

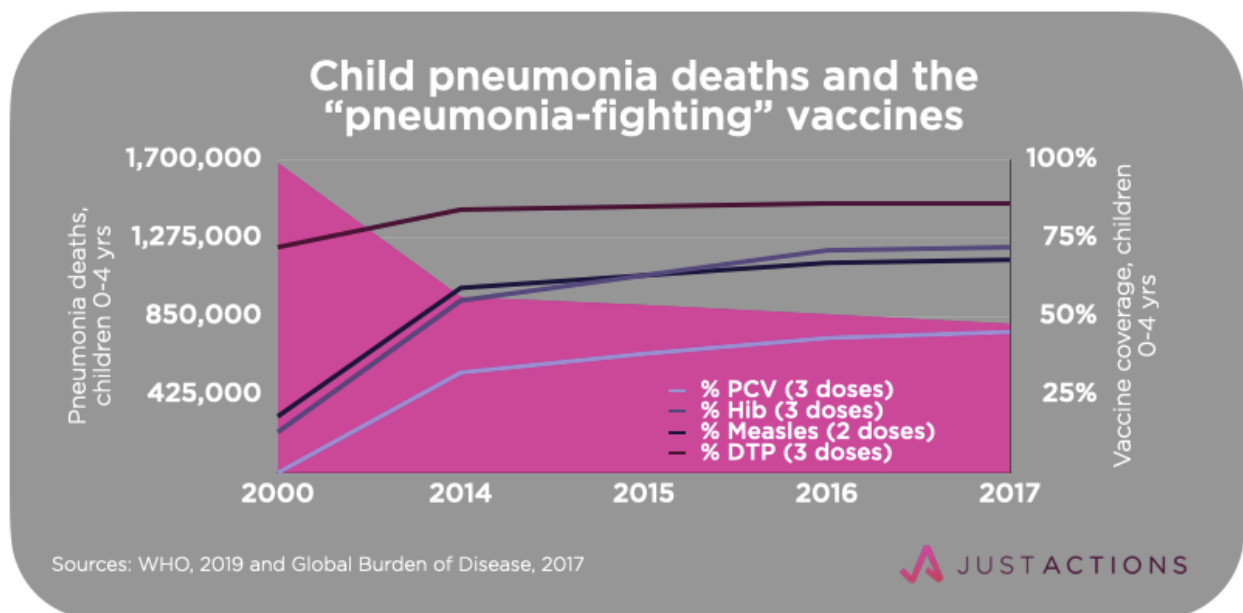
The critical role of pneumonia-fighting vaccines in the context of COVID-19 and the Sustainable Development Goals

June, 2020

1. Why are vaccines that prevent pneumonia so important?

Pneumonia is the leading infectious cause of death in the world and was responsible for an estimated 2.6 million deaths in 2017, according to the **Global Burden of Disease** (GBD).¹ Three-quarters of these deaths are among two vulnerable populations - 800,000 are among children under five years of age and 1.1 million are among adults over 70 years of age. This means that every country is dealing with a pneumonia burden. In high income countries, pneumonia deaths concentrate among the elderly, in low income countries it is children who bear the greatest burden and in many middle income countries there is a “double-burden” of pneumonia among both children and the elderly.²

This burden would be much higher without the vaccines that have been developed to prevent some of the leading causes of pneumonia; principally the pneumococcal conjugate vaccine (PCV) and the haemophilus influenzae type B vaccine (Hib), which target the leading bacterial causes of childhood pneumonia. Vaccines against diphtheria, tetanus and pertussis (DTP) and measles (MCV) are also critical pneumonia-fighting vaccines, as pertussis and measles can also cause pneumonia.



¹ Institute for Health Metrics and Evaluation. [Global Burden of Disease](#), 2017.

² JustActions. [The Missing Piece: Why continued neglect of pneumonia threatens the achievement of health goals](#), 2018.

The expansion of this “basket” of pneumonia-fighting vaccines has contributed to the dramatic fall in childhood pneumonia deaths in recent decades, from an estimated 1.7 million in 2000 to 800,000 in 2017. For example, after Kenya introduced the PCV in 2011, the average annual incidence of severe pneumococcal disease dropped by 92% among children under five years of age,³ and hospital admissions fell sharply.⁴ Studies also suggest that childhood PCV vaccination leads to substantial protection across the whole population within a decade.⁵ Although there are no routine estimates of pneumonia deaths prevented among the elderly with PCV vaccination among children, some countries now recommend routine pneumococcal vaccination for those aged over 65 years.⁶

The pneumonia-fighting vaccines could have an even greater impact if all children received them and if the elderly were protected in every country. This is particularly true for the PCV, which only reaches 47% of children in the world, leaving the majority unprotected. PCV coverage rates vary widely across World Health Organization (WHO) regions,⁷ from 13% and 17% in the Western Pacific and South East Asian regions to 78% and 82% in Europe and the Americas respectively. The Eastern Mediterranean region has a rate of 53% and Africa records an impressive 73%, a testament to the partnership between Gavi, the Vaccine Alliance (Gavi) and African governments and the support of the **Advanced Market Commitment** (AMC), an innovative financing mechanism that has underwritten PCV expansion in most Gavi-eligible countries and prevented an estimated 700,000 deaths.⁸ But major gaps remain, especially in a subset of Gavi-eligible countries and those that are not eligible for Gavi support.⁹

For example there are 54 countries that have not yet introduced the PCV with 146 million children under five living in them. These “zero-dose”¹⁰ PCV countries are in every region of the world.¹¹ The Western Pacific is home to 96 million children under five, followed by the Eastern Mediterranean with 24 million, and Africa with 10 million. Europe is home to seven million, Southeast Asia to six million and the Americas to three million children. All of these children are vulnerable to infection with pneumococcal disease.

³ Laura L, Hammit LL, Etyang AO, Morpeth SC et al. [Effect of ten-valent pneumococcal conjugate vaccine on invasive pneumococcal disease and nasopharyngeal carriage in Kenya: a longitudinal surveillance study](#). The Lancet, May 2019.

⁴ Silaba M, Ooko M, Bottomley C, et al. [Effect of 10-valent pneumococcal conjugate vaccine on the incidence of radiologically-confirmed pneumonia and clinically-defined pneumonia in Kenyan children: an interrupted time-series analysis](#). The Lancet, March 2019.

⁵ Shiri T, Datta S, Madan J, et al. [Indirect effects of childhood pneumococcal conjugate vaccination on invasive pneumococcal disease: a systematic review and meta-analysis](#). The Lancet, January 2017.

⁶ Van Buynder P, Booy R. [Pneumococcal vaccination in older persons: where are we today?](#) Pneumonia, January 2018.

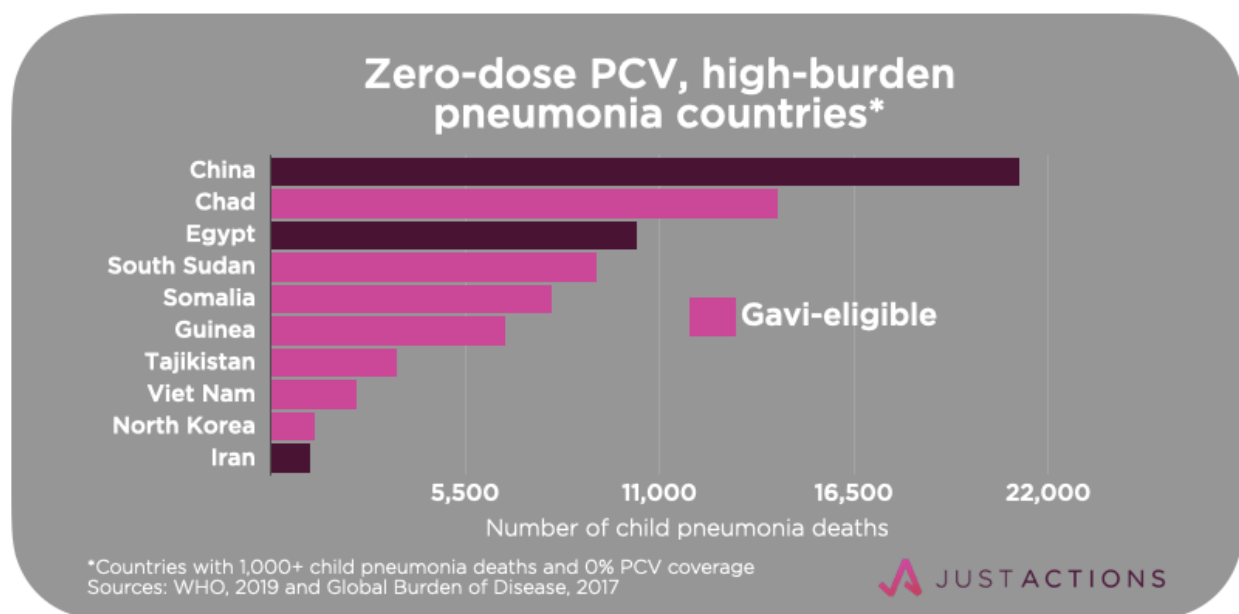
⁷ [WHO regions and WHO Regional Immunisation Summaries, 2019](#).

⁸ AMC Secretariat (Gavi), World Bank and UNICEF, [Pneumococcal AMC Annual Report](#), 2019.

⁹ Gavi-eligible country list (58 countries).

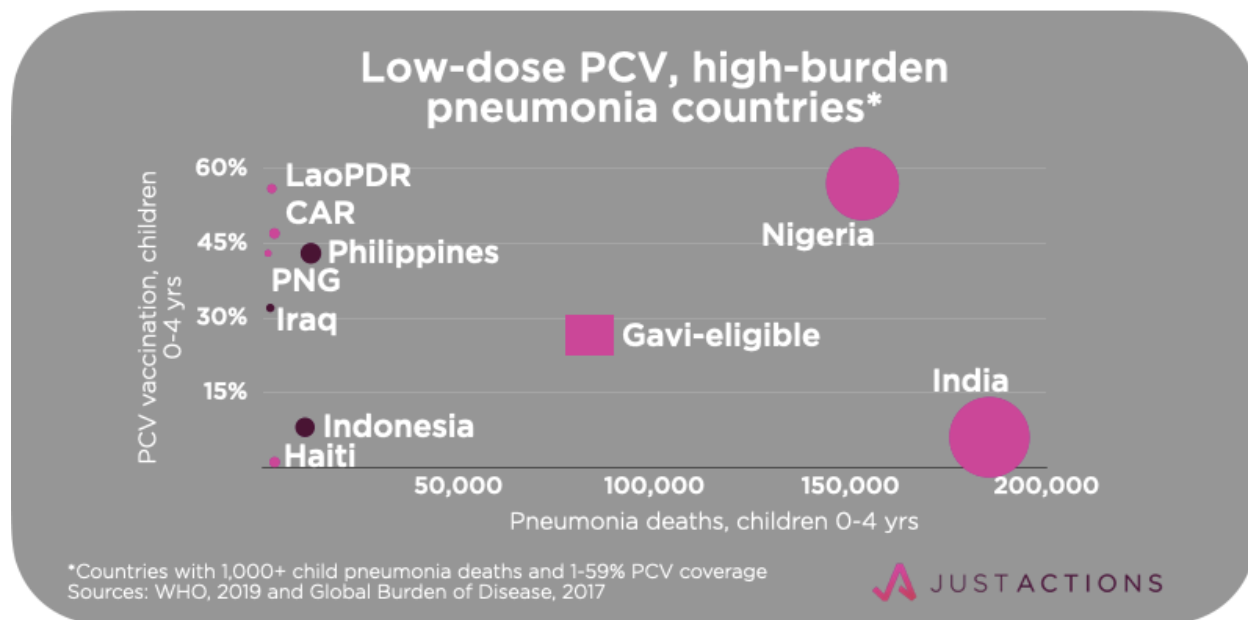
¹⁰ Note Gavi refers to “zero-dose children” as those who do not receive the DTP vaccine. This report refers to “zero-dose PCV children” as those who do not receive the PCV vaccine.

The cost of this exposure is ultimately measured in children's lives lost due to pneumonia - an estimated 83,000 every year in the zero-dose PCV countries - representing 10% of all pneumonia deaths among children under five. The zero-dose PCV countries with the heaviest burdens of child pneumonia deaths include China, Chad, Egypt, South Sudan, Somalia, Guinea, Tajikistan, Viet Nam, North Korea and Iran. Together these ten countries account for more than 90% of the 83,000 child pneumonia deaths occurring in zero-dose PCV countries.



In addition to the zero-dose countries, of great concern are the countries with PCV coverage rates between 1% and 59%. There are even more children living in these low-dose PCV countries - 195 million. They include India with 117 million children under five years of age and 6% PCV coverage, Nigeria with 34 million children and 57% PCV coverage, Indonesia with 24 million children and 8% PCV coverage, the Philippines with 11 million children and 43% PCV coverage, Iraq with 5.4 million children and 32% PCV coverage, Haiti with 1.3 million children and 1% PCV coverage, Papua New Guinea with 1.1 million children and 43% PCV coverage, Lao PDR with 800,000 children and 56% PCV coverage and the Central African Republic with 740,000 children and 47% PCV coverage. Together, these countries account for 374,000 child pneumonia deaths, almost half (49%) of the global total.

Together, zero and low-dose PCV countries are home to 340 million children under five; almost half of all children under five in the world. These children are dangerously exposed to pneumonia, and so are the adults around them. As many of these countries are also experiencing heavy burdens of pneumonia deaths among their elderly populations, and some among working age adults, protecting children with the PCV should also have a significant impact on reducing infections and deaths from pneumonia among the adults.



Although average global vaccine coverage rates are higher for DTP (86%), Hib (72%) and measles (69%) vaccines, they are much lower in many of the high-burden pneumonia countries, including those with zero or low-dose PCV coverage. For example, DTP and Hib coverage are below 60% in Nigeria (57%), Chad (41%), South Sudan (49%), Somalia (42%), Guinea (45%) and the Central African Republic (47%).

In addition, very few high-burden pneumonia countries have achieved high coverage of two doses of the measles vaccine. Among the countries with more than 1,000 child pneumonia deaths, only 19 have measles vaccine coverage above 80%.¹² This underscores the urgency of increasing and sustaining high coverage of the measles vaccine. The decline of measles deaths is one of the greatest public health achievements. Between 1990 and 2017, measles deaths among children fell from an estimated 700,000 to 95,000, according to the GBD, largely as a result of high and sustained measles vaccine coverage. Recent outbreaks of measles, due to falls in coverage in some countries, reveal how critical it is to maintain universal coverage of the measles vaccine.

¹² India, China, Bangladesh, Tanzania, Egypt, Myanmar, Uzbekistan, Ghana, Tajikistan, Mexico, Rwanda, Viet Nam, Iraq, Azerbaijan, Eritrea, North Korea, Colombia, Iran and Russia.

To summarize, one out of every two children under five in the world is not fully protected with the pneumonia-fighting vaccines. These children are dangerously exposed to pneumonia and at risk of infecting others. Of greatest concern are the high-burden pneumonia countries with zero or low doses of the PCV, less than 60% coverage of three doses of the DTP and Hib vaccines and two doses of the measles vaccine. All of these countries are Gavi-eligible and include Nigeria, Chad, Somalia, South Sudan, Guinea and the Central African Republic. Also of concern are a second cluster of six countries with very low coverage of all four vaccines. Four of these countries are Gavi-eligible - Afghanistan, Haiti, Lao PDR and Papua New Guinea - while two are not - Angola and the Philippines.

What must be done?

- 1. National governments must commit to fully protecting all children under five years of age with the WHO-recommended pneumonia-fighting vaccines by 2030, including with three doses of the pneumococcal conjugate vaccine (PCV), the haemophilus influenzae type B vaccine (Hib) and the diphtheria, tetanus and pertussis vaccine (DTP), and two doses of the measles vaccine (MCV).**
- 2. International donors must fully replenish Gavi, the Vaccine Alliance (Gavi) in 2020, so that Gavi-eligible countries have the support they need to fully protect all children under five years of age with the existing pneumonia-fighting vaccines.**
- 3. International donors and global health agencies should continue to support existing and new vaccine manufacturers to ensure the continued supply of affordable, quality pneumonia-fighting vaccines, especially PCV, for both Gavi-eligible and non-eligible countries, so that all children and other vulnerable populations can be protected.**

2. Why are new pneumonia-fighting vaccines so urgently needed?

As powerful as the existing pneumonia-fighting vaccines are, they do not target all of the causes of pneumonia and especially the leading viral causes, such as respiratory syncytial virus (RSV), influenza and of course SARS-CoV-2. Prior to the pandemic, studies revealed that viruses now dominate as leading causes of severe pneumonia in children in low and middle-income countries. The seven-country **Pneumonia Etiology Research for Child Health (PERCH)** study revealed that 61% of severe pneumonia cases in children are caused by viruses, especially RSV (31%), influenza (9.4%), rhinovirus (7.5%) and hMPV - human metapneumovirus (7.5%).¹³

It is extremely promising then, that an RSV vaccine and more effective influenza vaccines have been in development for some time and are expected to become available in the next decade. All national governments should support the development of these vaccines and prepare for their introduction, as they will have a significant impact not just on child survival but on population health broadly, as both RSV and influenza also cause large burdens of sickness and death among adults.¹⁴

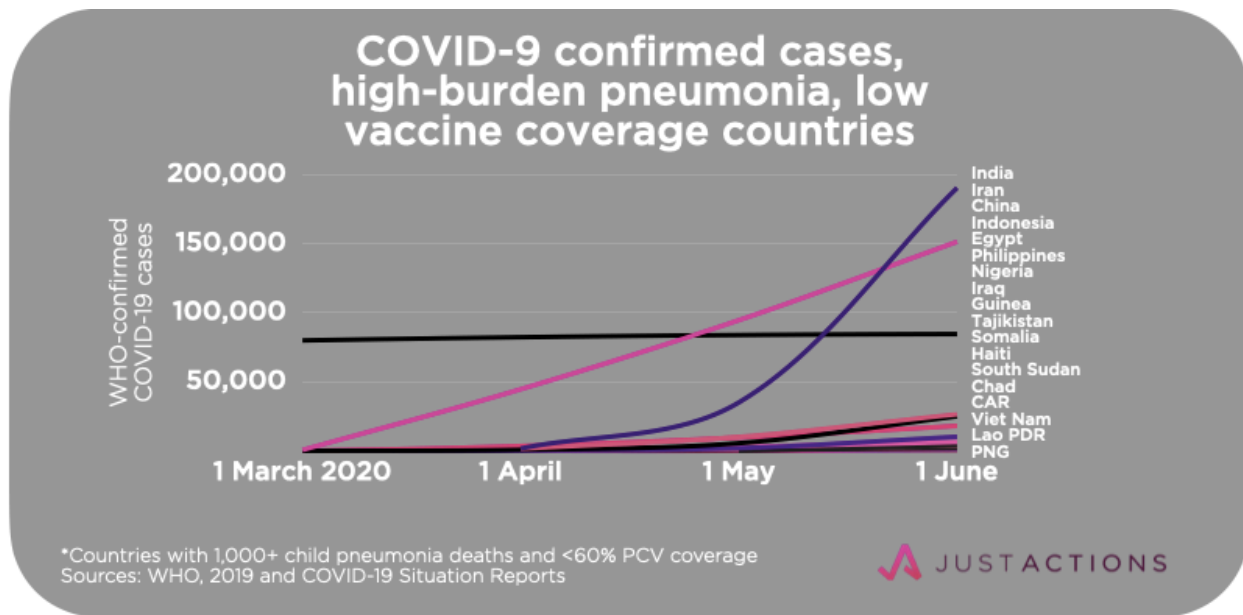
Of course, the emergence of COVID-19 and its aggressive spread throughout the world underscores the urgent need for a vaccine to prevent SARS-CoV-2. The virus has so far infected more than six million people and caused more than 370,000 deaths, according to WHO.¹⁵ As pneumonia is a major cause of death from SARS-CoV-2, a successful vaccine will substantially strengthen the basket of “pneumonia-fighting” vaccines and make a major contribution to reducing pneumonia deaths. The new vaccine must be universally available and affordable to people in every country, with the most vulnerable a priority for early protection, including healthcare workers. Many government leaders from low and middle income countries have called for a “global guarantee” which ensures that a safe and effective vaccine is produced rapidly at scale and made available for all people, in all countries, free of charge.¹⁶

¹³ PERCH Study Group. [Causes of severe pneumonia requiring hospital admission in children without HIV infection from Africa and Asia: the PERCH multi-country case-control study](#). The Lancet, August, 2019.

¹⁴ Tin Tin Htar M, Yeramalla MS, Moisi JC et al. [The burden of respiratory syncytial virus in adults: a systematic review and meta-analysis](#). Epidemiology and Infection, February, 2020 and GBD 2017 Influenza Collaborators. [Mortality, morbidity, and hospitalisations due to influenza lower respiratory tract infections, 2017: an analysis for the Global Burden of Disease Study 2017](#). Lancet Respiratory Medicine, January 2019.

¹⁵ WHO, [COVID-19 Daily Situation Report](#), 1 June, 2020.

¹⁶ Open Letter from government leaders, [“Uniting Behind A People’s Vaccine Against COVID-19”](#), May, 2020.



Universal access to a COVID-19 vaccine will be especially critical in the countries already struggling with heavy burdens of pneumonia deaths from other causes. All of the countries losing more than 1,000 children to pneumonia each year except North Korea have reported COVID-19 cases. While deaths from COVID-19 have disproportionately affected adults in middle and high income countries, it is not yet clear if that will be true in low resource settings. Pneumonia experts have recently warned that children in these settings may be more vulnerable to COVID-19 due to a confluence of risk factors including malnutrition, air pollution, low vaccination rates, HIV-exposure and poor access to healthcare.¹⁷

Of particular concern are the high and rising numbers of confirmed COVID-19 cases in the zero and low dose PCV countries, especially India, Iran, China, Indonesia, Egypt and the Philippines.¹⁸ These countries are now dealing with “double-burdens” of pneumonia from SARS-CoV-2 and other causes, most of which are vaccine-preventable.

The importance of the pneumonia-fighting vaccines goes well beyond the current pandemic. Respiratory infections are such a major cause of sickness and death in every country that vaccines to prevent them are essential tools to improve population health and reduce mortality in the context of achieving the **Sustainable Development Goals** (SDGs). The United Nations (UN) Secretary-General recently expressed concern at the low levels of PCV coverage in the 2020 **SDG Progress Report** underscoring how important wide coverage of this vaccine is to national achievement of the child survival goal.¹⁹ All countries have committed to reducing child deaths to at least 25 per 1,000 births by

¹⁷ Ahmed S, Mvalo T, Akech S et al. Protecting children in low-income and middle-income countries from COVID-19. *BMJ Global Health*, May 2020.

¹⁸ COVID-19 Daily Situation Reports, World Health Organization (WHO).

¹⁹ United Nations. Sustainable Development Goal Progress Report, May, 2020.

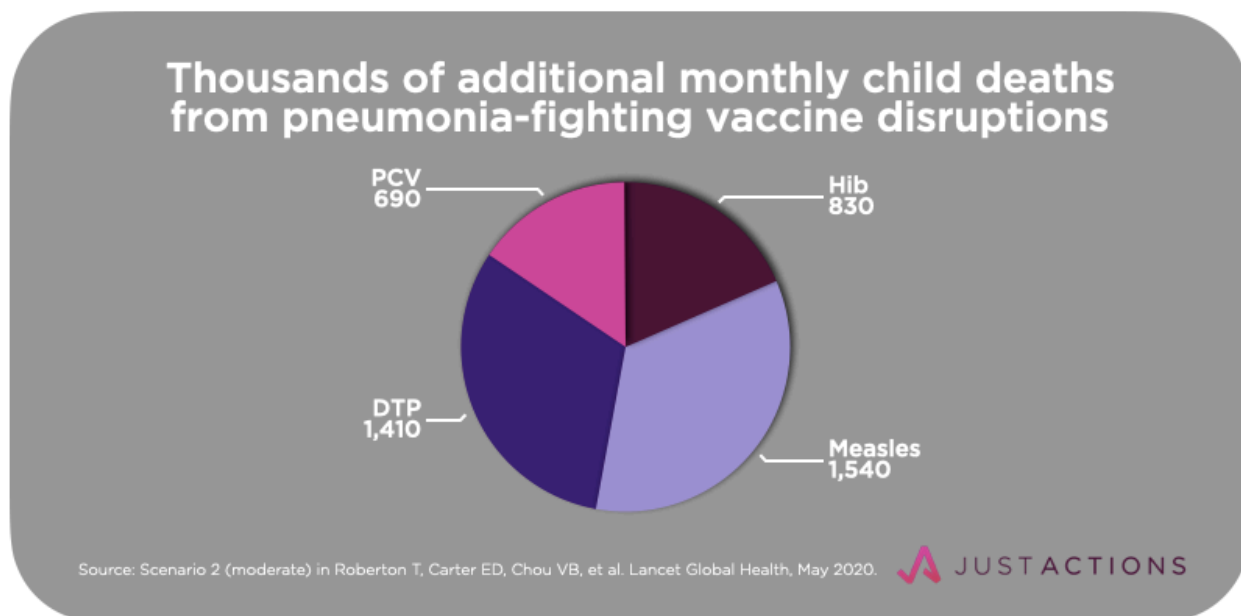
2030 and high coverage of the pneumonia-fighting vaccines is an essential SDG-achievement tool for most countries.

What must be done?

- 4. National governments should make plans to introduce emerging pneumonia-fighting vaccines as they become available, including a vaccine for SARS-CoV-2, the virus that causes COVID-19, respiratory syncytial virus (RSV) and improved influenza vaccines, prioritizing access to the most vulnerable populations (e.g., children, the elderly, healthcare workers etc), as appropriate for each vaccine and in each country setting.**

3. Why routine vaccination with the pneumonia-fighting vaccines must continue in the context of COVID-19

Early estimates of the indirect effects of COVID-19 on child mortality in low and middle-income countries underscore the importance of maintaining routine vaccination with the existing pneumonia-fighting vaccines.²⁰ These estimates suggest that thousands of children's lives are at risk every month from disruptions to routine vaccination, especially with the DTP, Hib, PCV and measles vaccines. For example, if vaccination with these four vaccines was reduced by 27% (scenario 2), the study estimated that 4,470 additional child deaths would occur each month - 1,540 from measles, 1,410 from DTP,²¹ 830 from Hib and 690 from PCV vaccine reductions.



There is evidence that vaccine services are already being disrupted. **UNICEF, Gavi and the Sabin Vaccine Institute** recently announced substantial disruptions and suspension in at least 68 countries affecting approximately 80 million children.²² In response, WHO has advised countries to maintain essential services during the pandemic,²³ and provided guidance on when and how to resume mass vaccination campaigns, noting that countries will need to make specific risk assessments based on local SARS-CoV-2 transmission, health system capacity, and public health benefit.²⁴

²⁰ Robertson T, Carter ED, Chou VB, et al. [Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study](#). Lancet Global Health, May 2020.

²¹ Most of these deaths are from pertussis, which killed an estimated 86,090 children under five in 2017. In contrast tetanus killed an estimated 18,624 children under five and child deaths from diphtheria are too small to report in the Global Burden of Disease.

²² WHO, UNICEF, Sabin Vaccine Institute. [Statement on routine child vaccination disruptions](#), May 2020.

²³ WHO. [Operational guidance for maintaining essential health services during an outbreak](#), March 2020.

²⁴ WHO. [Framework for decision-making: implementation of mass vaccination campaigns in the context of COVID-19](#), May 2020.

Protecting children with the pneumonia-fighting vaccines during the pandemic and beyond will not only reduce the risk of increases in child pneumonia deaths from non-SARS-CoV-2 causes, but it will also reduce the risk of adult co-infection with bacterial pneumonia and SARS-CoV-2, keeping the pressure off health systems that will be stretched to capacity providing diagnosis and respiratory therapies to patients with COVID-19. There is evidence that the heavy death toll from the 1918 influenza outbreak was due to subsequent bacterial infection, particularly with streptococcus pneumoniae, and that poor outcomes in the 2009 H1N1 influenza pandemic were also associated with bacterial co-infections.²⁵ Although there is no evidence yet that bacterial co-infection is contributing to SARS-CoV-2 deaths, ensuring that all children are protected with the pneumonia-fighting vaccines will reduce the risk of bacterial co-infection among COVID-19 patients and the healthcare workers who care for them.

To protect vulnerable populations from pneumonia beyond the pandemic, national governments and global health agencies should adopt a “life-cycle” approach to pneumonia vaccination, and develop policies and programs that target the pneumonia-fighting vaccines - existing and emerging - to children and the elderly, and to other vulnerable populations. This will be a highly effective public health strategy in all countries, but especially those struggling with double-burdens of pneumonia - high numbers of child and elderly pneumonia deaths and COVID-19 has placed many more countries in this situation.

Ultimately, the provision of a stronger basket of pneumonia-fighting vaccines should be part of national Pneumonia Control Strategies that every country adopts to deliver universal access to pneumonia prevention (e.g., vaccines, child nutrition, air pollution, WASH etc), diagnosis (e.g., pulse oximetry) and treatment services (e.g., oxygen therapies and recommended child-friendly antibiotics where appropriate). This is what will enable achievement of the Sustainable Development Goals (SDGs) and what is recommended in the Declaration signed by many governments and global health agencies at the inaugural **Global Forum on Childhood Pneumonia**, in January 2020.²⁶

What must be done?

- 5. During the COVID-19 pandemic, national governments must make every effort, with support from global health agencies where necessary, to continue to vaccinate children with the pneumonia-fighting vaccines, reducing the risks of increases in child deaths from all-cause pneumonia and increases in adult and child deaths from COVID-19 due to co-infection.**

²⁵ Cox MJ, Loman N, Bogaert D et al. Co-infections: potentially lethal and unexplored in COVID-19. The Lancet Microbe, May 2020.

²⁶ Bassatt Q, Watkins K, Peterson S et al. The first Global Pneumonia Forum: recommendations in the time of coronavirus. Lancet Global Health, June 2020.

6. **National governments and global health agencies should adopt a “life-cycle” approach to protection with the pneumonia-fighting vaccines, by ensuring that both children and the elderly are protected, especially in those countries experiencing a “double-burden” of pneumonia deaths among both populations.**
7. **Delivery of the pneumonia-fighting vaccines should form part of national Pneumonia Control Strategies that ensure access to the range of preventive (e.g., vaccines, child nutrition, air pollution, WASH etc), diagnostic (e.g., pulse oximetry) and treatment (e.g., oxygen therapies and recommended child-friendly antibiotics where appropriate) services that are required to achieve universal health coverage and the Sustainable Development Goals (SDGs).**

A final note

The potential for vaccination to significantly reduce the massive burden of sickness and death caused by pneumonia-causing pathogens is far from exhausted and increasingly necessary in the context of demographic shifts, urbanization, air pollution, and the likelihood that other novel respiratory pathogens will emerge. COVID-19 has demonstrated how vulnerable every nation is to a pandemic of respiratory infection and underscored the absolutely critical role of vaccination in ending the outbreak. Full coverage of the pneumonia-fighting vaccines - including a vaccine for COVID-19 - builds a strong foundation for all nations to deliver on the grand promise of the SDGs, to “ensure healthy lives and promote well-being for all at all ages.”

This report was written by Leith Greenslade, CEO of **JustActions** and Coordinator of the **Every Breath Counts Coalition**. It relies on the latest World Health Organization (WHO) and UNICEF **immunization statistics** (2018) for vaccine coverage data, on the **Global Burden of Disease** (2017) for mortality data and on **UN World Population Prospects** (2019) for demographic data.

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