



### 1,000 Pneumonia PPT= 207 DALYs averted in children under 5 in Mali

The sale of 1,000 pre-packed treatment (PPT) for pneumonia in Mali averts 207 Disability Adjusted Life Years, or 207 years of healthy life that would have been lost without PSI's intervention.

PSI's pneumonia treatment intervention includes a pre-packaged kit of oral antibiotic therapy. The product is used to treat children under five years old who have symptoms of pneumonia.

One DALY (Disability Adjusted Life Year) represents one year of life lost to illness or death. The PSI DALY Translation Model estimates how many DALYs are averted due to PSI interventions, by using burden estimates and epidemiological probability models.

The calculation of DALYs averted from the sale of PPT is based on the following factors:

- ⚡ **Targeting** – who is being treated
- ⚡ **Diagnostic specificity** – the likelihood the episode is due to pneumonia
- ⚡ **Protective Benefit**
  - **Number of units** of the product that are required for treatment of one episode
  - **Adherence** rate to regimen
  - **Efficacy** of the product in terms of treating disease
  - **Burden of the disease** prevented specific to the target group and country in terms of **Years of Life Lost (YLL)** due to premature death, based on mortality rates and **Years Lost to Disability (YLD)** due to illness, based on morbidity of pneumonia.
  - **Wastage** of product lost in supply chain due to expiration, loss, etc.

One thousand PPT will result in, on average, the effective treatment of 407 pneumonia cases.

The PPT is estimated to have 79% efficacy in successfully treating pneumonia if compliance with the drug regimen is complete<sup>1</sup>. It is also estimated that about 81% of those who receive the PPT will properly adhere<sup>1</sup>. It is expected that 5% of all PPT sold will be lost to wastage. Finally most cases of pneumonia in Africa will be treated symptomatically – that is the decision to treat is based on the appearance of symptoms of pneumonia, in this case cough or difficulty breathing, and fast breathing – it is estimated that the proportion of those who are treated who do in fact have pneumonia is about 67%, and of those children under 5 who have pneumonia, 8.2% have severe pneumonia. As a result of 1,000 PPT, 33 cases of severe pneumonia are effectively treated.

Pneumonia is common in Mali, where children under 5 have an average of 0.42 episodes per year. Yet, only a small proportion of such episodes lead to death with a case fatality rate (CFR) of 0.0165<sup>2</sup>. This means that in successfully treating 407 pneumonia cases we have prevented 6.72 deaths (407 \* 0.0165). Each death that has been averted from successful treatment of pneumonia is equivalent to averting 30.7 YLL (years of lost life to death).<sup>2</sup> Thus, in our example a total of **206 YLL** is averted.

In addition to averting YLL, pneumonia treatment shortens the period of illness from severe pneumonia, thereby averting years of life lost to disability (YLD). 1,000 PPT sold averts **1 YLD**. (See below for calculation details.)

<sup>1</sup> [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(02\)09994-4/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(02)09994-4/abstract)

<sup>2</sup> Please see page 2 for details of this calculation.

## Details for Number Crunchers

### :: Targeting

Children under 5 years in Mali with symptoms of pneumonia.

### :: Estimating Impact

*Number of units needed for treatment \* (1 – wastage) \* adherence rate \* clinical efficacy of product \* diagnostic specificity*

- :: Number of suspected pneumonia episodes treated: 1,000 PPT / One PPT needed to treat one case of suspected pneumonia
- :: Wastage: 5%.
- :: Adherence rate: 81%
- :: Clinical Efficacy of product: 79%

*Number of suspected pneumonia episodes treated: (1,000) \* (1 – 0.05) \* 0.81 \* 0.79 = 607*

### :: Diagnostic Specificity<sup>3</sup>:

Proportion of suspected pneumonia cases that are pneumonia: 67%

Proportion of pneumonia that are classified as severe pneumonia: 8.2%

*Confirmed pneumonia episodes treated: 607 suspected episodes treated \* 67% confirmed as pneumonia = 407*

*Severe pneumonia episodes treated: 407 confirmed pneumonia cases \* 8.2% classified as severe pneumonia = 33*

### :: Years of Life Lost due to premature death (YLL)

*Deaths averted \* discounted value of life years lost to death from pneumonia*

- :: CFR: Imputed from number of deaths per year divided by number of cases per year. Mortality rate of pneumonia is 6.95 per 1,000 children under 5 in Mali, or 0.00695.<sup>4</sup> The average number of episodes per child per year is 0.42. The CFR is therefore 0.00695/0.42 = 0.0165, or 1.65%.

- :: Discounted value of life years lost: 1.8 is used as the mean age of death for children under 5 years<sup>5</sup>, and this is then subtracted from the constant optimal life expectancy of 81.25 years. Those years lost are then discounted by 3% to estimate their value in the current year. This yields 30.7 YLL per child death.

*407 pneumonia episodes effectively treated \* CFR of 1.65% \* 30.7 YLL per child death = 206.2 YLL averted.*

### :: Years Lost to Disability or illness (YLD)

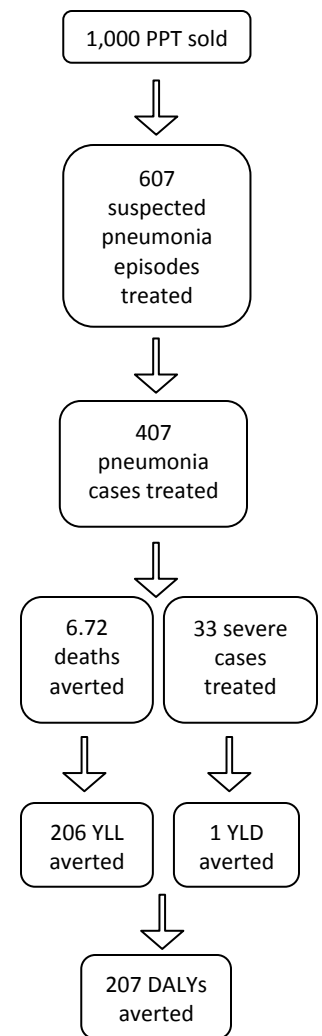
*Severe pneumonia episodes averted \* YLD weight for severe pneumonia \* duration in years of severe pneumonia*

WHO YLD weight for severe pneumonia = 0.279,

Duration in years of severe pneumonia = 0.08 years

*33 severe pneumonia cases averted \* 0.279 \* 0.08 = 0.7 YLD averted*

**Total DALYs averted = YLL averted + YLD averted = 206 + 1 = 207 DALYs averted**



<sup>3</sup> Adherence, efficacy and estimate of diagnostic specificity taken from literature review.

<sup>4</sup> DCP2, Table 3B.7: Deaths by Cause, Sex and Age in the Sub Sahara Africa Region, 2001.

<sup>5</sup> 1.8 years is mean age of death, which was derived from a model using multiple DHS datasets (www.measureDHS.org).