World Health Organization

Malaria vaccine supply situation & Framework for allocation of limited vaccine

OPT-SMC workshop, Dakar, Senegal, 23-25 January 2023

Malaria vaccine supply

Current situation

First Malaria Vaccine RTS,S/AS01

WHO pre-qualified since 15 July 2022

Manufacturer	GSK
Price	EUR 9.30/dose
Current availability	**4 M doses** in Q4 2023 **6 M doses** in 2024 **8 M doses** in 2025
Allocation	Based on Framework for Allocation of Limited Malaria Vaccine Supply

Medium to long term outlook

- RTS,S/AS01 to be supplied by Bharat Biotech (India), product transfer underway
- Potential market entry of R21/Matrix-M, currently in Phase 3 trials - data to be reviewed by WHO
- Weighted Average Price reduction expected with more supply and scale up of production capacity

Useful links

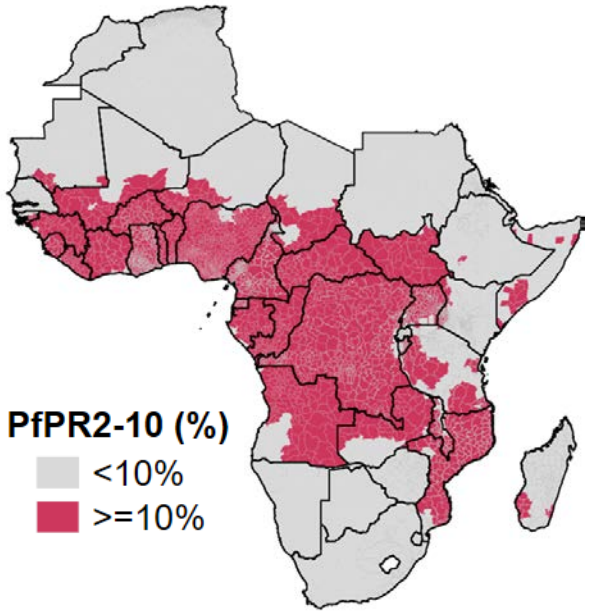
UNICEF Q&A on malaria vaccines supply, price and market-shaping efforts
https://www.unicef.org/supply/documents/malaria-vaccine-questions-and-answers-august-2022

Gavi Market Shaping Roadmap – Malaria Vaccines
https://www.gavi.org/sites/default/files/document/Malaria-Roadmap-Public-Summary.pdf

Vaccine supply expected to be insufficient to meet demand in initial years

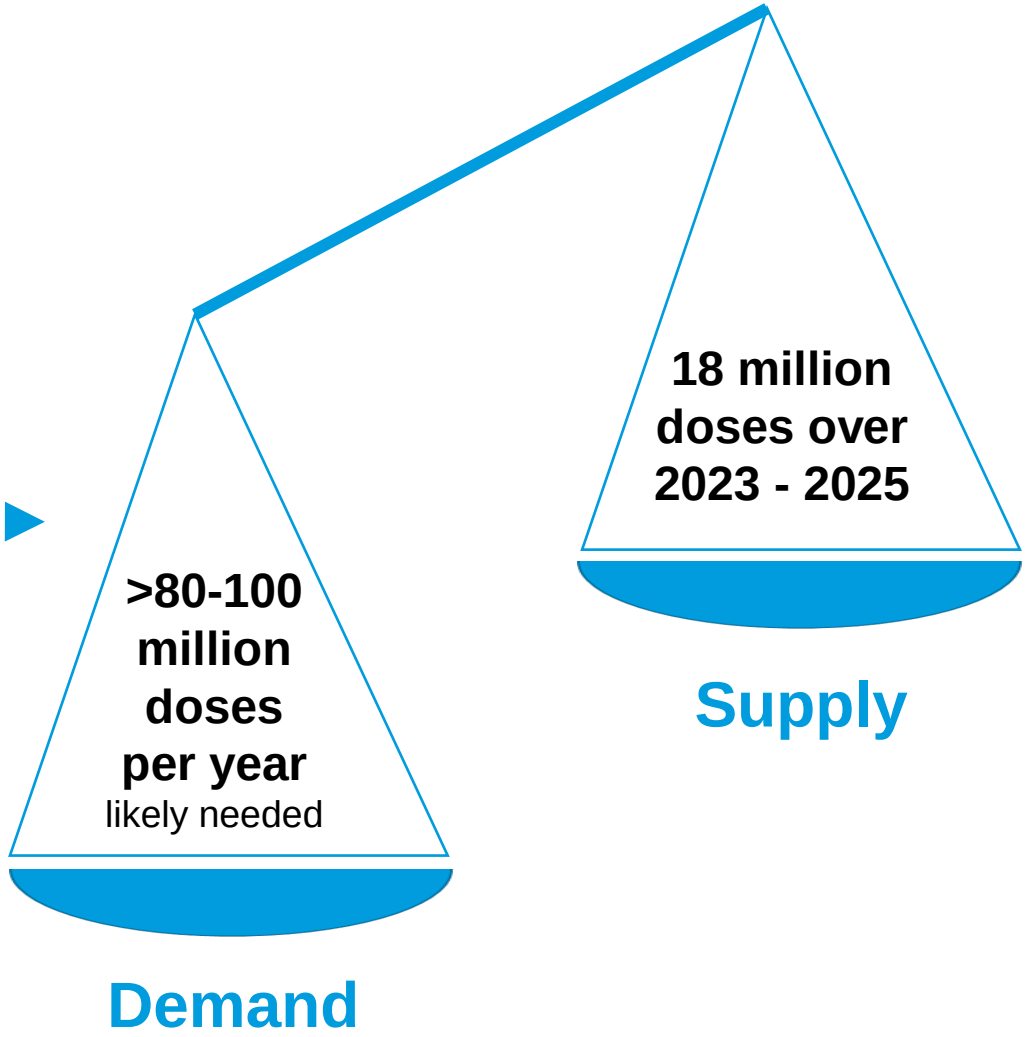
Over **25 million children** are born each year in regions with moderate to high malaria transmission

Over **25 countries** have already expressed interest in introducing the vaccine



Pockets of moderate transmission outside Africa, mainly in PNG and possibly in India

P. falciparum parasite prevalence ($PfPR_{2-10}$) estimates, 2019.
Source: MAP 2019



WHO was tasked to support the development of a mechanism to allocate the available vaccine doses…

- To the **first** countries that are **ready**?
- To those countries with the **highest burden**?
- To those countries that are most likely to achieve the **best outcome**?
- To countries that **participated in the clinical development** of the vaccine?
- ….or…?

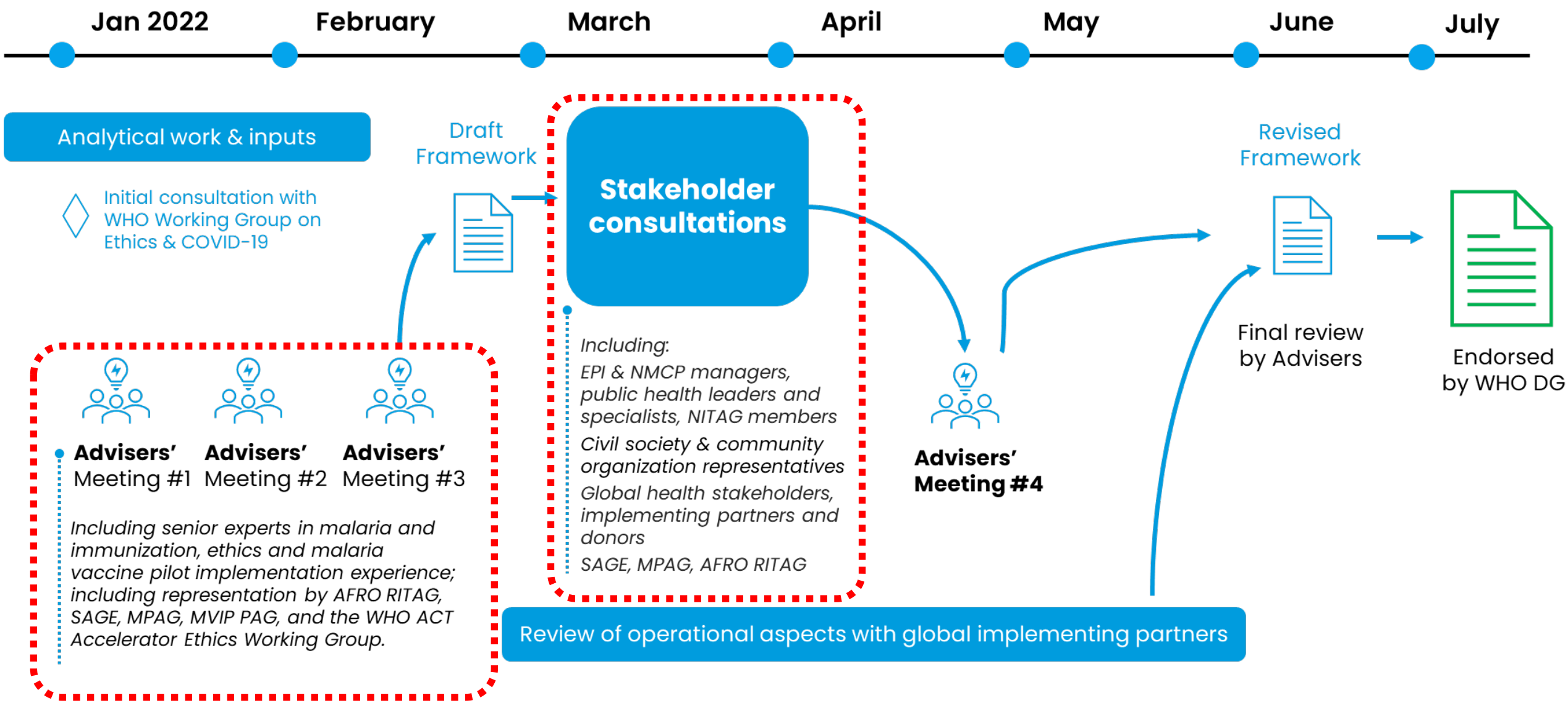
Advice from WHO Working Group on Ethics and COVID-19[1]:

…Science and/or evidence alone cannot tell us which choice or aim is 'correct' or which aim society should value most…

*…Consequently, the first step in developing a framework for the **allocation of scarce resources requires explicit consideration and clarification of ethical values**…*

Source: 1 - Extract from: Ethical foundations of a global vaccine allocation framework for COVID-19: high-level overview - Considerations from WHO Working Group on Ethics and COVID-19

Process to develop the Framework for allocation of malaria vaccines in 2022



Framework for the allocation of limited malaria vaccine supply

Available on WHO website

Governance principles

Transparency

Inclusiveness & participation

Accountability

Ethical principles for allocation

First priority principle: Greatest need
Allocate the vaccine to countries with areas of greatest need, where the malaria disease burden in children and the risk of death are highest

Second priority principle: Maximize health impact
Allocate the vaccine to countries for use in areas where the expected health impact is greatest

Third priority principle: Equity (Equal Respect)
Prioritize countries that commit to fairness and addressing the needs of marginalized individuals and communities in their malaria vaccination programmes

Fourth priority principle: Fair benefit sharing
If everything else is equal, the country with a prior contribution to the vaccine's development should get priority

Additional key considerations

Honour commitments to MVIP countries: MVIP areas continue to get priority access to vaccine

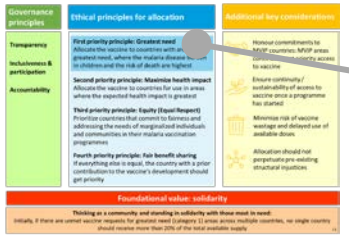
Ensure continuity / sustainability of access to vaccine once a programme has started

Minimize risk of vaccine wastage and delayed use of available doses

Allocation should not perpetuate pre-existing structural injustices

Foundational value: solidarity

Thinking as a community and standing in solidarity with those most in need:
Initially, if there are unmet vaccine requests for greatest need (category 1) areas across multiple countries, no single country should receive more than 20% of the total available supply



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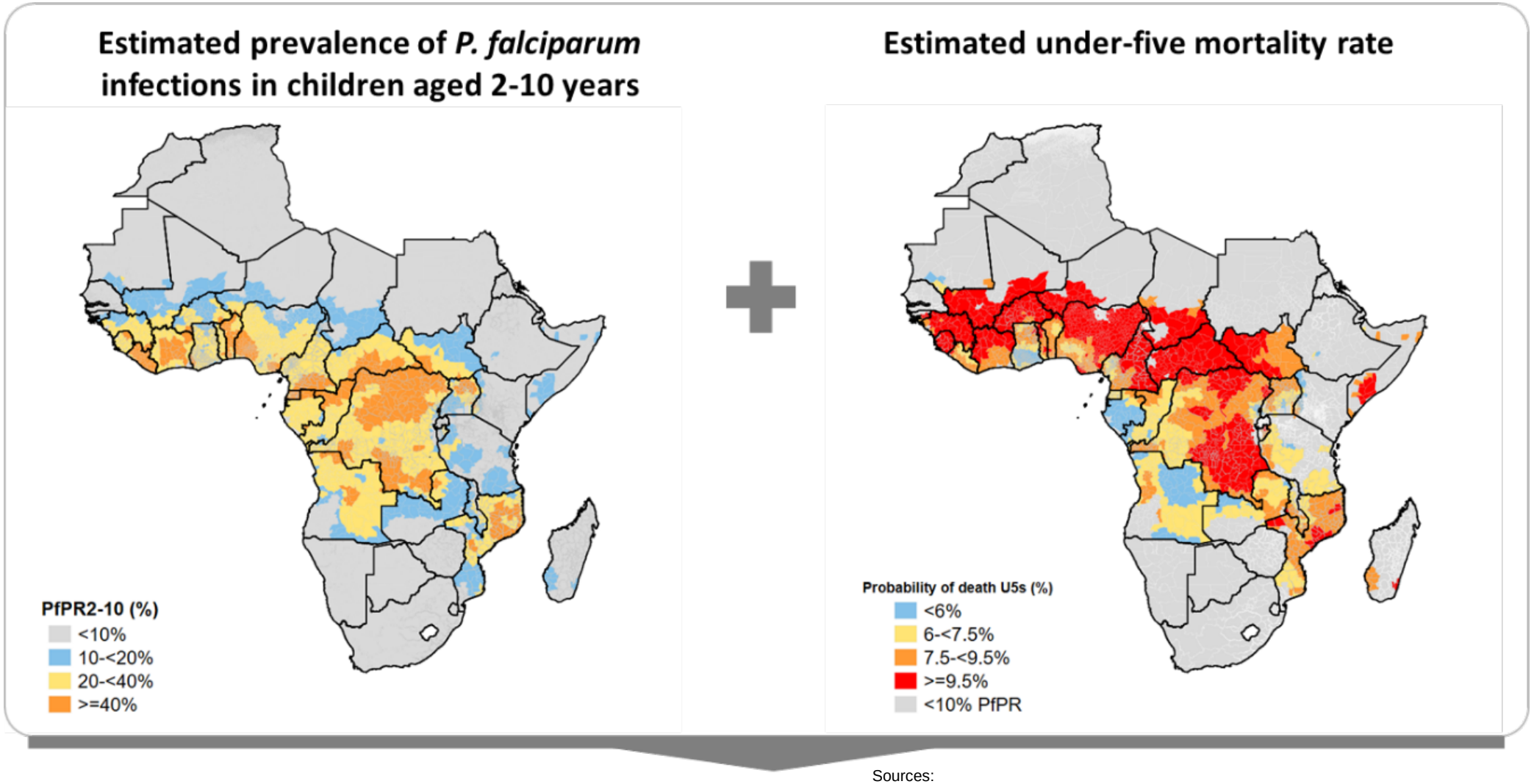
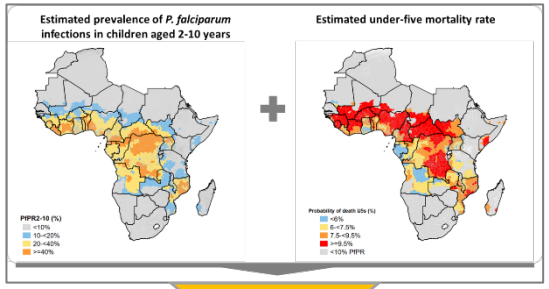
Proxy measure: Composite index that combines sub-national levels of **P. falciparum parasite prevalence rate (PfPR)** in children and **under-five all-cause mortality rate (U5MR)** – using best available local data

Illustration of “need” classification



Sources:
District level mean estimates of *Pf*PR in 2-10 year old children in 2019 (Malaria Atlas Project)
District level mean estimates probabilities of death from all-causes before the age of 5 in 2015 (IHME)

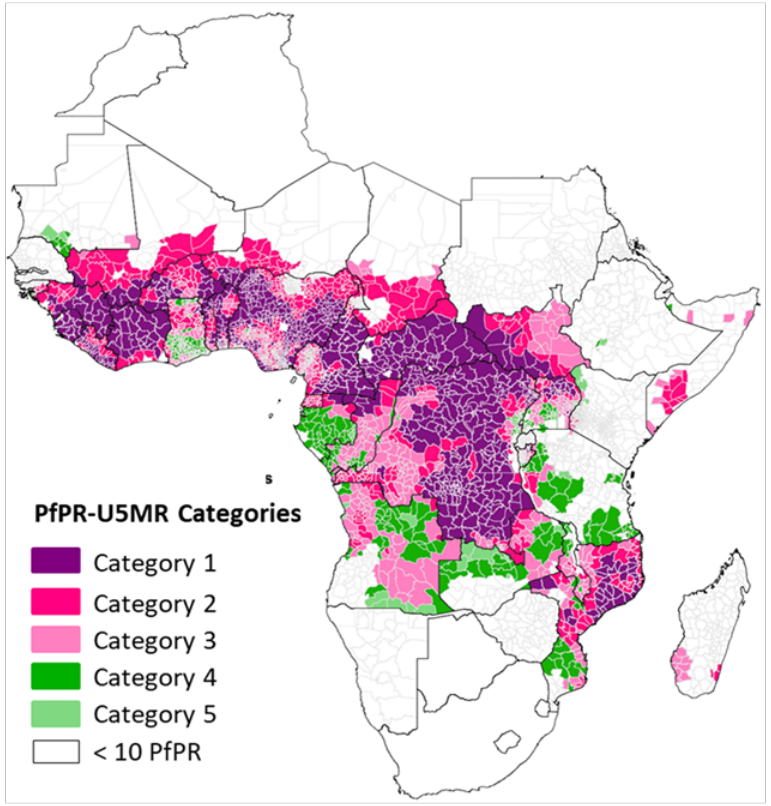
Sub-national stratification of areas by categories of need



First priority for allocation

Composite classification of malaria prevalence and all-cause under-five mortality as proxy for "need"

Category	Possible combinations: Malaria prevalence		All-cause under-five mortality
1 Greatest need	PfPR 20-<40%	&	U5MR >=9.5%
	PfPR >=40%	&	U5MR >=9.5%
	PfPR >=40%	&	U5MR 7.5-<9.5%
2	PfPR 10-<20%	&	U5MR >=9.5%
	PfPR 20-<40%	&	U5MR 7.5-<9.5%
	PfPR >=40%	&	U5MR 6-<7.5%
3	PfPR 10-<20%	&	U5MR 7.5-<9.5%
	PfPR 20-<40%	&	U5MR 6-<7.5%
	PfPR >=40%	&	U5MR <6%
4	PfPR 10-<20%	&	U5MR 6-<7.5%
	PfPR 20-<40%	&	U5MR <6%
5	PfPR 10-<20%	&	U5MR <6%



Maps are illustrative based on global estimates. Countries will identify areas of highest burden and need within its own borders based on best available local evidence and the broader context of sub-national tailoring of malaria interventions

New births estimated for 2023 by need category in sub-Saharan African countries with moderate to high malaria transmission*

Highest need

	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	Total Cat 1-5	<10% PfPR
Angola	-	86,000	255,000	224,000	351,000	916,000	297,000
Benin	205,000	102,000	108,000	43,000	-	458,000	-
Burkina Faso	266,000	385,000	163,000	-	-	814,000	-
Burundi	111,000	80,000	100,000	24,000	-	315,000	208,000
Cameroon		13,000	318,000	104,000	32,000	857,000	91,000
Central African Republic		0	-	-	-	179,000	-
Chad			78,000	-	-	454,000	263,000
Congo			48,000	66,000	55,000	177,000	-
Côte d'Ivoire			-	-	-	895,000	-
Democratic Republic of th			41,000	130,000	369,000	3,662,000	180,000
Equatorial Guinea			5,000	-	-	25,000	-
Ethiopia			-	7,000	19,000	26,000	3,620,000
Gabon			2,000	49,000	1,000	58,000	-
Ghana			000	247,000	147,000	549,000	96,000
Guinea			1	-	77,000	526,000	-
Guinea-Bissau			5,000		-	17,000	54,000
Kenya			4,000	11,000	000	112,000	1,097,000
Liberia		000	49,000	-		172,000	-
Madagascar		32,000	32,000	12,000	-	76,000	827,000
Malawi	-	19,000	240,000	136,000	-	395,000	13,000
Mali	171,000	458,000	11,000	-	-	640,000	244,000
Mauritania	-	-	3,000	26,000	44,000	73,000	86,000
Mozambique	337,000	406,000	183,000	77,000	-	1,003,000	237,000
Niger	192,000	628,000	100,000	-	-	920,000	281,000
Nigeria	2,830,000	3,188,000	890,000	301,000	-	7,209,000	788,000
Sierra Leone	178,000	-	37,000	-	-	215,000	-
Somalia	-	80,000	30,000	16,000	-	126,000	412,000
South Sudan	129,000	199,000	164,000	-	-	492,000	13,000
Togo	61,000	73,000	78,000	-	67,000	279,000	-
Uganda	181,000	192,000	650,000	327,000	243,000	1,593,000	163,000
United Republic of Tanzania	-	33,000	77,000	385,000	41,000	536,000	1,783,000
Zambia	15,000	33,000	113,000	160,000	88,000	409,000	312,000
TOTAL	**7,942,000**	**7,790,000**	**4,471,000**	**2,348,000**	**1,627,000**	**24,178,000**	**11,065,000**

DRC
~2 million
Children in
Cat. 1 areas

Solidarity cap:

Initially, if there are unmet vaccine requests for greatest need areas across multiple countries, no single country should receive more than 20% of total available supply.

Initial cap is
1 million doses
per year

⚠ **** Numbers in the table are indicative only -*** *countries will present their own data.* ***Additional countries may identify areas of need***

So when and how will the Framework be applied?

- The Framework will be applied **following each Gavi application round to all successful proposals,** i.e. proposals recommended for approval by Gavi's Independent Review Committee (IRC)

Gavi application rounds & IRC review dates in 2022

ROUND OPENING (ON THE PORTAL)	2023 DEADLINE FOR SUBMISSION	2023 IRC MEETING (INDICATIVE DATES)
~2mths prior	17 January	13–24 March
~2mths prior	18 April	19–30 June
~2mths prior	18 July	19–29 September
~2mths prior	3 October	27 Nov – 8 Dec

- Firm vaccine allocation decisions by Gavi will initially be:
  - Limited to category 1 (greatest need) areas
  - Subject to the cap (= max. 1 million doses per year)

So, what if there is not enough supply for all category 1 areas for all countries that apply?

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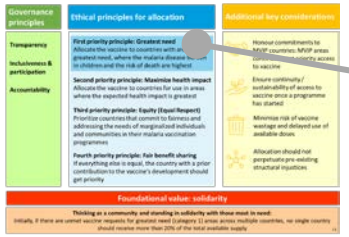

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Fourth priority principle: Fair benefit sharing
If everything else is equal, the country with a prior contribution to the vaccine's development should get priority

If supply is not sufficient to satisfy all country demands within the same category of need, this second allocation principle will be applied: the country with the lower drop-out rate would get priority.

Proxy measure. Drop-out rate between the third dose of Diphtheria-tetanus-pertussis vaccine (DTP3) and the first dose of Measles-virus containing vaccine (MCV1).

Preferably, this drop-out rate should be below 10% to minimize sub-optimal vaccine use

Key implications for countries (1)

- Due to supply constraints, interested countries are not guaranteed access to the malaria vaccine during the initial years of rollout; the goal is to ensure that the allocation of available supply adheres to values and principles of solidarity, greatest need, impact, and equity
- All countries will have to consider a phased approach to vaccine implementation, starting in areas with highest need, with expansion after supply increases.
- For the application to Gavi:
  - Countries are invited to present the **full scope** of desired vaccine roll-out in regions with moderate to high transmission (i.e. supply-unconstrained).
  - **Countries have to present a sub-national stratification of areas according to the categories of need in the Framework and related thresholds**, based on best available local evidence.
  - Provide more details on the proposed **scope of the first phase** of vaccine roll-out that would be implemented in greatest need areas while there is limited supply.

Key implications for countries (2)

- The Framework clarifies the allocation principles, but does not remove all uncertainties, e.g.:
  - Vaccine quantities are not set aside for each country
  - The country-specific analysis / stratification will confirm the areas of need (e.g. “category 1 areas”)
  - The outcome of the review by Gavi’s Independent Review Committee matters: high quality applications are more likely to be recommended for approval
  - Interest by other countries and timing of their application
  - Uncertainty about timing of supply increase
- To help manage expectations and support decision-making and planning, countries are informed through a dialogue about the supply, potential initial allocation quantities and implications - > transparency and communication will be maintained as the situation evolves.

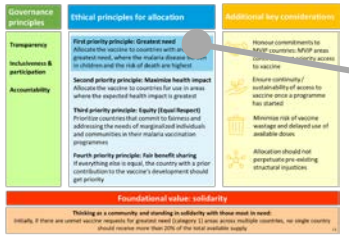
Thank you for your attention

These are the first babies vaccinated with the new malaria vaccine in Malawi, Ghana, and Kenya (from left to right) in 2019, at the start of the Malaria Vaccine Implementation Programme (MVIP)

Temporary Advisers for the development of the Framework for allocation of limited supply

Drawing expertise from the AFRO Regional Immunization Technical Advisory Group (RITAG), the Strategic Advisory Group of Experts on Immunization (SAGE), the Malaria Policy Advisory Group (MPAG), the Malaria Vaccine Implementation Programme Advisory Group (MVIP PAG), the WHO ACT Accelerator Ethics Working Group, CSOs and pilot implementation countries

Professor Helen Rees (Co-Chair)	Chair of AFRO Regional Immunization Technical Advisory Group (RITAG) & Executive Director, Wits RHI, University of the Witwatersrand, Johannesburg, South Africa
Professor Rose Leke (Co-Chair)	Emeritus Professor of Immunology and Parasitology and Fellow of the Cameroon Academy of Sciences CAS, the African Academy of Science (AAS) and The World Academy of Science, (TWAS), Université de Yaoundé, Cameroon
Professor Brieger William	Member of AFRO RITAG & Professor, Health Systems Program, Department of International Health, The Johns Hopkins Bloomberg School of Public Health
Dr Folake Olayinka	Member of AFRO RITAG & Immunization Team Leader, U.S Agency for International Development
Professor Richard Adegbola	Member of AFRO RITAG & Research Professor & Consultant, Nigerian Institute of Medical Research
Professor Alejandro Cravioto	Chair of the Strategic Advisory Group of Experts on Immunization (SAGE) & Affiliated with the Faculty of Medicine of the Universidad Nacional Autónoma de México (UNAM)
Professor Dyann Wirth	Chair of the Malaria Policy Advisory Group (MPAG) & Director, Defeating Malaria: From the Genes to the Globe, Harvard University and Faculty Director, Harvard Integrated Life Sciences Ph.D. Programs
Dr Fredros Okumu	Member of MPAG & Public Health Researcher and Director of Science at Ifakara Health Institute, Tanzania
Professor Evelyn Korkor Ansah	Member of MPAG & Director, Center for Malaria Research, University of Health and Allied Sciences, Ghana
Dr Bvudzai Magadzire	Senior Technical Advisor for Research & Advocacy at VillageReach, based in Cape Town, South Africa; Gavi Alliance Alternate Board member representing Civil Society Organizations
Dr Caesar Atuire	Senior Lecturer, Department of Philosophy and Classics, University of Ghana, Accra, Ghana & Member of the WHO ACT Accelerator Ethics Working Group
Professor Fred Binka	Expert from MVIP Pilot country (Ghana) & Professor of Epidemiology and the Vice Chancellor of the University of Health and Allied Sciences Ho, Ghana
Dr Rose Jalang'o	Expert from MVIP Pilot country (Kenya) & Strategic Information Management and Communications Officer in the National Vaccines and Immunization Program, within the Kenya Ministry of Health
Professor Peter Smith	Chair of MVIP Programme Advisory Group (PAG) & Professor of Tropical Epidemiology, London School of Hygiene and Tropical Medicine (LSHTM), UK
Dr Eusebio Macete	Co-Chair of MIVP Programme Advisory Group (PAG) & Director, Farmácias de Moçambique SA, Mozambique
Professor Keymanthri Moodley	Distinguished Professor in Department of Medicine and Director of the Centre for Medical Ethics and Law, Stellenbosch University, South Africa and Adjunct Professor, Department of Social Medicine, University of North Carolina- Chapel Hill, USA



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- Indicator: Measurement and monitoring through the **Gavi IRC** in line with the established Gavi processes, requirements and suggested analyses related to coverage & equity

Operationalization:

- **All countries should describe in their application to Gavi how they implement an equity approach in their planning for and implementation of the malaria vaccine.**
- **Countries will be required to detail the rationale for targeting specific subnational geographies for malaria vaccination.**

Solidarity cap example

- **Example:**
  - In DRC, there are almost 2 million children born each year in category 1 areas
    - *Using simplified assumptions (100% coverage for all doses), this would mean that the country would need 2 million x 4 doses = 8 million doses per year → above the cap*
  - With a cap of 1 million, DRC would have to further prioritize within category 1 areas:
    - **Select a sub-set of category 1 areas with an appropriate target population size so that no more than 1 million doses would be needed each year**:
    - *Using simplified assumptions (100% coverage for all doses):*

      *Area with **250,000 children** born each year x 4 doses = 1 million doses*
  - The Framework does not prescribe how to further prioritize within category 1 areas

Who is affected by the cap?

- Only countries with relatively large category 1 areas will be affected by the cap
- As a rough indication, if the annual birth cohort of your country's **category 1 areas** add up to **more than 250,000 children**, your country might be affected by the cap
- Caveat: coverage for each dose will affect this number
- Example:

  Target area: **280,000 children** in target population each year
  Coverage: 90% for each dose
  Wastage: 10%
  -> Would require 950,000 doses per year

- Countries affected by the cap should take the likely coverage and wastage assumptions into account when working out what an appropriate target areas is

Who is NOT affected by the cap?

- Countries for which the total size of the target population in **category 1 areas** is below approximately 250,000 children per year (with coverage caveat mentioned before)
- **For these countries, if enough supply is available, the first allocation would correspond to the size of the category 1 areas** (i.e. less than 1 million doses per year)
- Example:
  - 150,000 children born each year in category 1 areas
  - This could be the country's first phase of introduction
  - No further prioritization needed within category 1 areas

- Important: if following an IRC round, there is not enough supply to meet the needs of all countries' category 1 areas, the **second allocation principle** would apply (with the proxy indicator being the drop-out rate between DTP3 and MCV1)