Malaria Technical Report

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I. Data Dictionary (ORS 2010)

Column	Header Name	Description
A	Country	Name of country according to WHO format.
B	WHO Region	WHO-classified region.
C	Population	Population size of country
D	1st Line (p. falc.)	P. falc first-line drug regimen used by that country
E	% febrile children under 5 receiving any antimalarial treatment	Treatment coverage of antimalarial treatment, sourced from UNICEF global database.
F	% febrile children under 5 receiving ACT only	Treatment coverage of ACT treatment only, sourced from UNICEF global database.
G	DALY	WHO age-weighted DALY 2015 estimates for all malaria cases.
H	Prevalence	Total number of malaria cases in each country.
I	% p. falc	Proportion of malaria cases that are p. falc.
J	Estimated p. falc DALY	Adjusted DALY values to reflect impact of p. falc only. = Total DALY * % p. falc = Col G * Col I
K	Estimated p. falc prevalence	Number of malaria cases attributed to p. falc only. = Malaria prevalence * % p. falc. = Col H * Col I
L	Number P. falc. treated	The number of cases of p. Falc. that have received treatment =% febrile children under 5 receiving ACT only *Estimated p. Falc. prevalence =col F*col K

	Number treated by each drug	The number of people treated for p.falc for each drug =# p.falc treated*(1/number of drugs in the first line treatment) =col L*(1/number of drugs in the first line treatment)
R-AE	New efficacy	New country level efficacy data.
AF-AJ	Efficacy	Hand inputted country level efficacy data.
AK-AX	Estimated efficacy	Fallback regional or world efficacy data is applied.
AY-BL	Impact	Impact of drug regimens on p. falc (DALYs alleviated by specific drug regimens).
BM	Impact of p. falc.	Total impact of p. falc. in each country. = Row sum from AY-BL
BO	1st line p. vivax	P.vivax first-line drug regimen used by that country.
BP	% p. vivax	Proportion of malaria cases that are p. vivax.
BQ	Estimated p. vivax DALY	Adjusted DALY values to reflect impact of p. vivax only. = Total DALY * % p. vivax. = Col G * Col BP
BR	Estimated p. vivax prevalence	Number of malaria cases attributed to p. vivax. only. = Malaria prevalence * % p. vivax. = Col BP * Col H
BS	P. vivax treatment coverage	Treatment coverage any antimalarial – Treatment coverage ACT. = E6
BT-BZ	Efficacy	New country level efficacy data.
CA-CG	Estimated efficacy	Hand inputted country level efficacy data.
CH-CN	Impact	Impact of p. vivax.

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CO	Impact of p. vivax	Final impact of p. vivax. = Row sum CH-CN
CQ3:CS17	Company Impact	Calculates final impact for drugs as well as companies.
CU3:DJ23	Regional Average Efficacy	Average original efficacy data points by region. Used in estimated efficacy sections.
DL1:DQ55	Treatment Coverage Data	Original treatment coverage data points. Used in columns E and F.
DS2:DU9	Regional Average Treatment Coverage	Averages original treatment coverage data points by region. Used in column E.

II. Missing Data

1. Treatment coverage and efficacy data is sparse.

2. We would ideally have data on particular ACT (artemisinin-based combination therapy) proportions at the country-level.

3. There is some concern about GBD DALY estimates over-estimating the number of people over 5 in Africa with malaria.

iii. Scoring Calcula†ions

This is the current scoring mechanism, where D = DALYs, = treatment coverage, and e = efficacy

Impact= $\frac{D \cdot \theta \cdot e}{(1-\theta \cdot e)}$

1. For each country, DALY values (for malaria in general) are calculated by the percentage of p. falc to obtain estimated DALY values for p. falc.

2. If more than one first-line drug is listed, the number of DALYs that could be alleviated by each drug is calculated as:
Total DALYs * (1/n), where n is the number of first-line drugs in that country.

3. Efficacy for first-line drugs are calculated based on WHO data: we use country-specific drug-specific data if available, otherwise we use regional drug-specific data averaged across all countries. Otherwise, we use global averages.

4. Treatment coverage is calculated using DHS/MICS survey data. If country-specific treatment coverage from DHS/MICS surveys is available, then this is used. If not, then the regional average of the treatment coverage based on available DHS/MICS is used. If no regional data is available, then the global average of available DHS/ MICS survey data is used.

5. To calculate the impact score for each country:

$\frac{D \cdot \theta \cdot e}{(1-\theta \cdot e)} * (1/n)$ Where n is the number of first-line drugs in that country

6. Total impact scores for each manufacturer is totaled based on the drugs they produce, e.g. for Norvatis that produces drug AL, total impact score for Novartis is the sum of impact values from Col H where AL is one of the corresponding first-line drug used.

Ⅳ. An Example Scoring Calculation: Novartis

The following shows the calculation of the final impact score for the company Novartis. Novartis is credited with the patent for one antimalarial drug, Artemether Lumefantrine (AL).

Taking Bhutan in 2010 as an example, where AL is the only first-line drug, we have:

p. falc		
DALY	**= 785.32**	(Cell G29)
% p. falc	**= 40%**	(Cell I29)
Estimated p. falc DALYs	**= 314.13**	(Cell J29)
Treatment coverage	**= 4.63%**	(Cell E29)
1st line drug efficacy	**= 97.43%**	(Cell AK29)

Impact for p. falc in Bhutan:

= (Estimated p. falc DALYs * Treatment coverage * 1st line efficacy)/(1 - Treatment coverage * 1st line efficacy)/(1/n)

= (314.13 * 4.63% * 97.43%)/(1 - 4.63% * 97.43%)*(1/1)

= **14.85**

The process above is repeated for every country so that an impact score for AL in every country is obtained. To get the total impact score for Novartis, we sum the impact scores where the first-line drug includes "AL", which Novartis manufactures.

Total impact score for Novartis:

= Impact scores for AL in (Angola + Bangladesh + Benin + Bhutan + Botswana + Brazil + Burkina Faso + Cape Verde + Central African Republic + Chad + Comoros + Egypt + Ethiopia + Gambia + Ghana + Guinea-Bissau + Guyana + Iraq + Kenya + Lao People's Democratic Republic + Malawi + Mali + Mauritania + Mozambique + Myanmar + Namibia + Nepal + Niger + Nigeria + Papua New Guinea + Paraguay + Rwanda + Senegal + Sierra Leone + Solomon Islands + South Africa + Suriname + Swaziland + Tajikistan + United Republic of Tanzania + Timor Leste + Togo + Uganda + Vanuatu + Zambia + Zimbabwe).

V. Assumptions

Data	Column/Range	Value Assumed
Treatment Coverage	E	If country-specific treatment coverage from DHS/MICS surveys is available, then this is used. If not, then the regional average of the treatment coverage based on available DHS/MICS is used. If no regional data is available, then the global average of available DHS/MICS survey data is used.
First-line drug efficacy	AK:AX, CA:CG	Reflects the efficacy rate of the specific first-line drug in each country. If country-specific efficacy for the first-line drug is not available, we use the average efficacy for that drug in the respective region. There is also no distinction between first-line, second-line drugs for malaria.
Manufacturers	CQ3:CS17	Original patent holders.
DALYs	J, BQ	P. falc is the more virulent species and causes more death and disability per case than p. vivax due to the nature of the parasite. Additionally, there are three other species of malaria which are not included in the model including p. ovale, p. malariae, and p. knowlesi. These species represent only a small percentage of malaria cases. Precedence is given to p. falc data, and all remaining is attributed to p. vivax.
Impact	AY:BL, CH:CN	We split impact equally between drug regimens within a country if more than one is present, however splitting may not necessarily be equal.