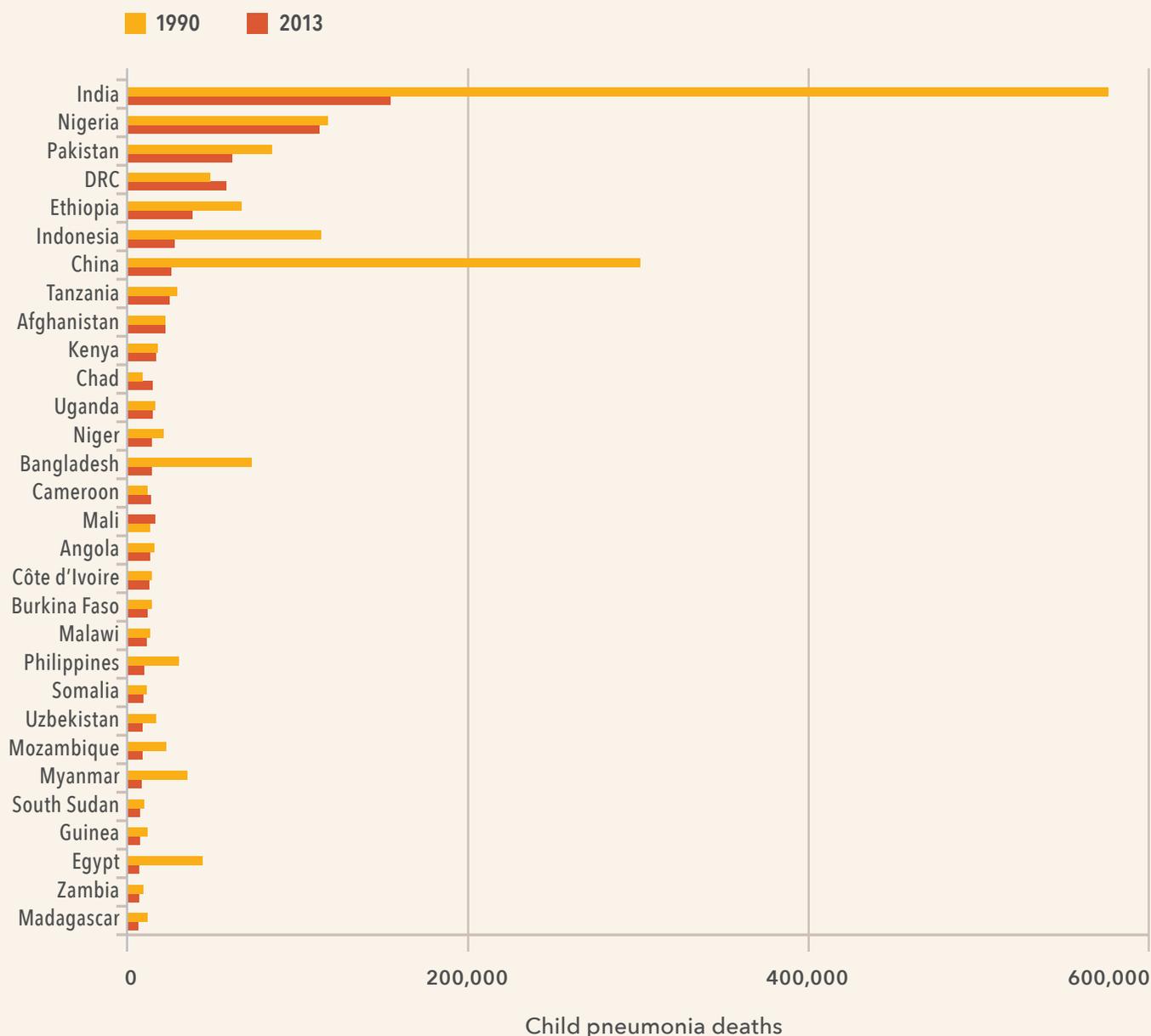
Pneumonia is one of the world's leading killers of children. In 2013, 905,059 children died from pneumonia before they reached their fifth birthdays.¹ If a tragedy of this magnitude took place in the United States, every child under 5 living in six major American cities (Boston, Los Angeles, New York City, San Francisco, Seattle, and Washington, DC) would have died in a single calendar year.²

Countries in sub-Saharan Africa, South Asia, and Southeast Asia bore the brunt of child pneumonia mortality in 2013.¹ In fact, 60% of the world's under-5 deaths from pneumonia occurred in 10 countries: India, Nigeria, Pakistan, Democratic Republic of the Congo (DRC), Ethiopia, Indonesia, China, Tanzania, Afghanistan, and Kenya. In 2013, 30 countries accounted for 85% of child pneumonia deaths experienced worldwide.

In 2013, a child died from pneumonia every 35 seconds.

Nearly all high-burden countries recorded reductions in child pneumonia deaths since 1990.

Child pneumonia deaths in 30 high-burden countries, 1990 and 2013



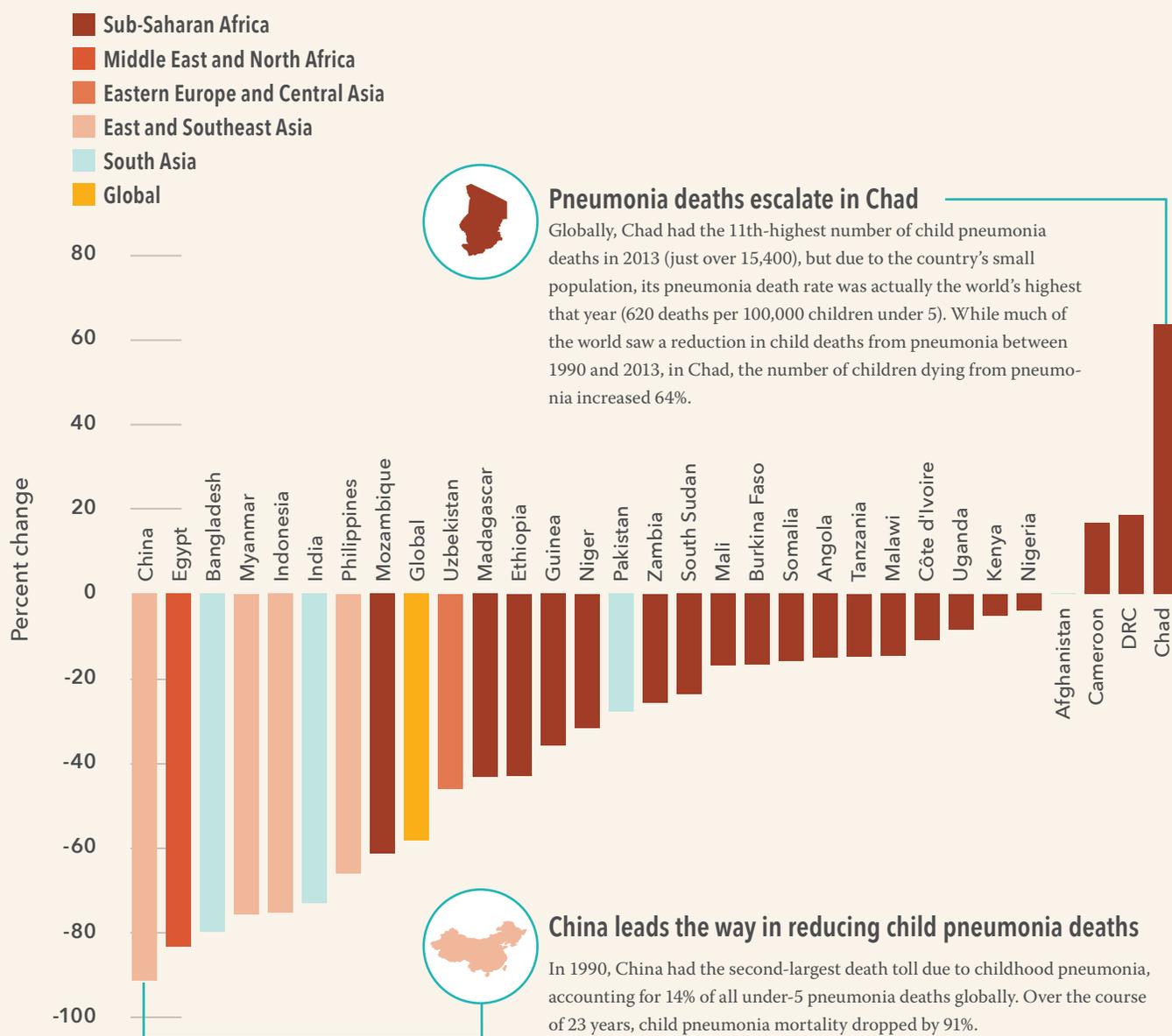
The world has made substantial progress in improving child survival from pneumonia, as well as preventing the disease altogether. In 1990, pneumonia killed nearly 2.2 million children younger than 5 years old. By 2013, the disease claimed 58% fewer lives.¹

In some places, pneumonia mortality fell even faster between 1990 and 2013. In India, pneumonia killed 421,000 fewer children in 2013 than in 1990, a 73%

decrease in lives lost. Bangladesh, China, and Egypt recorded declines that equaled or exceeded 80% during this time. Expanding access to life-saving vaccines and treatment, strengthening health system responsiveness, investing in integrated community case management (iCCM), and reducing risk factors for pneumonia, such as household air pollution and malnutrition, have likely helped to drive much of the gains seen today.

Uneven country progress underlies global gains in reducing child pneumonia deaths.

Percent change in child pneumonia deaths, 1990-2013



Advances in fighting childhood pneumonia have not been experienced evenly across countries. Outside sub-Saharan Africa, high-burden countries averaged a 62% drop in child pneumonia deaths between 1990 and 2013. In sub-Saharan Africa, the average reduction was only 14%. This means that global progress in decreasing child pneumonia deaths has largely been driven by advances occurring outside sub-Saharan Africa.

Some African countries achieved a faster pace in reducing child pneumonia deaths (for example, Mozambique recorded a 61% decrease from 1990 to 2013, and Ethiopia had a 43% decline during this time),¹ but these places were more frequently the exception. In fact, a few countries actually saw child deaths from pneumonia increase since 1990. To move closer to truly ending preventable child mortality, substantially reenergized and targeted efforts to tackle pneumonia are needed in sub-Saharan Africa.

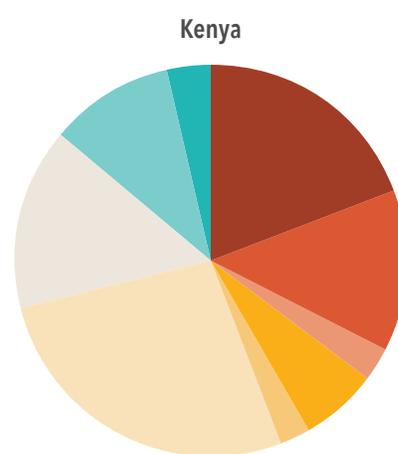
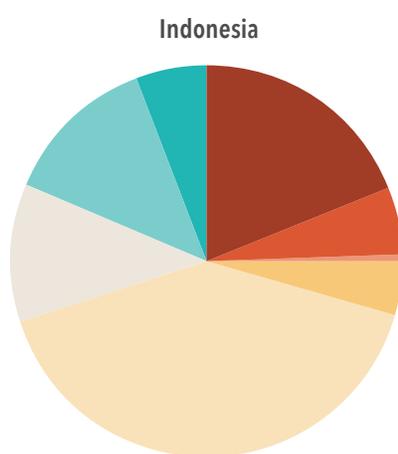
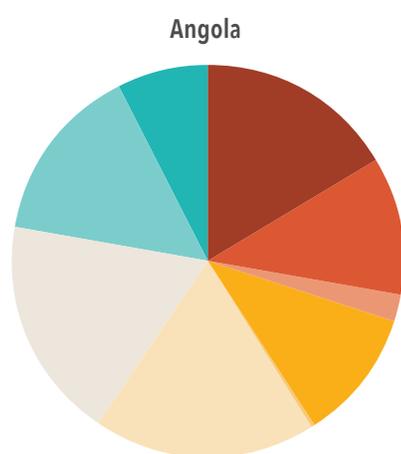
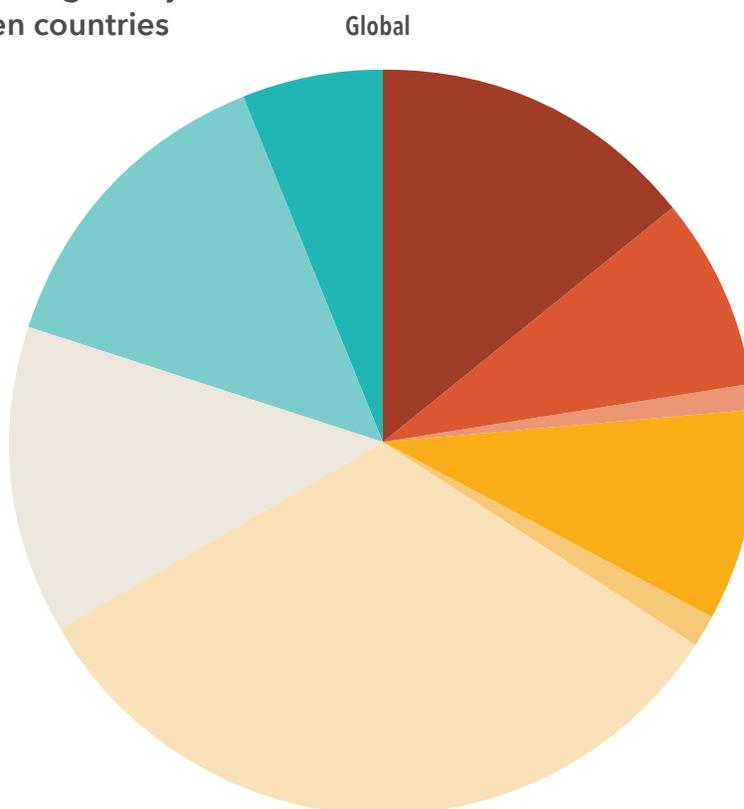
In 2013, pneumonia caused 14% of all under-5 deaths worldwide.

More children lost their lives to pneumonia than to HIV, malaria, and measles – combined.

Leading causes of child deaths in 2013: globally and in three high-pneumonia-burden countries

- Pneumonia
- Diarrheal diseases
- HIV/AIDS
- Malaria
- Measles
- Neonatal disorders
- Other communicable diseases
- Non-communicable diseases
- Injuries

The global toll of pneumonia on children is often overshadowed by a number of other infectious diseases. And for some places, this may be understandable: in 2013, HIV/AIDS claimed more children's lives than pneumonia in Mozambique, and malaria killed twice as many children as pneumonia in Mali.^{1,3} However, across the globe, more children died from pneumonia that year than HIV/AIDS, malaria, and measles combined.



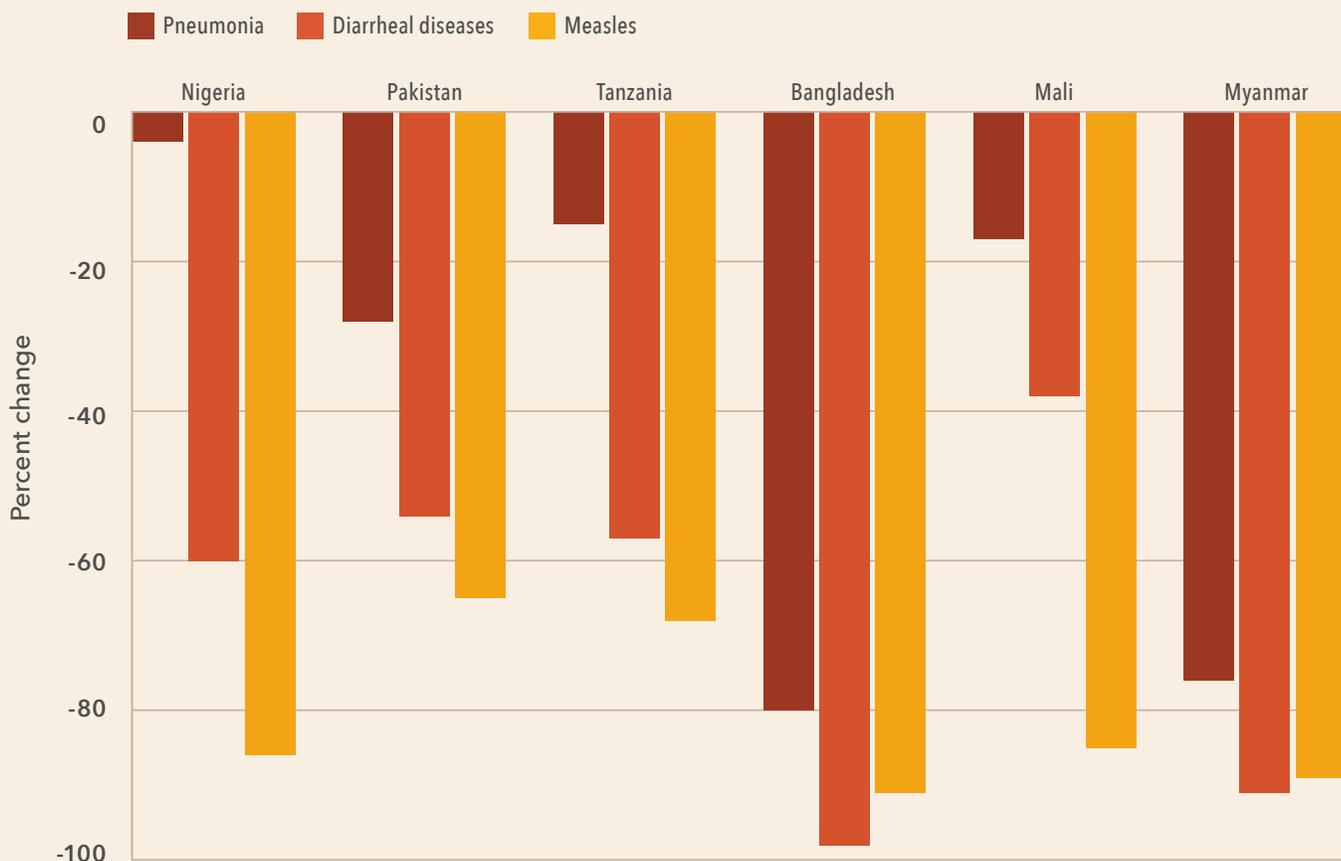
Pneumonia exacts a heavier toll in Angola than malaria and HIV/AIDS combined.

In 2013, about 8,990 Angolan children lost their lives to malaria and about 1,750 died from HIV/AIDS. By contrast, pneumonia killed more than 13,600 children in Angola that year.

In an effort to address this burden, Angola formally introduced the pneumococcal conjugate vaccine (PCV) in July 2013. As Angola continues to increase immunization coverage, it is possible that the country will see accelerated gains against childhood pneumonia.

Child pneumonia deaths declined, but these gains for most countries lagged behind progress against other diseases.

Comparing six countries' progress in decreasing child pneumonia deaths to reductions in mortality from diarrheal diseases and measles, 1990-2013



Declines in child pneumonia deaths have often trailed advances made against other leading causes of child mortality. Between 1990 and 2013, global reductions in child deaths from diarrheal diseases and measles – 68% and 83% declines, respectively – outpaced decreases in child pneumonia deaths.

This uneven progress in childhood survival was particularly evident in sub-Saharan Africa. Nigeria, for example, recorded a 4% reduction in child deaths due to pneumonia from 1990 to 2013.¹ By contrast, child mortality from diarrheal diseases fell 60%, and measles deaths dropped 86%.^{1,3}

Until the global toll of childhood pneumonia receives greater and more sustained attention worldwide, pneumonia is unlikely to soften its grip on the world's most vulnerable children.

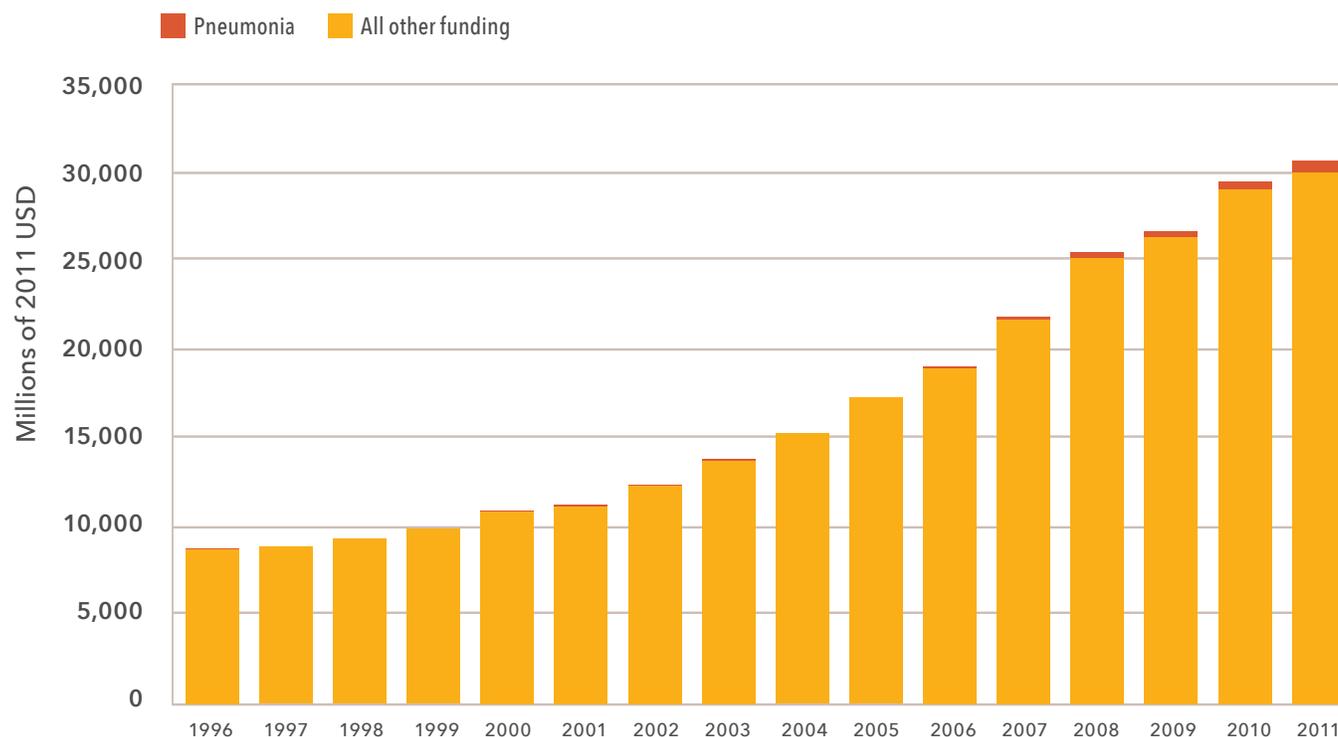
In the DRC and Chad, pneumonia claimed more children's lives in 2013 than in 1990.

Conversely, measles deaths fell more than 70% in both countries.

The funding landscape to address pneumonia

More than \$30 billion was spent on development assistance for health in 2011. Only 2% went to pneumonia.

Trends in development assistance for health, 1996-2011



International funding to support the scale-up of global health interventions and programs has grown substantially over the last two decades,⁴ but such gains have not necessarily aligned with trends in disease burden. Of the \$30.6 billion spent on development assistance for health in (DAH) 2011, only 2% of these funds were allocated to pneumonia.⁵ By contrast, childhood pneumonia caused 5% of all years of life lost and 14% of child deaths worldwide.

Even though funding for pneumonia pales in comparison to funds generally allocated to other infectious diseases, financial support for pneumonia has increased, particularly in more recent years. In fact, global funding for pneumonia more than doubled, from about \$306 million in 2008 to more than \$663 million in 2011.⁵ The bulk of these funds have been allocated to sub-Saharan Africa and South Asia, where the majority of child pneumonia deaths occur.

The pneumonia funding landscape is not yet fully mapped, and a greater understanding is needed of how effectively these funds are spent on addressing childhood pneumonia. Identifying potential gaps in specific types of pneumonia support, such as procurement of antibiotics or improving diagnostic capacity, also should be prioritized. However, given the world's current burden of childhood pneumonia and signs of slowing progress, it is clear that a larger – and sustained – financial commitment is needed to truly end child pneumonia deaths.

An (im)balancing act: global pneumonia financing and mortality by the numbers



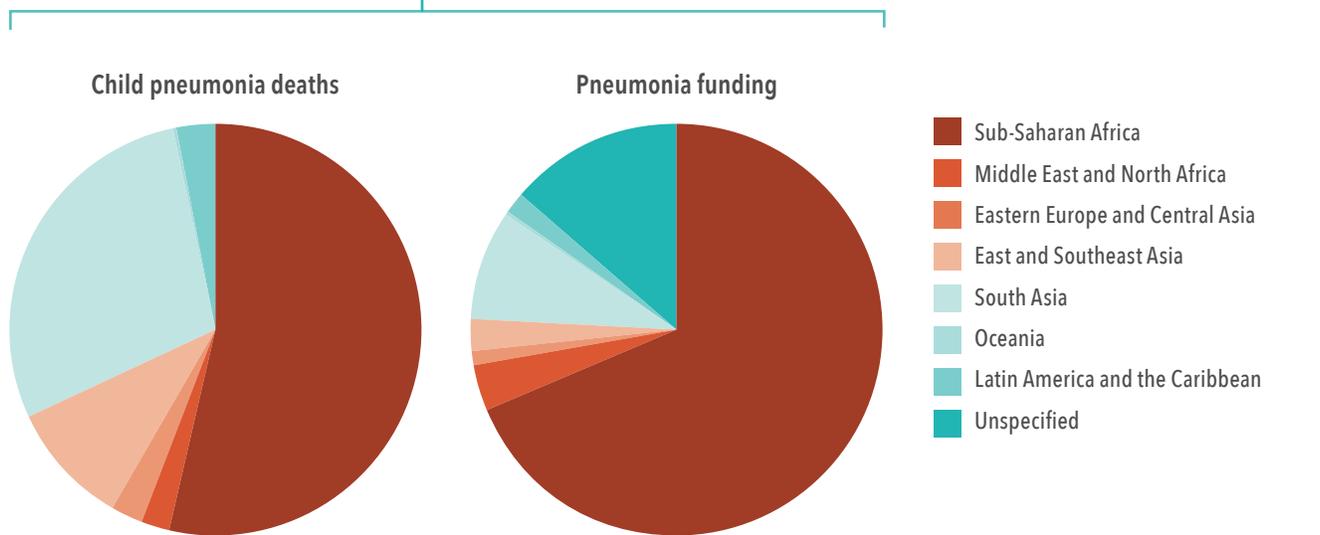
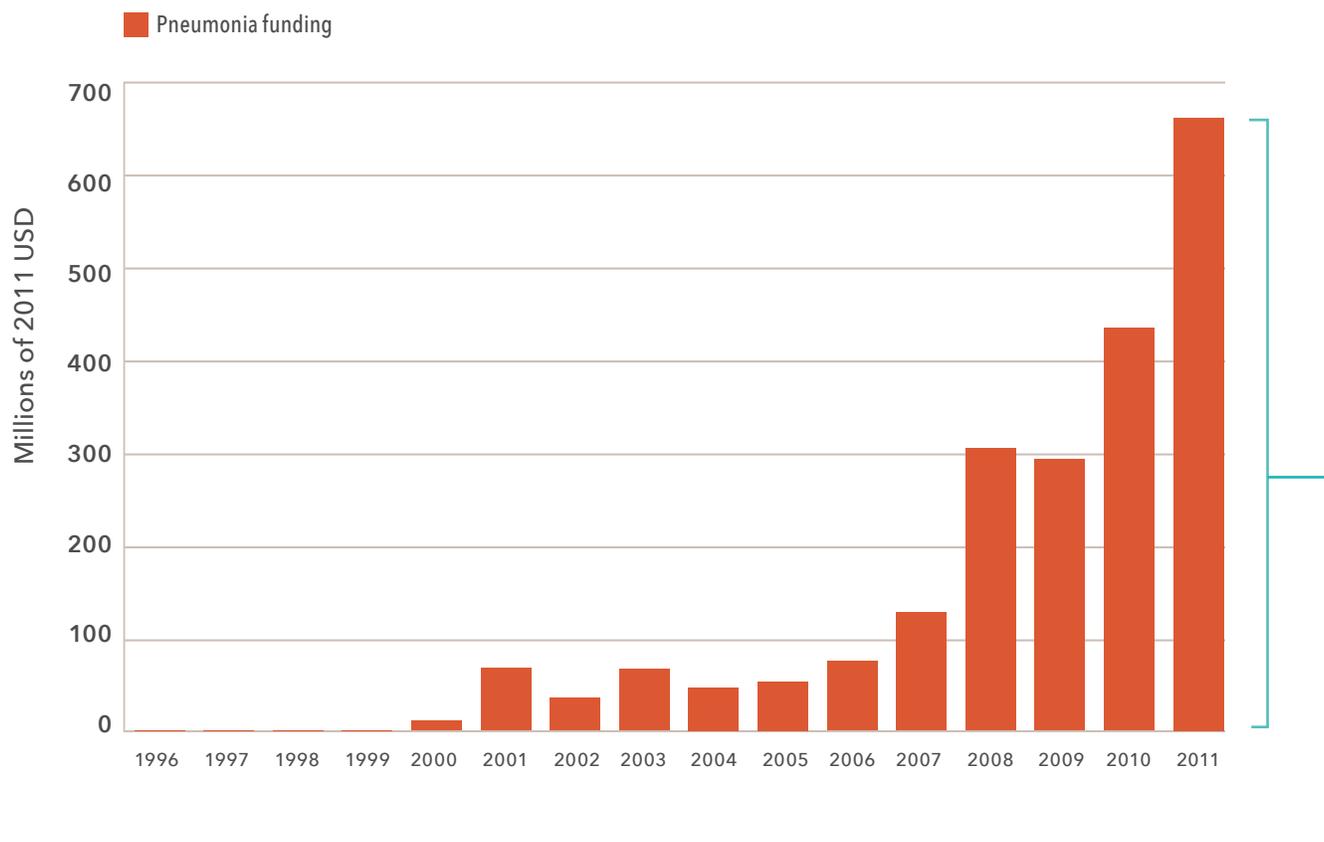
Funding



Child deaths

International funding for pneumonia has increased – and is targeting high-burden areas in the world.
 In 2011, 69% of pneumonia funding went to sub-Saharan Africa, where more than half of all child pneumonia deaths occur.

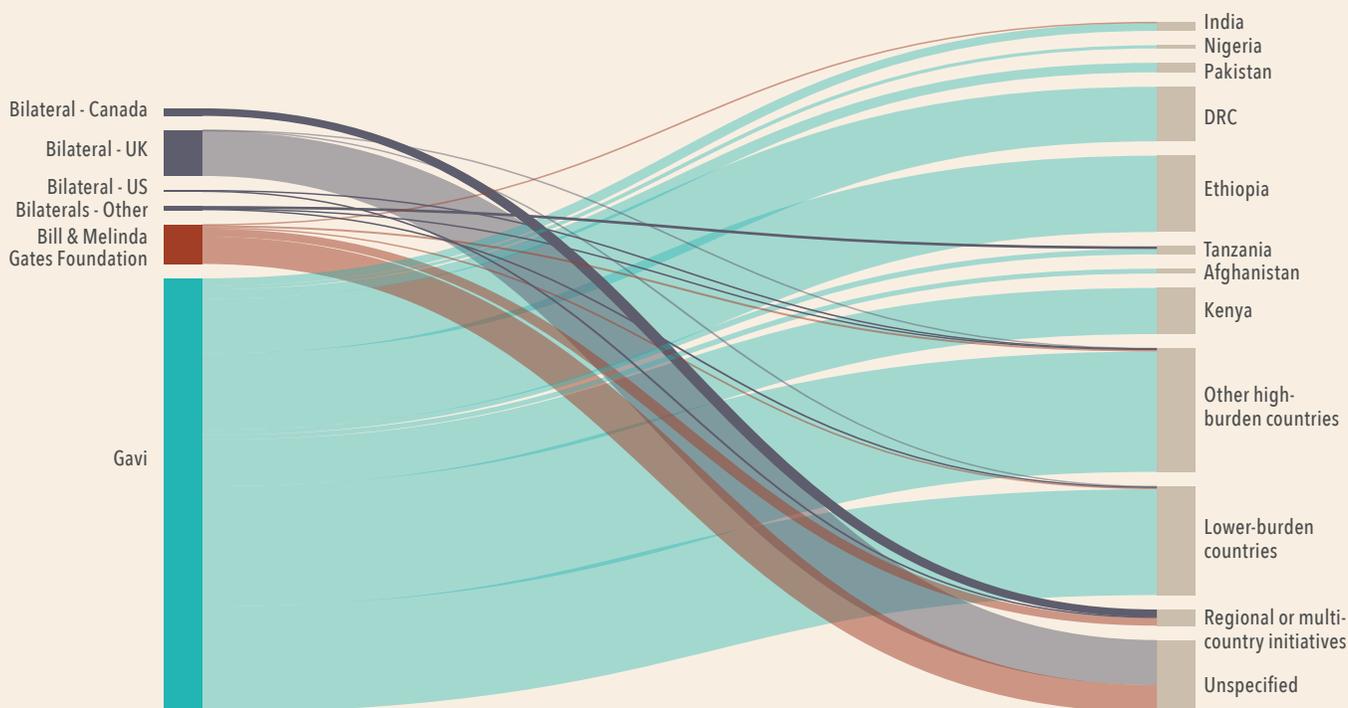
Trends in development assistance for pneumonia, 1996-2011



Who funds pneumonia - and where.

Gavi led funding channels, while Ethiopia and the DRC were the top country recipients.

Leading pneumonia funding channels and recipients, 2011



As a funding channel, Gavi accounted for about 82% of all pneumonia support in 2011. The remaining development assistance for pneumonia came from the Bill & Melinda Gates Foundation (7%) and bilateral agencies (11%). It is important to note these statistics reflect funding channels and not necessarily the original funding sources; the Bill & Melinda Gates Foundation, for instance, directly contributed more than \$214 million to Gavi.⁷ However, it was through Gavi, as the funding channel, that support for pneumonia-targeted grants or projects was allocated over time.

In 2011, Ethiopia, DRC, and Kenya were the top country recipients of pneumonia funding, all originating from Gavi.

These three countries introduced the pneumococcal conjugate vaccine (PCV) that year,⁶ so it is likely that much of the Gavi funding went to supporting the launch of this vaccine.

As pneumonia funding channels, the Bill & Melinda Gates Foundation and bilateral agencies generally did not directly allocate development assistance to specific countries; rather, financial support often went to medical research, regional initiatives, and organizations that implement pneumonia programs (e.g., the United Nations Children’s Fund [UNICEF], the World Health Organization [WHO], and the World Bank).⁵

Canadian agency supports UNICEF to reach poorest populations for pneumonia care.

In 2011, UNICEF received about \$15 million to launch a multicountry program called “Health for the Poorest Populations” from the Canadian International Development Agency.⁵ With a focus on sub-Saharan Africa, UNICEF implemented this program to improve the delivery of

integrated child health services for pneumonia, diarrhea, and malaria to the most disadvantaged districts in target countries – the places with the highest rates of poverty, poorest health system access, and highest burdens of disease.

Strengthening efforts to fight childhood pneumonia



In today's world, no child should die from pneumonia.

We have made great strides in preventing childhood pneumonia, providing prompt diagnosis and treatment of the disease, and reducing its risk to children. Each year, more countries introduce vaccines to protect against pneumonia-specific pathogens and strive to increase the reach of immunization programs to every child within their borders.^{6,8}

Low-cost, effective treatment exists, and a myriad of health initiatives, such as programs to manage pneumonia and other fever-based conditions (for example, iCCM), have been scaled up to deliver treatment to even the hardest-to-reach populations in the world. Investments have been made to train more health professionals to provide integrated services for the prompt diagnosis and treatment of pneumonia alongside other childhood diseases, such as diarrhea and malaria.⁹

The health burdens of leading risk factors for pneumonia, including malnutrition and exposure to household air

pollution, were more than halved between 1990 and 2010.¹⁰ In some low-income areas, improved sanitation and hygiene practices, such as hand-washing, appear to be related to reductions in pneumonia transmission.^{11,12} Substantial positive changes have also occurred outside the immediate health sector, including extended road networks for easier access to health facilities and gains in educational attainment that can prompt improved health-care-seeking behaviors among caregivers.

Yet, pneumonia still kills children and does so in abundance. A comprehensive, rigorous assessment of the persistent hurdles to reducing child pneumonia deaths has yet to occur; no evaluation to date can point to the overarching solutions for ending pneumonia deaths in childhood. Instead, we have to piece together a collective understanding of what may be accelerating – or hindering – progress in reducing pneumonia mortality.

Many countries have experienced considerable challenges in maintaining high levels of immunization coverage for longstanding vaccines, such as measles and polio, while at the same time adding new vaccines to routine immunization schedules.¹³ The introduction and scale-up of newer vaccines, such as pneumococcal conjugate vaccine (PCV), are resource-intensive processes, and their phased implementation can leave children in some areas of a country unprotected for years.^{14,15} PCV has been formally introduced in most high-burden pneumonia countries, but some places, such as India and South Sudan, have yet to provide this critical intervention for preventing childhood pneumonia.⁶

Despite improvements, access to care remains a substantial barrier to further preventing child pneumonia deaths. Delays in receiving care, because of geographic distance or indecision about going to a health facility in the first place, can affect the prompt diagnosis and treatment of pneumonia – critical factors to a child’s survival.

Simply arriving at a health facility, however, does not guarantee that prompt or effective treatment will be received. In 2012, 30% of patients who sought care at public health centers in Kenya had to wait at least one hour before seeing a provider.¹⁶ Among these facilities, 40% did not stock amoxicillin, the WHO-recommended first-line antibiotic for childhood pneumonia.¹⁷ Rural areas still struggle to staff facilities with skilled health workers.¹⁸ These ongoing health system challenges – continued gaps in prompt access to care and facility capacity to provide necessary medicines – likely impede greater advances against childhood pneumonia.

The persistence of inadequate nutrition and poor living conditions in many countries may further stymie efforts to reduce pneumonia deaths. In Niger, for instance, household air pollution remained a top risk factor for child death between 1990 and 2010;¹⁰ inhaling the smoke from burning unclean energy sources, such as coal or wood, puts children at substantially higher risk for pneumonia.¹⁹ The improved health outcomes associated with greater access to pneumonia treatment and immunization services may be jeopardized if broader efforts are not made to address the factors that heighten a child’s risk for developing pneumonia in the first place.

To accelerate the pace of declines in child pneumonia deaths today and in the future, more comprehensive approaches are needed. Such actions include deliberately linking improvements in health system responsiveness and expanded immunization programs to broader development efforts. Ensuring that every child has access to timely pneumonia diagnosis and treatment, regardless of where they live, needs to be a top priority for policymakers. As outlined in the Integrated Global Action Plan for the Prevention and Control of Pneumonia and Diarrhoea (GAPPD), strengthening the reach of integrated care for pneumonia and diseases with similar treatment needs and associated risks, such as diarrhea, will likely contribute to improved child health outcomes.⁹ Going forward, it is critical to assess how each component that reduces childhood pneumonia influences the others – and then harness their collective impact to make ending child pneumonia deaths a reality.



Nigeria had a phased roll-out of the pentavalent vaccine, which left more than 30% of states waiting two years to receive the vaccine for their children.

Nearly one-third of patients in Uganda traveled longer than an hour to reach a facility in 2012.



In 2011, about 40% of Zambian primary care facilities had fewer than two skilled health workers – and several had none.



Childhood underweight, which reflects long-term malnutrition, was the leading driver of under-5 deaths for nearly all countries where pneumonia killed the most children.

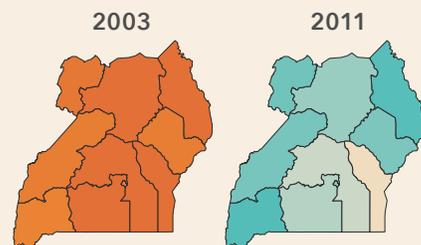
A focus on Uganda's efforts to tackle childhood pneumonia

In 2013, pneumonia killed about 15,340 Ugandan children, the 12th-highest toll across countries that year.¹ Decreases in child pneumonia deaths have generally lagged behind the progress Uganda has made against other infectious diseases. However, the country has quickened its pace of decline for pneumonia, with child deaths falling 16% between 2000 and 2013 – a substantial improvement compared to the 9% increase experienced from 1990 to 2000. Although gaps in Uganda's approach remain, the country has shown notable gains in a number of factors, ranging from heightened prevention efforts to addressing risk factors for childhood pneumonia.

Pneumonia prevention: introducing and scaling up the pentavalent and pneumococcal conjugate vaccines

Uganda was among the first countries in sub-Saharan Africa to roll out the pentavalent vaccine, which includes the Hib vaccine. Nationwide introduction took place in 2002,²⁰ and the country quickly brought up immunization coverage, with some regions exceeding 80% coverage by 2011.²¹

For the introduction of the pneumococcal conjugate vaccine (PCV), Uganda took a more phased approach.¹⁴ PCV was launched in one district in April 2013, after which district-by-district PCV introduction gradually occurred through May 2014.

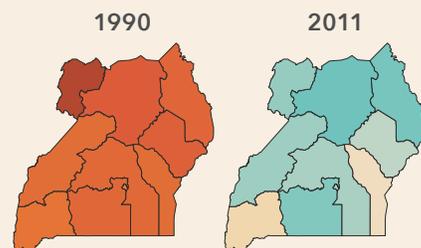


Pentavalent vaccine coverage

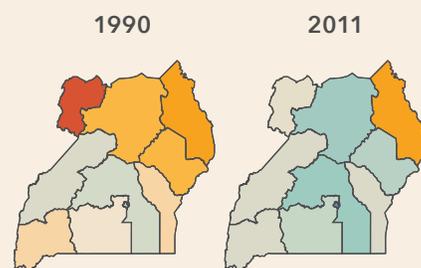
Pneumonia treatment: access to care and facility capacity to provide pneumonia treatment

Between 1990 and 2011, Uganda saw large regional increases in the proportion of children who were brought to care for suspected pneumonia.²¹ Greater knowledge of pneumonia symptoms among caregivers and expanded community access to health facilities may account for these gains.

At health facilities, the capacity to provide treatment for bacterial pneumonia varied across levels of care.²⁰ Based on a nationally representative facility survey in 2012, nearly all hospitals stocked amoxicillin, WHO's recommended first-line antibiotic for treating pneumonia among child patients.¹⁷ This held true for both urban and rural areas. However, an urban-rural divide emerged among health centers, with 22% of these rural facilities and 15% of urban health centers lacking this antibiotic. Clinics, which are privately owned and dispense medications for a fee, generally had a lower availability of amoxicillin (56% of facilities stocked the first-line antibiotic).



Percentage of children under 5 for whom care was sought at a health facility for suspected pneumonia



Percentage of underweight children under 5

Pneumonia risk reduction: decreasing childhood underweight and exposure to household air pollution

Between 1990 and 2010, Uganda recorded large declines in disease burden associated with elevated risk for pneumonia: a 70% drop in childhood underweight (which reflects malnutrition) and a 63% decrease in household air pollution.¹⁰ Analyses showed country-wide progress in reducing the percentage of underweight children across regions, yet within-country disparities remained.²¹

Conclusion

As the deadline for achieving the Millennium Development Goals (MDGs) nears, many countries will be lauded for their successes in achieving MDG4, the goal for reducing under-5 mortality by two-thirds between 1990 and 2015. A number of factors will have contributed to their successes, and it is likely that reducing child pneumonia deaths will be one of them. If some countries fail to meet MDG4, slower progress against child pneumonia mortality could be a main culprit.

The next bold development goal is to end preventable child deaths by 2030. It is a goal that supports an equity and human rights perspective, emphasizing that every person deserves to live a full and healthy life. It is a goal that supports socioeconomic prosperity and overall development, seeking to bring all children through adolescence and adulthood as active citizens contributing to their countries. It is a goal that demands much greater progress in child health – and without pushing the pace against childhood pneumonia, it is a goal with a steep upward climb.

We have seen where marked reductions in child pneumonia deaths took place over the last two decades – and where such achievements have yet to be realized. Funding for pneumonia has increased in recent years, but still represents a very small fraction of overall development assistance for health. Vaccine program support has accounted for the majority of pneumonia-specific funding, but expanded immunization activities represent only part of fully addressing childhood pneumonia. Accelerated progress in reducing child pneumonia deaths will likely need a larger – and sustained – policy focus on improving access to timely diagnosis and effective treatment.

Although much is known about how individual interventions can address childhood pneumonia, a comprehensive, data-driven understanding of how these various interventions should be combined for greater impact over time has yet to emerge. Health facilities still stock out of antibiotics, suggesting that monitoring and feedback systems meant to respond to health system demands have yet to fully deliver on their promise. Pinpointing which communities lack access to care or experience heightened risk for pneumonia still relies more on guesswork and word-of-mouth than routine assessments of health care gaps. The investments needed to advance gains against pneumonia are likely to span from specific health programs to improved health data collection and assessment.

To achieve MDG4 – and to ultimately end preventable child deaths – every life counts. Overcoming persistent challenges and stepping up the pace in reducing child pneumonia deaths will help turn this goal into an attainable reality.



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Data on financing for pneumonia were extracted from the development assistance for health (DAH) database overseen by IHME. Results on intervention coverage and health facility capacity for pneumonia treatment originated from the Access, Bottlenecks, Costs, and Equity (ABCE) project and the Malaria Control Policy Assessment (MCPA) project, both coordinated by IHME. Information presented on vaccine introduction and scale-up came from the Gavi Full Country Evaluations (FCE) project. Results from the ABCE, MCPA, and Gavi FCE projects may change following peer review.

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References

- 1** Global Burden of Disease (GBD) Mortality and Causes of Death Collaborators. Global, regional, and national levels of age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. In press.
- 2** United States Census Bureau. *State & County QuickFacts*. <http://quickfacts.census.gov/qfd/states> (accessed October 10, 2014).
- 3** Murray CJL, Ortblad KF, Guinovart C, Lim SS, Wolock TM, Roberts DA, on behalf of the Global Burden Diseases, Injuries, and Risk Factors Study 2013 (GBD 2013). Global, regional, and national incidence and mortality for HIV, tuberculosis, and malaria during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2014; 23. doi: 10.1016/S0140-6736(14)60844-8.
- 4** Dieleman JL, Graves CM, Templin T, Johnson E, Baral R, Leach-Kemon K, et al. Global health development assistance remained steady in 2013 but did not align with recipients' disease burden. *Health Affairs*. 2014. doi: 10.1377/hlthaff.2013.1432.
- 5** Institute for Health Metrics and Evaluation (IHME). Development Assistance for Health Database, 1990–2011. <http://ghdx.healthdata.org/record/development-assistance-health-database-1990-2011> (accessed October 4, 2014).
- 6** Gavi. *Country hub*. <http://www.gavi.org/country> (accessed October 11, 2014).
- 7** Gavi. *Donor profile: the Bill & Melinda Gates Foundation*. <http://www.gavi.org/funding/donor-profiles/bmgf> (accessed October 21, 2014).
- 8** Vandelaer J, Bilous J, Nshimirimana D. Reaching Every District (RED) approach: a way to improve immunization performance. *Bulletin of the World Health Organization*. 2008; 86(3).
- 9** World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). *Ending Preventable Child Deaths from Pneumonia and Diarrhoea by 2025: the Integrated Global Action Plan for Pneumonia and Diarrhoea (GAPPD)*. Geneva, Switzerland: WHO and UNICEF, 2013. http://www.who.int/maternal_child_adolescent/documents/global_action_plan_pneumonia_diarrhoea/en (accessed October 21, 2014).
- 10** Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, on behalf of the Global Burden Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*. 2012; 380: 2224–2260.
- 11** Warren-Gash C, Fragaszy E, Hayward AC. Hand hygiene to reduce community transmission of influenza and acute respiratory tract infection: a systematic review. *Influenza and Other Respiratory Viruses*. 2013; 7(5): 738–749.
- 12** Rabie T, Curtis V. Handwashing and risk of respiratory infections: a quantitative systematic review. *Tropical Medicine & International Health*. 2006; 11(3): 258–267.
- 13** Lee BY, Assi T, Rajgopal J, Norman BA, Chen S, Brown ST, et al. Impact of introducing the pneumococcal and rotavirus vaccines into the routine immunization program in Niger. *American Journal of Public Health*. 2012; 10(2): 269–276.
- 14** Gavi Full Country Evaluation (FCE) team. *Gavi Full Country Evaluation: 2013 Annual Progress Report, January 2014*. Geneva, Switzerland: Gavi, 2014. <http://www.gavi.org/Library/GAVI-documents/Evaluations/GAVI-FCE-Annual-Progress-Report> (accessed October 10, 2014).
- 15** Institute for Health Metrics and Evaluation (IHME). *Health Service Provision in Kenya: Assessing Facility Capacity, Costs of Care, and Patient Perspectives*. Seattle, WA: IHME, 2014.
- 16** World Health Organization (WHO). *Technical updates of the guidelines on the Integrated Management of Childhood Illness (IMCI): evidence and recommendations for further adaptations*. Geneva, Switzerland: WHO, 2005.
- 17** Institute for Health Metrics and Evaluation (IHME). *Health Service Provision in Zambia: Assessing Facility Capacity, Costs of Care, and Patient Perspectives*. Seattle, WA: IHME, 2014.
- 18** Dherani M, Pope D, Mascarenhas M, Smith KR, Weber M, Bruce N. Indoor air pollution from unprocessed solid fuel use and pneumonia risk in children aged under five years: a systematic review and meta-analysis. *Bulletin of the World Health Organization*. 2008; 86(5).
- 19** International Vaccine Access Center (IVAC). *VIMS Report: Global Vaccine Introduction, September 2014*. Baltimore, MD: IVAC, 2014. <http://www.jhsph.edu/research/centers-and-institutes/ivac/vims/IVAC-VIMS-Report-2014Sep.pdf> (accessed October 10, 2014).
- 20** Institute for Health Metrics and Evaluation (IHME). *Assessing Impact, Improving Health: Progress in Child Health Across Regions in Uganda*. Seattle, WA: IHME, 2014.
- 21** Institute for Health Metrics and Evaluation (IHME). *Health Service Provision in Uganda: Assessing Facility Capacity, Costs of Care, and Patient Perspectives*. Seattle, WA: IHME, 2014.

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