# NTD CALCULATION

Spreadsheet Documentation

# Definitions

- WHO region: designated regions provided by the World Health Organization[1]
- DALY: Disability-Adjusted Life Years (D)
  - Years of life taken by disease from population if it was in a healthy state free from disease
- Treatment Coverage (θ):
  - Ratio between number of people receiving treatment to the estimated number of people needing treatment
- Efficacy (e):
  - Percentage of population receiving treatment that were actually cured
- Data generated from WHO, UNAID database

[1] *http://www.who.int/neglected_diseases/preventive_chemotherapy/sch/en/*

# Impact Formula

$$I = \frac{D * e * \Theta}{1 - e * \Theta} * p$$

- Where:
  - $D$ = DALYs
  - $e$ = Efficacy
  - $\Theta$ = Treatment Coverage
  - $p$ = Prevalence

# Country Data

- **Column A:** Country
- **Column B:** Countries sorted by WHO Region
- **Column C:** Population

| A | B | C |
|---|---|---|
| **Country** | **WHO Region** | **Population** |
| **Afghanistan** | EMR | 28,803,167 |
| **Albania** | EUR | 2,913,021 |
| **Algeria** | AFR | 36,117,637 |
| **American Samoa** | WPR | 55,637 |
| **Andorra** | EUR | 84,449 |
| **Angola** | AFR | 23,369,131 |
| **Anguilla** | AMR | 16,373 |

# DALY Data

- **Range D:N:** All DALY data sourced from the IHME

| D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|
| **LF DALYs** | **Schist DALYs** | **Whipworm DALYs** | | | **Hookworm DALYs** | | | **Roundworm DALYs** | | |
| *Total* | *Total DALYs* | *Under 5 Years* | *5-14 Years* | *Total* | *Under 5 Years* | *5-14 Years* | *Total* | *Under 5 Years* | *5-14 Years* | *Total* |
| 0.00 | 0.00 | 36.38356181 | 177.1500265 | 213.5335883 | 89.4232686 | 137.805145 | 227.23 | 3,861.20 | 9,079.47 | 12940.66993 |
| 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.844935789 | 0.713633379 | 1.558569169 |
| 0.00 | 5,615.93 | 0.352621086 | 1.222264912 | 1.574885998 | 0.21504442 | 0.16197697 | 0.38 | 89.98 | 67.13191658 | 157.1119406 |
| 121.68 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21,679.42 | 28,347.68 | 146.5138063 | 525.6568869 | 672.17 | 1,558.51 | 3,829.15 | 5,387.66 | 11,871.54 | 2,009.57 | 13,881 |
| 0.00 | 0.00 | | | 0 | 0 | 0 | 0 | | | 0 |

# Treatment Coverage

- Original data points (Cols P, Q, T, V, and X) are sourced from the WHO's PCT databank
- Regional and global averages are then applied (Cols S, U, W, and Y)

| P | Q | R | S | T | U | V | W | X | Y |
|---|---|---|---|---|---|---|---|---|---|
| **LF Treatment Coverage** | | | | **SCHIST Treatment Coverage** | | **STH** | | | |
| *Prevalence* | *Number Treated* | *LF Treatment Coverage* | *Estimated LF Treatment Coverage* | *SCHIST Treatment Coverage* | *Estimated Schist Treatment Coverage* | *STH Pre-SAC Treatment Coverage* | *14842.84%* | *STH SAC Treatment Coverage* | *10631.67%* |
| | | *Global Average* | *40.13%* | *Global Average* | *42.35%* | *Global Average* | *61.26%* | *Global Average* | *43.00%* |
| | | | 32.11% | | 59.49% | 100.00% | 100.00% | 30.63% | 30.63% |
| | | | 40.13% | | 34.68% | | 100.00% | | 71.74% |
| | | | 17.16% | | 25.20% | | 72.67% | | 43.42% |
| | | | 19.55% | | 62.60% | | 55.18% | | 48.26% |
| | | | 40.13% | | 34.68% | | 100.00% | | 71.74% |
| 12,090,000 | | 0.00% | 17.16% | | 25.20% | | 72.67% | | 43.42% |
| | | | 14.55% | | 39.44% | | 36.16% | | 50.16% |

# Prevalence

- All prevalence data sourced from the GBD Results Tool

| AD | AE | AF | AG | AH | AI | AJ | AK | AL |
|---|---|---|---|---|---|---|---|---|
| | | | | Prevalence (%) | | | | |
| *LF* | *SCHIST All Ages* | *SCHIST SAC* | *Whipworm* | *Whipworm* | *Hookworm* | *Hookworm* | *Roundworm* | *Roundworm* |
| | | *5-14 years* | *1-4 years* | *5-14 years* | *1-4 years* | *5-14 years* | *1-4 years* | *5-14 years* |
| 0.00% | 0.00% | 0.00% | 7.25% | 11.35% | 0.43% | 0.70% | 0.00% | 43.80% |
| 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 0.00% | 1.00% | 0.18% | 1.44% | 2.22% | 0.00% | 0.00% | 3.00% | 5.08% |
| 4.29% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 0.00% | 11.00% | 3.56% | 11.15% | 17.32% | 10.20% | 16.17% | 12.00% | 19.04% |
| 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

# LF and SCHIST Efficacy

- Efficacy data is sourced from numerous studies found by the systematic review team
- If no country-level efficacy data exists we apply regional or global averages

| AN | AO | AP | AQ | AR | AS | AT | AU | AV | AW | AX | AY | AZ | BA | BB | BC | BD | BE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LF Efficacy | | | | | SCHIST Efficacy | | Whipworm Efficacy | | | | | | Hookworm Efficacy | | | |
| *Single Dose of DEC (6mg/kg)* | *Estimated Efficacy* | *Single dose of DEC (6mg/kg) + ALB(400mg)* | *Estimated Efficacy* | *Combination of ALB (400mg) +IVM (400ug/kg)* | *Estimated Efficacy* | *PZQ* | | *Alb* | | *Mbd* | | *Ivm+Alb* | | *Alb* | | *Mbd* | |
| | | | | | | | *Estimated* | *Original* | *Estimated* | *Original* | *Estimated* | *Original* | *Estimated* | *Original* | *79.24%* | *Original* | *Estimated* |
| | 35.74% | | 79.35% | | 37.15% | | 77.63% | | 38.01% | | 51.05% | | 71.77% | | 93.08% | | 51.15% |
| | 35.74% | | 51.37% | | 37.15% | | 65.50% | | 38.01% | | 51.05% | | 71.77% | | 79.24% | | 51.15% |
| | 31.23% | | 40.00% | | 29.43% | | 64.44% | | 32.98% | | 58.80% | | 70.60% | | 81.32% | | 70.92% |
| | 38.00% | | 65.70% | | 37.15% | | 95.00% | | 35.72% | | 41.55% | | 65.10% | | 68.82% | | 46.05% |
| | 35.74% | | 51.37% | | 37.15% | | 65.50% | | 38.01% | | 51.05% | | 71.77% | | 79.24% | | 51.15% |
| | 31.23% | | 40.00% | | 29.43% | | 64.44% | | 32.98% | | 58.80% | | 70.60% | | 81.32% | | 70.92% |
| | 25.90% | | 34.65% | | 75.75% | | 77.33% | | | | | | | | | | |

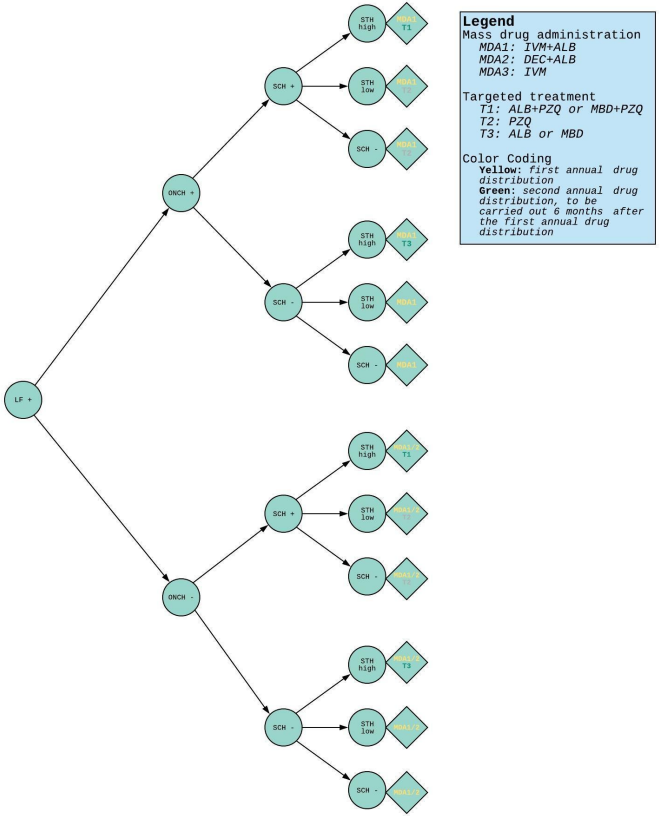
# Treatment Guidelines

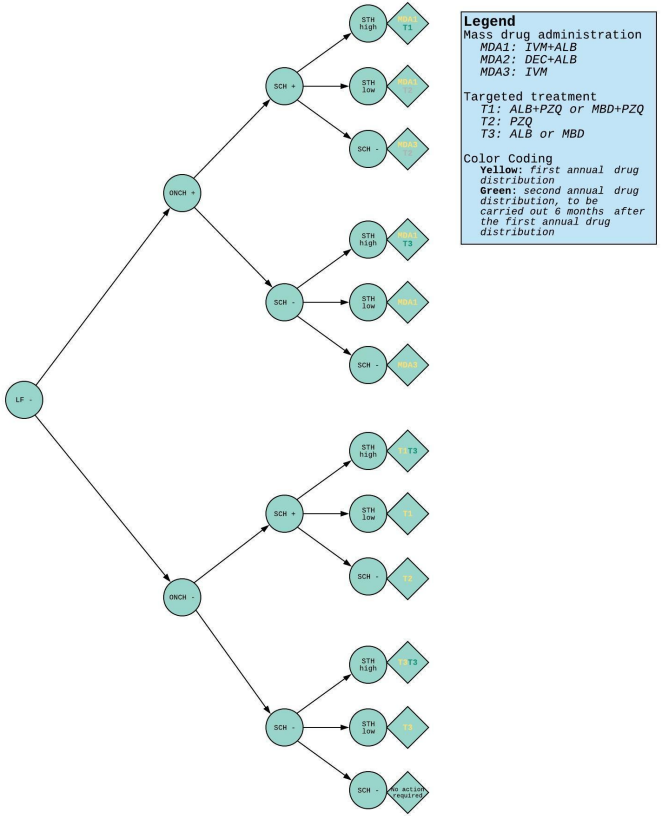
- **Range BN:BQ:** Country level endemicity data
- **Column BR:** Endemicity scores grouped together
- **Column BS:** MDA type recommended based on the NTD guidelines
- **Range BT:BU:** Split treatment plan
- **Column BV:** Disease targeted by MDA

| BN | BO | BP | BQ | BR | BS | BT | BU | BV |
|---|---|---|---|---|---|---|---|---|
| **Treatment Guidelines** | | | | | | | | |
| *LF* | *ONCH* | *SCHIST* | *STH Level* | *Coding* | *MDA type* | *Treatment Part 1* | *Treatment Part 2* | *Diseases targeted by the MDA* |
| *1 if endemic* | *1 if endemic* | *1 if endemic* | *2 if high, 1 if low* | | | | | |
| 0 | 0 | 0 | 0 | 0000 | no action required | | | sth only |
| 0 | 0 | 0 | 0 | 0000 | no action required | | | sth only |
| 0 | 0 | 0 | 0 | 0000 | no action required | | | sth only |
| 0 | 0 | 0 | 0 | 0000 | no action required | | | sth only |
| 0 | 0 | 0 | 0 | 0000 | no action required | | | sth only |
| 1 | 1 | 1 | 0 | 1110 | MDA1+T2 | IVM+ALB | PZQ | lf+onch+schist |
| 0 | 0 | 0 | 0 | 0000 | no action required | | | sth only |

# Treatment Guidelines

To determine which mass drug intervention was initiated in each country we applied two algorithms provided by the WHO's PCHH found on pages 16 and 17. The visualization of these algorithms is found to the right.



# Impact Score

- The impact formula shown on slide 3 is applied to all diseases
- Onchocerciasis' impact score is divided by 30 because treatment needs to be given every six months for the lifespan of the adult worm, the lifespan of an adult worm is on average 15 years
- We multiply our impact score by prevalence because MDA is given to all individuals in a given area and only a percentage of the population will be infected with a given NTD. This account for the difference between the population requiring preventative chemotherapy and the actual number of people with the NTD as we intend to measure only the direct impact of treatment.

| BW | BX | BY | BZ | CA | CB | CC | CD | CE | CF | CG |
|---|---|---|---|---|---|---|---|---|---|---|
| **Impact of LF** | | **Impact of Schist** | **Impact of Whipworm** | | | **Impact of Hookworm** | | **Impact of Roundworm** | | |
| *DEC+ALB* | *IVM+ALB* | *PZQ* | *ALB* | *MBD* | *IVM+ALB* | *ALB* | *MBD* | *ALB* | *MBD* | *IVM+ALB* |
| ***2893.191772*** | ***629.1728395*** | ***167250.3117*** | ***1429.188581*** | ***326.2761209*** | ***1833.032571*** | ***9007.154229*** | ***116.4738646*** | ***22254.5942*** | ***1233.498113*** | ***9034.815122*** |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | 0 | 604.5404653 | | | | | | | | |
| | | | | | | | | | | |

# Example: Drug Score

## *Impact of PZQ in Angola in 2010*

LF, ONCH, and SCHIST are endemic in Angola in 2010. In this case, the WHO recommends the MDA type MDA1 + T2. This MDA contains the treatment IVM+ALB and PZQ, which are used to treat LF, ONCH, and SCHIST. Let's calculate the impact of PZQ in Angola in 2010.

$$I = \frac{28{,}347.68 * 64.44\% * 25.20\%}{1 - 64.44\% * 25.20\%} * 11\%$$

***DALYs*** *= 28,347.68*

***Efficacy*** *= 64.44%*

***Treatment Coverage*** *= 25.20%*

***Prevalence*** *= 11%*

Using this equation we arrive at **the final impact of PZQ in Angola in 2010: 604.54.**

# Example: Disease Score

## *Impact of whipworm drugs in 2010*

Whipworm can be treated using one of three drug regimens: **ALB, MBD, and IVM + ALB**. Recall the process taken to derive the impact of PZQ in Angola. The same steps are used to calculate the impact of each drug regimen that targets whipworm.

| **Regimen** | **Global Impact (2010)** |
|---|---|
| **ALB** | 2,263.50 |
| **MBD** | 327.57 |
| **IVM + ALB** | 3,883.77 |

The global impact of the three regimens are summed, yielding **6,474.84, the global impact of whipworm drugs in 2010.**

# Example: Company Score

## *Impact of Bayer Healthcare on NTD in 2010*

Bayer Healthcare only produces one NTD drug: PZQ. The process to calculate the impact of PZQ in Angola is repeated for every country so that an impact score for every country is obtained. To get the total impact score for Bayer Healthcare, we sum the impact scores where the drug used for treatment is PZQ, yielding **190,933.46.**

# Example: Country Score

## *Impact of LF drugs in Comoros in 2010*

According to the WHO, LF and STH is endemic in Comoros. The WHO's recommended MDA type is MDA1/2, which uses the drug DEC+ALB. Therefore, to calculate the impact of LF drugs in Comoros, we need to sum the impact scores of DEC+ALB in LF cases, which yields **2.73.**