

PCV vaccines indicator

Burden & epidemiology

Number of new cases per year (last 3-5 years)

Disease (incidence) rates are higher in Africa than in Europe or North America, incidence rates in Asia and Latin America range in between. Before widespread PCV introduction in 2006, mean annual incidence of invasive pneumococcal disease in children <2 years was 44/100,000 in Europe, 167/100,000 in the USA, 60 - 797/100,000 in Africa (SA and Mozambique). The reported incidence in countries in Asia and Latin America falls between these extremes. Some of the differences in disease incidence could be due to differences in surveillance methods. [1](#), [2](#), [3](#), [4](#), [5](#)

The introduction of the pneumococcal conjugate vaccine into childhood immunization programmes starting in 2000 led to substantial reductions in the overall IPD incidence in many countries due to reductions in the incidence of vaccine serotype (vaccine-type(s), VT) disease. IPD reductions were also observed in unvaccinated children and adults through herd protection in some countries. Declines in the incidence of VT disease were accompanied by increases in IPD caused by non-vaccine serotypes (NVTs), known as serotype replacement; however, among children, the increase in incidence of IPD due to NVTs was smaller than the decline in VT IPD, resulting in a decline in the overall incidence of IPD. [6](#)

To note is that the incidence estimates are driven by clinical practices in the country and

whether rates are limited to inpatients or also include outpatients. For example, in the US there is a lower threshold than in Europe to do blood cultures, and this impacts incidence rates. Most cases in the US are outpatients with febrile bacteraemia, which can be self-limiting. On the other hand, the cases in Africa may mainly be from inpatients with sepsis or bacteremic pneumonia.

Proportion of the population affected by the disease or infected with the antigen

About 75% of cases of invasive pneumococcal disease and 83% of cases of pneumococcal meningitis occur in children < 2 years of age. It is difficult to determine the proportion of pneumonia due to *S. pneumoniae*. Cross-sectional point prevalence of nasopharyngeal carriage ranges from 27% to 85%, with higher carriage rates in LMICs and in some indigenous populations in HICs. At least 34% of radiologically confirmed pneumonia could be caused by *S. pneumoniae* in children < 5 years of age.

Available microbiological, epidemiological and modelled data indicate that there is also a substantial burden of disease attributable to *S. pneumoniae* in adults ≥ 50 years of age. [7](#) [8](#), [9](#)

The risk of sequelae is 3 times higher in Africa and Asia than in Europe. [10](#)

Serogroup or serotype distribution (for serogroup- or serotype-specific vaccines)

There are >100 known serotypes of *S. pneumoniae*, with some serotypes grouped into serogroups based on similarities in the polysaccharide capsule. Of the numerous pneumococcal serotypes, only a subset is responsible for the majority of cases of invasive pneumococcal disease (IPD). The distribution of serotypes that cause disease varies over time and by age, disease syndrome, disease severity, geographical region and presence of AMR genes.

A 2010 systematic review found that before the introduction of PCV7, 6 to 11 serotypes accounted for $\geq 70\%$ of global and regional IPD cases, with 7 serotypes (1, 5, 6A, 6B, 14, 19F, 23F) being the most prevalent globally [11](#). More recently, the Pneumococcal Serotype Replacement and Distribution Estimation (PSERENADE) project, which compiled data from 45 countries with stable surveillance systems, found that following sustained, high coverage with PCV13 or PCV10, 10 vaccine serotypes (1, 3, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F in all age groups, and serotype 4 in adults) remain among the top 30 serotypes causing IPD. Serotype replacement with other non-vaccine serotypes was also common. [12](#), [13](#)

To note that with the introduction of PCV, the more recent availability of new formulations and WHO issuing recommendations about the higher valency vaccines, there is an impact on the circulating serotypes and it is no longer possible to determine the pre-vaccination serotype prevalence.

Number of deaths from the disease per year

In 2015 294,000 deaths of among children < 5 years of age (uncertainty range 192,000–366,000) were estimated to be caused by pneumococcal infections. An additional 23,300 deaths (UR 15,300–40,700) were estimated in children of the same age group co-infected with HIV. Most deaths occur in countries in Africa and Asia. ⁸ Global estimates of mortality burden are currently being updated using more recent data.

Case Fatality ratio (number of deaths / number of new cases, in %)

CFR of invasive pneumococcal disease in children in LMICs range from 20% for septicaemia to 50% for meningitis. There are up to 25% long-term neurological sequelae (hearing loss, mental retardation, motor abnormalities) in survivors of childhood pneumococcal meningitis. ¹⁴ The CFR for bacteremic pneumococcal pneumonia is 5-7% in areas with good access to medical treatment, but can be higher in areas in which access to care and treatment is more limited. ¹⁵

Outbreak, epidemic or pandemic risk

While pneumococcal disease is typically endemic, outbreaks have been reported in high-risk settings, including daycare centres, shipyards, prisons, homeless shelters and hospitals. ⁶ Large serotype 1 outbreaks have occurred in the African Meningitis belt. ¹⁶ There is limited evidence on the effectiveness of PCV in response to pneumococcal disease outbreaks. Considerations are given to multi-age cohort campaigns and relevant research is ongoing. ⁶

Contribution of the vaccine to achievement of the national, regional or global disease goals

WHO recommends the inclusion of PCVs in childhood immunization programmes worldwide. In many countries, the routine use of PCVs has dramatically reduced the incidence of invasive

pneumococcal disease with virtual disappearance of disease due to serotypes in the vaccines used. 17

Between 2000 and 2015, pneumococcal deaths in children aged <5 years declined by an estimated 51%, largely due to the widespread introduction of PCVs. With continued efforts, PCVs are projected to avert approximately 2 million deaths in children aged < 5 years from 2021 through 2030. 18

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