PMC COMPASS

User Manual

Informing choices to maximise the health impact of perennial malaria chemoprevention

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https://pmc-compass.shinyapps.io/pmc_compass/

1. Overview of PMC Compass

PMC Compass is a free, web-based decision-support tool designed to help public health and national malaria control programme managers, researchers, policymakers and funders evaluate and prioritise delivery options for Perennial Malaria Chemoprevention with Sulphadoxine Pyrimethamine (PMC-SP). It models health outcomes and cost-effectiveness across a range of delivery schedules and geographic settings, enabling cost-effectiveness-informed decisions about where and how to implement PMC.

PMC-SP is a chemoprevention strategy that delivers the antimalarial treatment to young, at risk children at regular intervals throughout the year, co-delivered with routine immunisation (EPI) contacts. Because SP efficacy depends on local drug-resistance, PMC Compass integrates molecular surveillance data on the frequency of resistance markers alongside health and economic modelling.

Key capabilities

- Ranks PMC delivery options by upper-administrative unit within a country by cost-effectiveness
- Visualises health impact through interactive maps, graphs, and tables
- Model custom user-inputted delivery schedules by specifying number of doses and timings, and estimated coverages by dose
- Explore
  - Economic assumptions, cost data, and country-specific cost-effectiveness thresholds
  - SP resistance data (dhps haplotype frequencies) and its effect on drug efficacy
- Download results for offline use

Who is this tool for?

- National malaria programme managers considering PMC roll-out or expansion
- Policymakers and donors seeking evidence to guide investment decisions

Important note on results

PMC Compass is currently in beta testing. Results are pending further validation and should be interpreted with this in mind. The tool will be updated periodically as newer and better estimates on SP efficacy become available following clinical trial results.

2. Getting Started

PMC Compass runs entirely in your web browser — no installation or account is required. Simply navigate to in your preferred browser:

https://pmc-compass.shinyapps.io/pmc_compass/

The app may take a few seconds to load on first visit. No login is needed.

Recommended browsers

- Google Chrome (recommended)
- Mozilla Firefox
- Microsoft Edge
- Safari (macOS / iOS)

> **Note:** *For the best experience, use a desktop or laptop computer with a screen. The app is functional on smartphones or tablets but some tables and maps may be distorted or require horizontal scrolling on tables.*

App layout

The app is divided into five tabs, accessible via the navigation bar at the top of the page:

Main page	The primary results page. Select a country and geographic level, generate a ranked prioritisation of PMC delivery options, and explore the cost-effectiveness table and map.
Health impact	Deeper exploration of the health effects of PMC, including clinical cases and hospitalisations averted, reductions in incidence, and age-stratified breakdowns — presented as maps, graphs, and tables.
Economics	Detailed cost assumptions and country-specific cost-effectiveness thresholds underpinning the main page prioritisation rankings.
SP resistance and efficacy	Data on dhps haplotype frequencies by upper-administrative area, maps of estimated SP protective efficacy, and drug protection curves.
User input	Customise your analysis by defining your own PMC delivery schedule (dose number and timings, and coverages), and optionally editing the frequencies of molecular markers associated with SP resistance.

3. Main Page

The main page is the starting point for most users. It displays a ranked prioritisation of PMC delivery options — from most to least cost-effective (relative to the scenario of no PMC being conducted in that geography) — for the country and geographic level you choose.

Step-by-step guide

1	**Select a PMC-eligible country** Click the 'Select PMC-eligible country' dropdown in the left-hand panel. The list includes all countries where PMC is considered eligible. Eligibility is defined using WHO's definition of the country containing at least one upper-administrative area with a P. f*alciparum* prevalence of >10% or an annual parasite incidence of >250 cases per 1000 population.
2	**Choose the geographic level** Use the 'Model whole country or a specific admin-1 unit?' dropdown to select either 'Whole country' (all upper-administrative areas) or 'Admin-1 unit' (upper-administrative area).
3	**Select a specific admin-1 unit (if applicable)** If you select 'Admin-1 unit', a third dropdown will appear allowing you to choose the specific area. Click it to see the list of provinces or regions for your chosen country. Select the region of interest.
4	**Generate results** Click the orange 'Generate results' button. The app will calculate and display results in the main panel to the right. This may take 1-2 minutes depending on your internet connection.

Main page results

Ranked prioritisation table

The primary output is a table titled 'Ranked prioritisation of PMC delivery options by admin-1 unit'. Each row represents a distinct PMC delivery schedule option (by number of doses, target ages and coverage). Options are ranked from most to least cost-effective — therefore, the first option in the table will avert the most health burden (clinical cases, hospitalisation and deaths) for a given cost.

The ranking compares each delivery schedule to the currently implemented package of malaria control interventions in the selected country, and to each other. All costs are presented in 2024 USD. Incremental Cost-Effectiveness Ratios (ICERs) incorporate both health impact and implementation costs, with start-up costs annualised at 3% over 7 years. National costs relating to PMC are included (training etc) and incorporated into the cost of implementing PMC in the first admin-1 district within a country. As such, the first admin-1 unit in the table may show up as less cost-effective as these costs are absorbed here. For countries not currently implementing PMC, this should be interpreted still as this is the most cost-effective region to start implementing PMC in. Costs for SP and consumables are also presented alone, which should be used as required cost estimates for countries already implementing PMC (as these exclude training and start up costs).

> **Note:** *ICERs should be interpreted cumulatively. If the first region in a country is not cost-effective on its own, but regions lower in the ranking are shown as cost-effective, this could indicate that would be more cost-effective to implement PMC in both regions simultaneously — not just in the later-ranked region alone.*

Map: cost-effectiveness by admin-1 unit

Click the 'Map: cost-effectiveness by admin-1 unit' tab within the results area to view a geographic map of cost-effectiveness across regions. This allows you to quickly identify which areas offer the greatest health impact for a given PMC investment.

Table: delivery schedule and coverage assumptions

This sub-tab shows the coverage assumptions used in the model for each delivery schedule option. Use this to understand what target ages and coverage assumptions underpin the ranked results.

Search, filtering and pagination

The results table includes a Search box in the top-right corner — type to filter rows by any value. The table also supports sorting by clicking column headers, and pagination controls appear below the table when results span multiple pages. You can also filter columns by low to high by clicking on the column title.

Download outputs

An orange 'Download outputs' button appears above the results panel once results have been generated. Click this to download the results data for offline use and reporting.

4. Health Impact Tab

The Health impact tab provides a deeper view of the expected health effects of PMC for the country and geographic level selected on the main page. Results are displayed for the region currently selected — to see results for a different area, return to the main page, update your selection, and regenerate results.

> **Note:** *In the Health impact tab tables, **options are NOT ranked**. Each row represents the incidence or health impact of PMC under a specific delivery schedule, **not a prioritisation**.*

Available views

The Health impact tab contains multiple sub-tabs, each offering a different visualisation or breakdown of health outcomes. Navigate between them by clicking the tab labels:

Maps

- Map: clinical cases averted — Geographic map showing the number of clinical malaria cases averted by PMC across subnational regions.
- Map: hospitalisations averted — Geographic map showing hospitalisations averted by PMC across subnational regions.
- Map: reduction in clinical cases (%) — Geographic map showing the percentage reduction in clinical cases by PMC across subnational regions.
- Map: reduction in hospitalisations (%) — Geographic map showing the percentage reduction in hospitalisations by PMC across subnational regions.

Graphs

- Graph: clinical cases with and without PMC (0-30mo) — A comparison graph showing clinical cases with and without PMC across every admin-1 unit.
- Graph: clinical cases averted by age — Shows the number of clinical cases averted, broken down by age group.
- Graph: hospitalisations averted by age — Shows the number of hospitalisations averted, broken down by age group.

Tables

- Table: average national incidence, age 0-30mo — Tabular data on average malaria incidence for children aged 0 to 30 months at the national level.
- Table: incidence, age 0-30mo — Incidence data presented for the 0 to 30 month age range for each admin-1 unit.
- Table: incidence, 6mo age groups — Incidence for each admin-1 unit broken down into six-month age bands for more granular age-stratified analysis.

How to use this tab

Click any sub-tab label to switch between maps, graphs, and tables. Some maps and graphs are interactive — hover over regions to see values. Graphs show data series for each PMC delivery option (labelled by number of doses). Tables support search and sorting in the same way as the Main page results table.

Use this tab to go beyond cost-effectiveness and understand the absolute and relative health gains from different PMC delivery approaches in your context.

5. Economics Tab

The Economics tab provides transparency into the cost assumptions and country-specific cost-effectiveness thresholds that underpin the rankings shown on the main page. It does not require any additional user input — it reflects the settings selected on the main page.

Table: cost assumptions

This is the default view when you open the Economics tab. It presents the detailed cost data used in the model, including:

- Number of PMC doses in the schedule
- Data source for cost estimates
- PMC implementation costs
- Treatment savings
- SP and consumables costs

All costs are presented in 2024 USD. Start-up costs are annualised at 3% over 7 years.

Table: country-specific cost-effectiveness thresholds

Click this sub-tab to view the cost-effectiveness thresholds applied for the selected country. These thresholds define the benchmark against which ICERs are compared when determining whether a PMC option is considered cost-effective in that national context. Thresholds vary by country and reflect local economic conditions and healthcare system parameters.

> **Note:** *These cost assumptions represent modelled estimates and may not capture all local implementation realities. Users should consider supplementing with locally available cost data where possible.*

6. SP Resistance and Efficacy Tab

SP (sulfadoxine-pyrimethamine) efficacy varies geographically depending on the frequency of resistance-conferring mutations in the parasite dihydropteroate synthase (dhps) gene. This tab provides data on these mutations and their estimated impact on SP's protective effectiveness.

Data sources include a comprehensive database held at LSHTM, including samples collected by surveillance and research programmes and published literature. Where measured data were not available, modelled estimates were used.

Protective efficacy of SP wanes over time following drug administration and depends on the parasite genotypes prevalent in a region. Subnational area-specific genotype frequencies are used to weight previously estimated protection curves against new P. falciparum infection.

Sub-tabs

Country-specific dhps haplotype frequencies

A searchable and sortable table showing the frequency of each dhps haplotype in each subnational region of the selected country. This data directly influences the SP efficacy estimates used in the model.

Country-specific map of estimated 30-day protective efficacy

An interactive geographic map displaying the estimated 30-day protective efficacy of SP for each subnational region. Regions with higher resistance frequencies will show lower estimated efficacy. Hover over regions to view specific efficacy estimates.

Probability of drug protection following a dose of SP

This sub-tab shows curves illustrating how the probability of being protected against P. falciparum infection declines over time following a single SP dose, for different dhps resistance profiles by admin-1 unit. Use this to understand the duration and magnitude of protection expected in your region.

> **Note:** *If you have locally measured dhps frequency data that differs from the modelled estimates shown here, you can override them using the User input tab. See Section 7 for instructions.*

7. User Input Tab

The User input tab allows you to move beyond the pre-modelled delivery options and define your own custom PMC delivery schedule. This is useful when you want to evaluate a specific combination of dose timings and coverage levels that reflects a proposed or existing programme in your context.

Step-by-step guide

1	**Select country and geographic level** As on the Main page, use the 'Select PMC-eligible country' and 'Model whole country or a specific admin-1 unit?' dropdowns to define the geographic scope of your analysis.
2	**Edit SP resistance frequencies (optional)** The 'Edit our estimated frequencies of molecular markers associated with SP resistance?' dropdown offers a Yes/No choice. The default is 'No', meaning the tool uses its own modelled estimates. Select 'Yes' if you have locally measured dhps frequency data and wish to enter it manually to improve the accuracy of SP efficacy estimates for your context.
3	**Set the number of PMC doses** Use the 'Select the number of PMC doses in the schedule to model (maximum 15)' numeric input to specify how many doses your proposed schedule includes. You can enter any whole number from 1 to 15.
4	**Define the delivery schedule** An editable table labelled 'PMC delivery schedule and coverage data' will appear in the main panel. It has three columns: Dose (e.g., Dose 1, Dose 2...), Age (months), and Coverage (0-100%). For each dose row, enter the target age in months at which that dose is given, and the expected coverage percentage for that dose. You can use decimal points to capture doses given in weeks not months (for example, 3.5 months to capture 14 weeks). Double click a cell in the table to edit it directly.
5	**Generate results** Once your schedule is defined, click the 'Generate results' button (orange) at the bottom of the left panel to run the model with your custom parameters. Results will update in the main panel.

Tips for using the User input tab

- Age entries should reflect the target age at administration in months — for example, 2.5, 3.5, 6, 9, 12, 15, 18, 24.
- Coverage values should be entered as percentages between 0 and 100 — do not include the % symbol.
- If editing SP resistance frequencies, ensure values are consistent with the haplotype format used in the SP resistance tab (see Section 6). These frequencies should total 1 across an admin-1 unit or errors will appear.
- Use this tab in combination with the health impact and economics tabs to evaluate the full health and economic profile of your custom schedule.

> **Note:** *Results generated from custom user inputs are displayed using the same output format as the main page — including ranked tables and maps.*

8. Glossary

Admin-1 unit	The first level of subnational administrative division within a country.
DALY	Disability-Adjusted Life Year. A measure of the overall burden of disease, combining years of life lost due to death, and burden from hospitalisation and clinical malaria cases.
dhps	The *dhps* (dihydropteroate synthase) gene in *Plasmodium falciparum* malaria is a key molecular marker for tracking resistance to sulfadoxine, a component of the drug sulfadoxine-pyrimethamine (SP)
Haplotype	A combination of specific genetic mutations at defined positions in the dhps gene, used to characterise levels of SP resistance.
ICER	Incremental Cost-Effectiveness Ratio. The additional cost per DALY averted of one intervention compared to another.
PMC	Perennial Malaria Chemoprevention. A strategy delivering preventive antimalarial treatment at regular intervals throughout the year, typically to young children.
SP	Sulfadoxine-pyrimethamine. The antimalarial drug combination used in PMC. Its efficacy depends on local levels of drug resistance.

9. Troubleshooting

The app is slow to load

PMC Compass is hosted on shinyapps.io and may take 10–20 seconds to load, especially if the server has been idle. If the app does not load within 30 seconds, try refreshing the page.

Results do not appear after clicking 'Generate results'

Ensure a country has been selected from the dropdown. If the app appears frozen, try scrolling down — results may have loaded below the visible area. If problems persist, refresh the page and try again.

I cannot find my country in the dropdown

PMC Compass includes only countries currently considered eligible for PMC based malaria prevalence. If your country does not appear, it may not currently be included in the tool's scope. Contact the development team for more information.

Further support

For further questions, feedback, or to report a bug, please contact the PMC Compass development team at: pmc-compass@lshtm.ac.uk. Use the 'Click here for more information on how to use this app' link at the top of the app for additional in-app guidance.

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