Malaria in older children and adolescents and the intermittent preventive treatment of malaria in school-aged children

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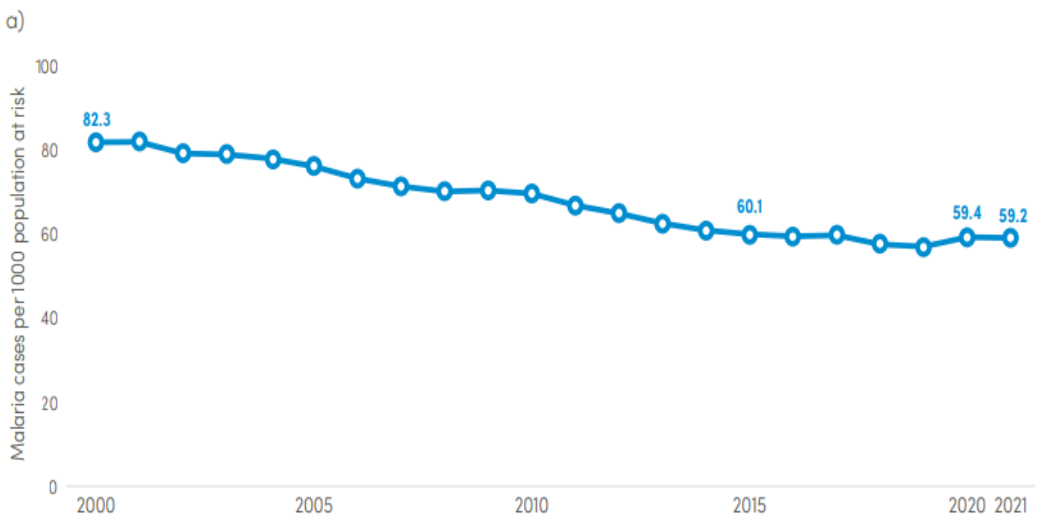
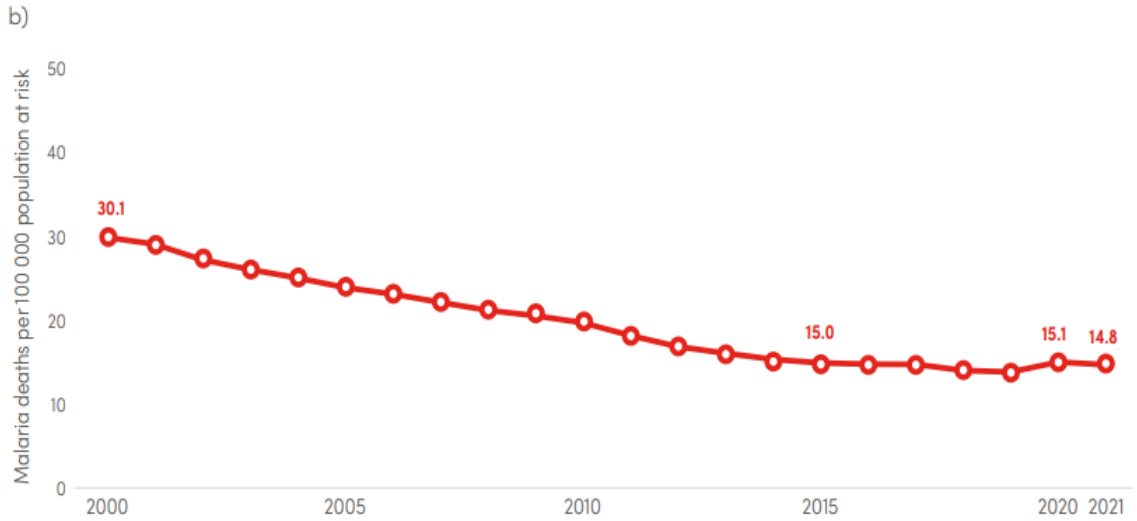
21st October 2023

72nd Annual Meeting of the American Society of Tropical Medicine & Hygiene

Background: Global malaria trends





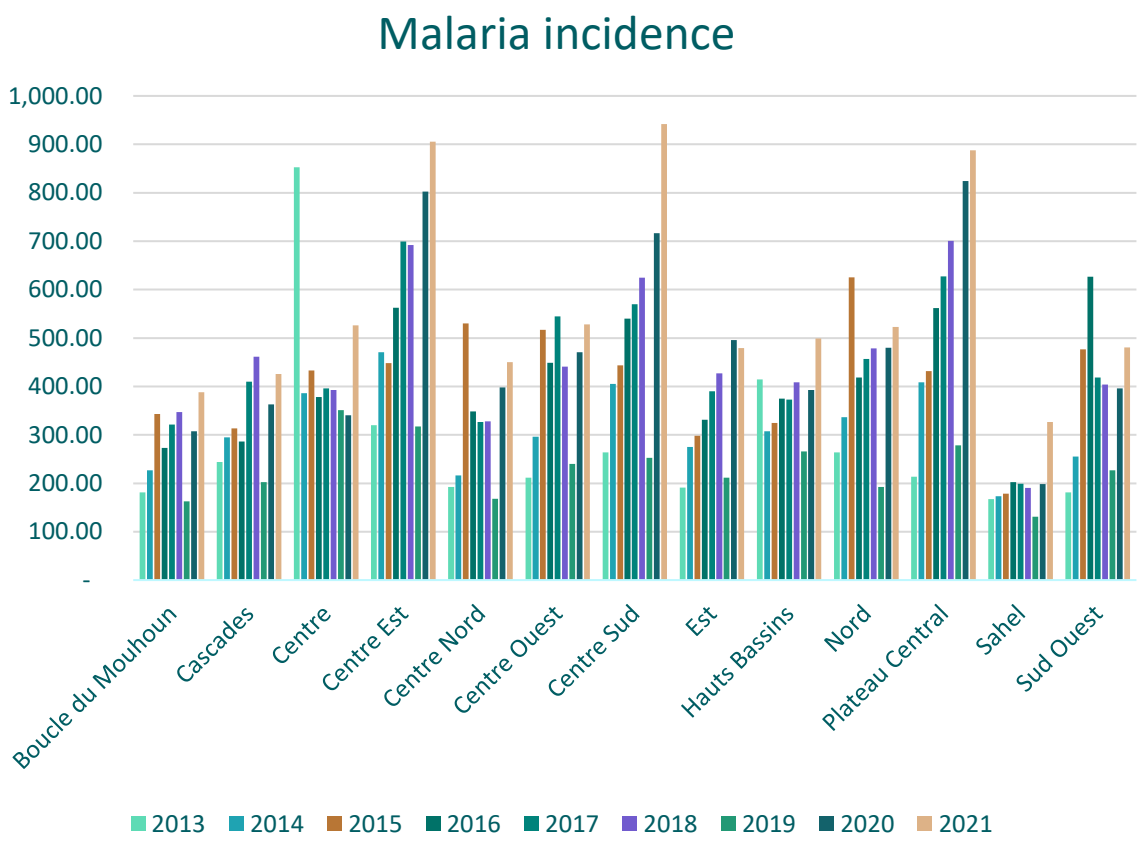
Emerging challenges that may have contributed to this include:

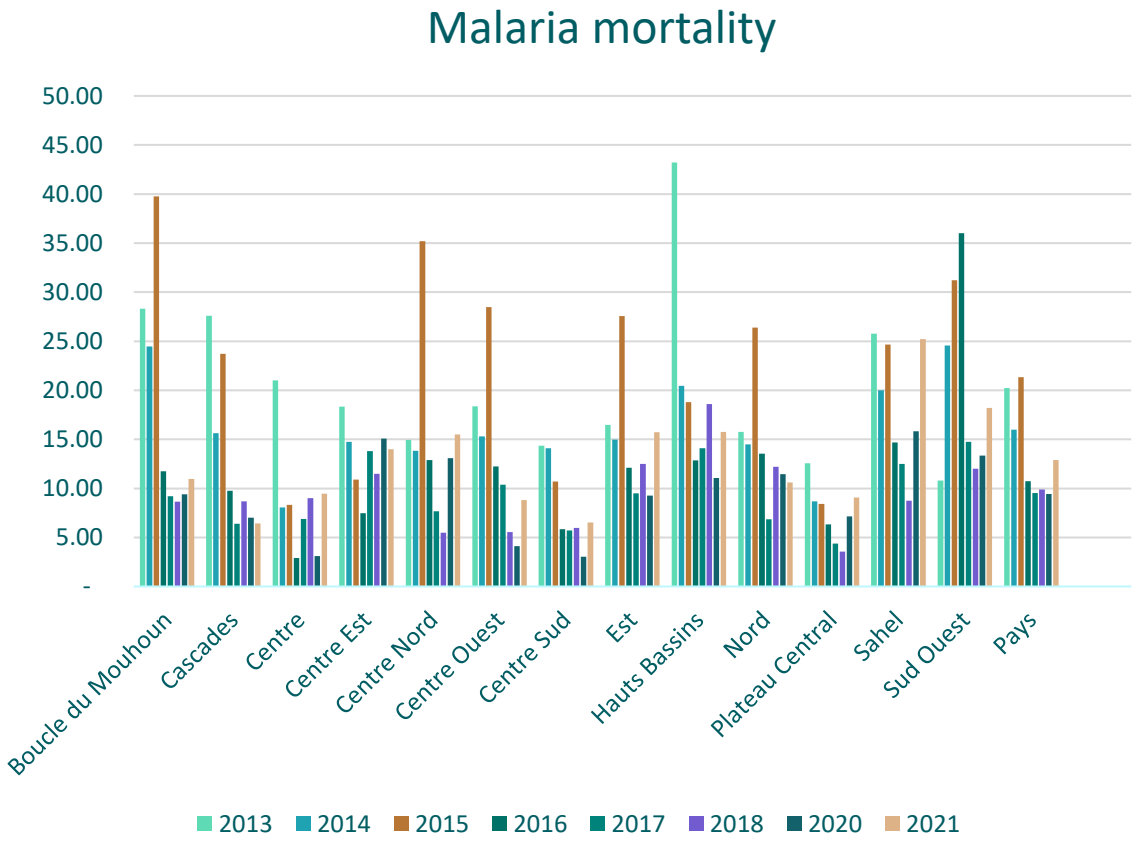
- intervention coverage gaps
- insecticide resistance
- mobile and migrant populations
- **changing epidemiological patterns with shifts in at-risk populations**

Children 5–15 years: Why this age group needs attention

- Studies consistently indicate that this age group exhibits a high prevalence of malaria infection and often does not report associated symptoms.
- School-aged children are more likely to be sub-microscopic carriers of malaria and less inclined to use nets or receive treatment.
- The escalating burden of severe disease within this age group is anticipated to result in higher mortality rates.
- Malaria infection in this age group affects not only children’s health and education but also contributes to further parasite transmission, hindering elimination efforts.

Malaria incidence and mortality in children aged 5–14 years by region, Burkina Faso, 2013–2021

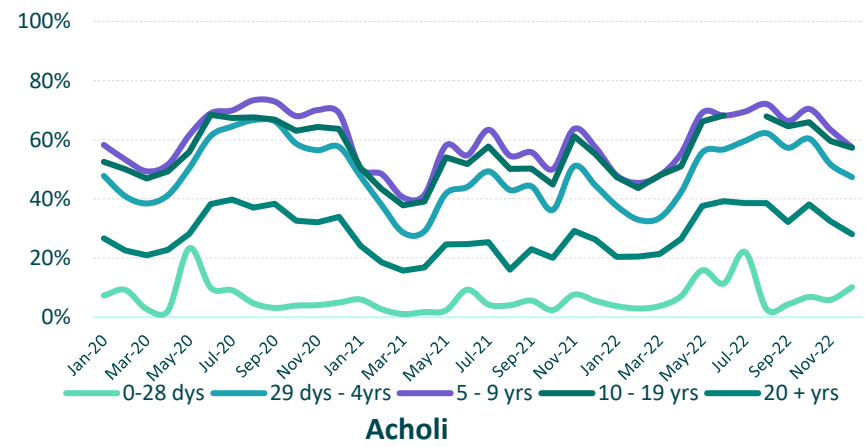




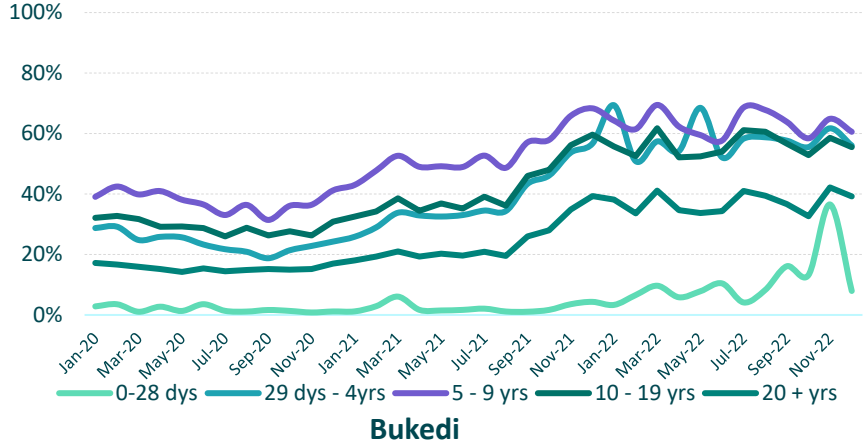
Malaria prevalence at the start of the transmission season, Boussé, Burkina Faso, 2023

Age categories	Rapid diagnostic test results				
	Positive n=622	Negative n=1,382	Test positivity rate	Difference in proportion	p value
<5 years	53	351	53/404 (13%)	Reference	
5–15 years	508	691	508/1,199 (42.4%)	29.2	0.001
>15 years	61	340	61/401 (15.2%)	2.1	0.393

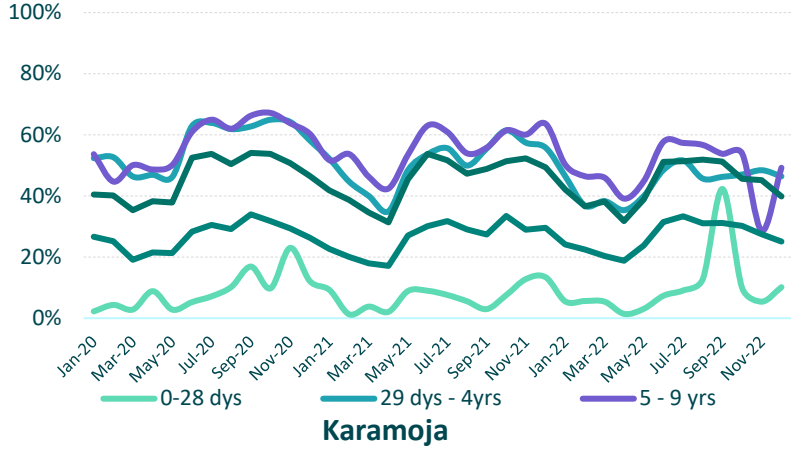
Proportion of confirmed malaria cases at out-patient clinics by age group, Uganda, 2020–2022



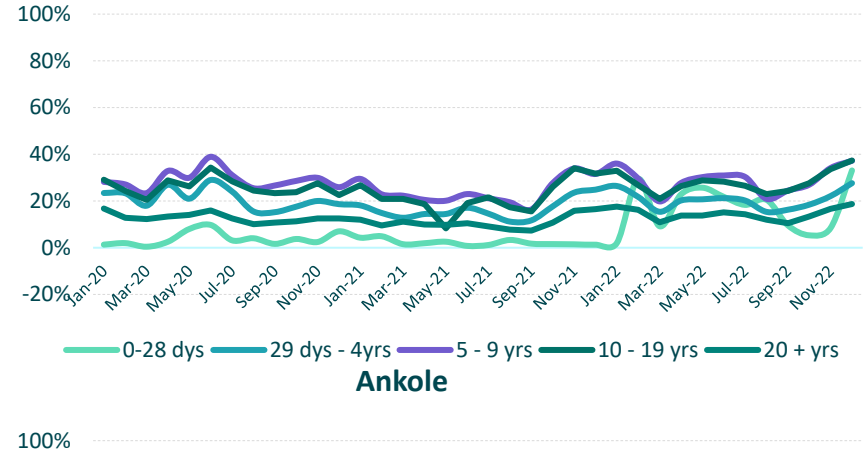
Acholi



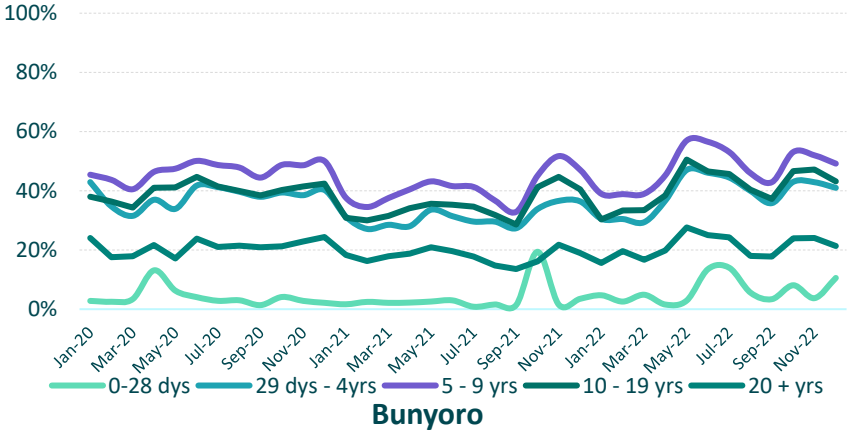
Bukedi



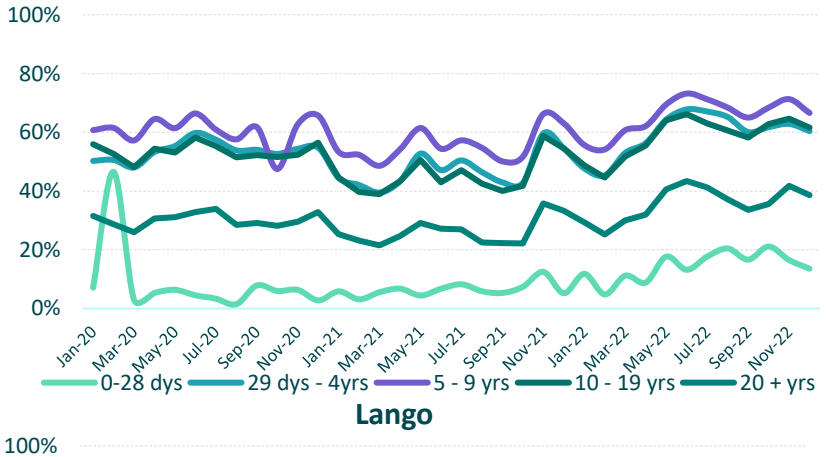
Karamoja



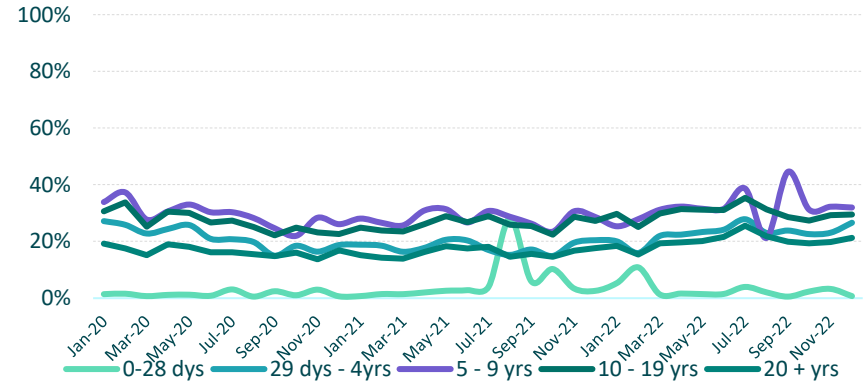
Ankole



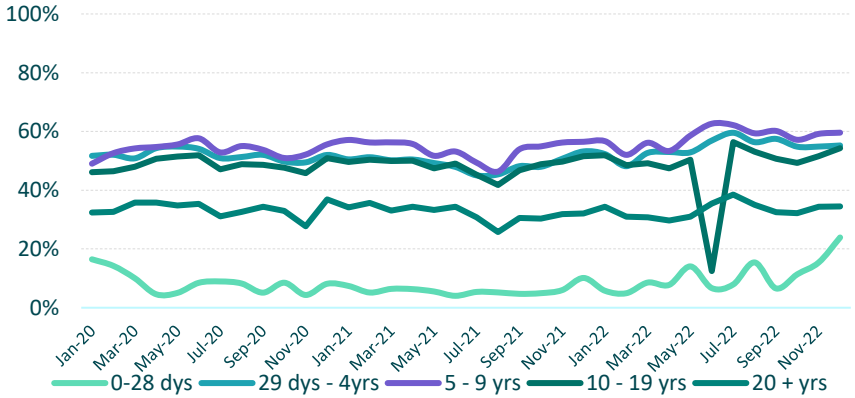
Bunyoro



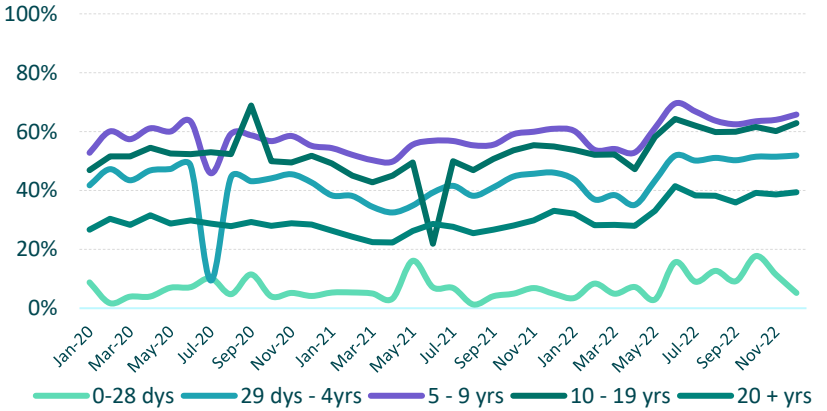
Lango



Bugisu

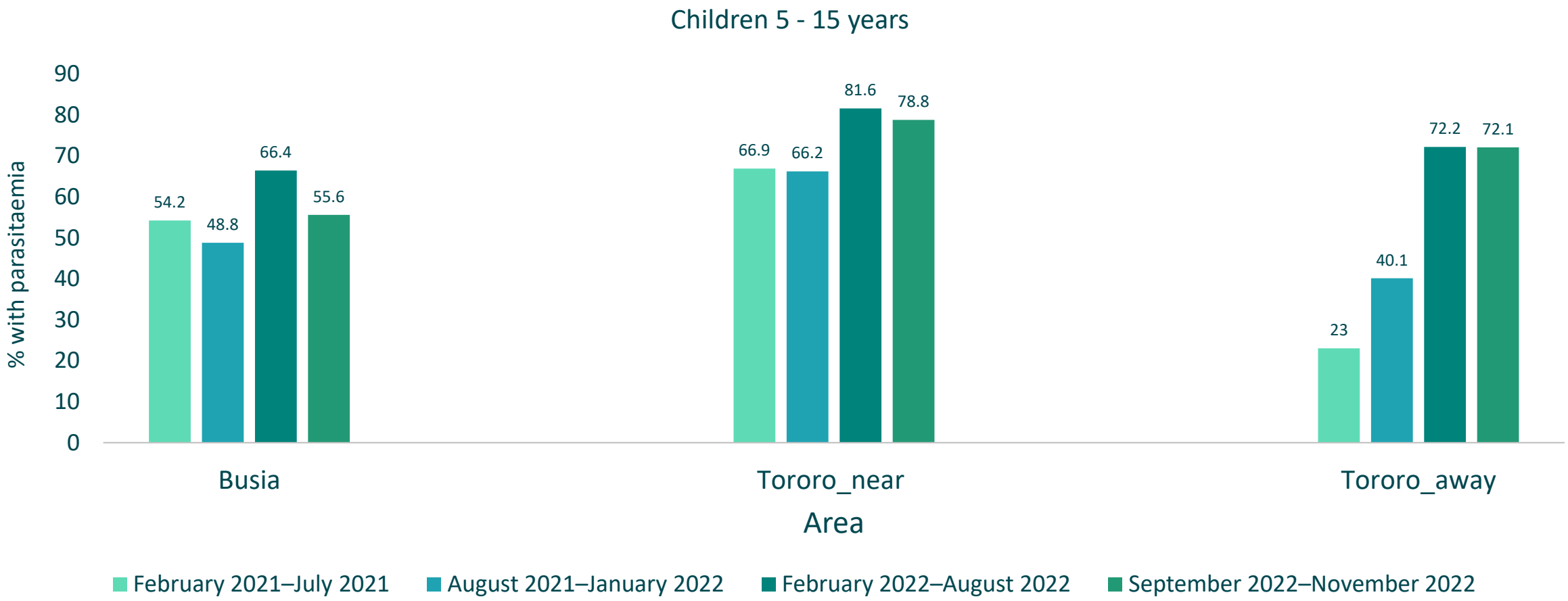


Busoga

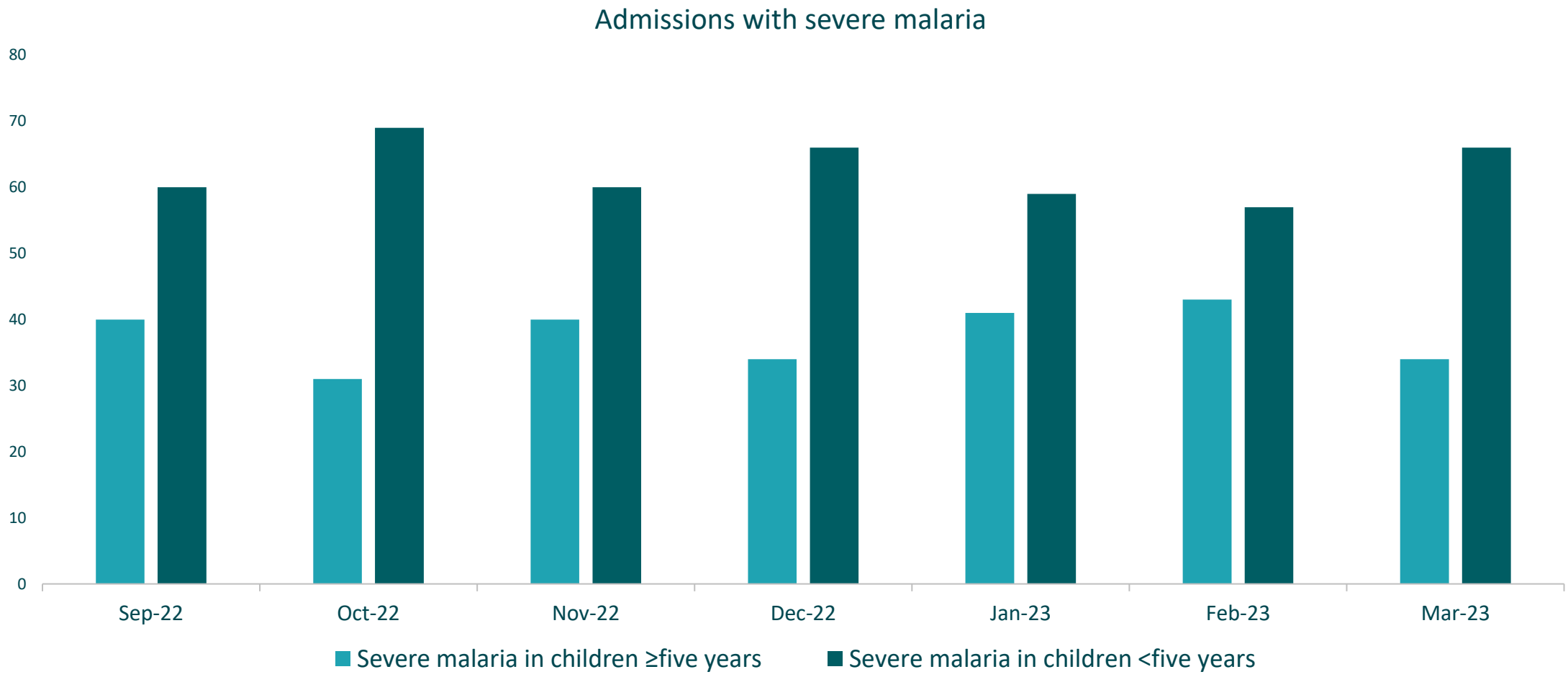


Teso

Longitudinal changes in malaria prevalence in school-aged children, Eastern Uganda, 2021–2022



Inpatient malaria trends, Mulago Hospital, Uganda, 2022–2023



Mapping malaria interventions by target populations, Burkina Faso and Uganda

Strategies/interventions	Target populations				Zones
	<5 years	5–14 years	>15 years	Pregnant women	
Case management, diagnosis and treatment	X	X	X	X	Countrywide
Long-lasting insecticide treated nets mass campaign	X	X	X	X	Countrywide/every three years
Long-lasting insecticide treated nets routine distribution	X			X	Countrywide
Intermittent preventive treatment of malaria during pregnancy (IPTp)				X	Countrywide
Seasonal malaria chemoprevention (SMC)	X				Burkina Faso: Countrywide Uganda: Focal

Intermittent preventive treatment of malaria in school-aged children (IPTsc)

Conditional recommendation for , Low certainty evidence

New

Intermittent preventive treatment of malaria in school-aged children (2022)

School-aged children living in malaria-endemic settings with moderate to high perennial or seasonal transmission can be given a full therapeutic course of antimalarial medicine at predetermined times as chemoprevention to reduce disease burden.

- *IPTsc has been evaluated in children aged 5–15 years. The burden of malaria and benefits of IPTsc may vary across this age range, but evidence is limited.*
- *National malaria programmes can consider IPTsc if resources allow for its introduction among school-aged children without compromising chemoprevention interventions for those carrying the highest burden of severe disease, such as children < 5 years old.*
- *Schools may provide a low-cost means to deliver chemoprevention to school-aged children. However seasonal variation in malaria transmission and the timing of school terms, as well as equity concerns, may mean alternative delivery channels are needed to maximize impact.*
- *First- and second-line malaria treatments should not be used for IPTsc if safe and effective alternatives are available (see "Practical info").*
- *The dosing schedule for IPTsc should be informed by the local malaria epidemiology and timed to give protection during the period of greatest malaria risk (see "Practical info").*
- *Moderate to high malaria transmission settings are defined as areas with P. falciparum parasite prevalence greater than 10% or an annual parasite incidence greater than 250 per 1000 [31]. These thresholds are indicative and should not be regarded as absolutes for determining applicability of the IPTsc recommendation.*

Overview of implementation guidance: Status update

SMC

- Implementation field manual, second edition
  - Now published by WHO.

IPTp at community level

- New field manual to be developed by WHO

Perennial malaria chemoprevention

- Projects and early implementation are underway to gather the necessary evidence for expanding intermittent preventive treatment during infancy (IPTi) beyond the current recommendation and transitioning to perennial malaria chemoprevention. The development of an updated implementation field manual is planned.

IPTsc and post-discharge malaria chemoprevention

- Implementation guidance document not available
- Deployment studies and experience are required to develop implementation guidance documents. This will inform what medication to give, when to give and where to give it.

Summary of studies relating to IPTsc

	Years	Randomisation level	Treatment	Intervention strategy	Treatment interval
Weiss et al (1995), Kenya	1993	Individual	Doxycycline vs primaquine (PQ) vs mefloquine (MQ) + multivitamin vs proguanil + chloroquine (CQ)	Chemoprophylaxis	Weekly for MQ and CQ
Clarke et al (2008), Kenya	2005–2006	Cluster	Sulfadoxine-pyrimethamine plus amodiaquine (SPAQ)	IPT	Termly
Barger et al (2009), Mali	2007–2008	Individual	ASAQ vs SPAS	IPT	Every 2 months
Nankabirwa et al (2010), Uganda	2008	Individual	Sulfadoxine-pyrimethamine (SP) vs SPAQ vs dihydroartemisinin-piperaquine (DP)	Parasite clearance	Once
Rohner et al (2010), Côte d'Ivoire	2006–2007	Individual	SP	IPT	Every 3 months
Clarke et al (2012), Senegal	2012	Individual	SPAQ	Parasite clearance	Once
Halliday et al (2014), Kenya	2010–2012	Cluster	Artemether-lumefantrine (AL)	Screen and treat	Termly
Nankabirwa et al (2014), Uganda	2011–2012	Individual	DP termly vs monthly	IPT	Termly
					Monthly
Opoku et al (2016), Ghana	2011	Individual	AL	IPT	Every 3 months
Clarke et al (2017), Mali	2011–2012	Cluster	Sulfadoxine-pyrimethamine plus artesunate (SPAS)	Parasite clearance	Once
Matangila et al (2017), DRC	2012–2013	Individual	SP alone vs with piperaquine	IPT	Every 4 months
Staedke et al (2018) and Rehman et al (2019), Uganda	2014	Cluster	DP	IPT	Monthly
Thera et al (2018), Mali	2013–2014	Individual	Artesunate-amodiaquine (ASAQ)	IPT	Monthly
Makenga et al (2023), Tanzania	2019–2020	Individual	DP, ASAQ and standard of care	IPT	0, 4 and 8 months

- Studies vary in antimalarial medications and dosing regimens used.
- Outcome measures vary and include incidence of clinical malaria, prevalence of parasitaemia, anaemia and cognitive function.

Planned study: Burkina Faso

- The objectives of this study are to:
  - determine the baseline prevalence of malaria among children 5–15 years in the selected health district.
  - evaluate the efficacy, safety, implementation feasibility and cost-effectiveness of IPTsc with SPAQ and DP plus integrated vector management (IVM) for malaria prevention in this population.
  - determine the immunological and molecular epidemiological changes that occur in a nested population following IPTsc.

- Community-based IPTsc will be given monthly during the transmission season.
- Study timelines: June 2023–December 2024.

Planned study: Uganda

- Study objectives are:
  - to determine the current burden of malaria among school-aged children in different regions
  - to describe the temporal dynamics of malaria transmission among school-aged children
  - to evaluate the implementation feasibility, efficacy, safety and cost-effectiveness of IPTsc with DP alone, DP plus IVM and pyronaridine-artesunate (PA) given **twice every school term** in selected schools in Uganda
  - to describe the immunological and molecular epidemiological changes that occur in this population following IPTsc using these different treatment regimens.

- Study design:
  - Phase I: Targeted epidemiological surveys to collect data on current malaria burden, clinical consequences of malaria and malaria control interventions implemented in selected schools and communities in two regions of varying malaria transmission intensity
  - Phase II: A cluster randomised controlled trial to evaluate the feasibility, efficacy, safety and cost-effectiveness of implementing the three IPTsc approaches.

- IPTsc will be **given twice every school term** (six times per school year)
- Estimated timelines: March 2024–July 2026

Summary

- The burden of malaria in this age group is significant.

- IPTsc is recommended by WHO but the policy recommendations do not specify what to deploy, how to deploy and when to deploy.

- We have an opportunity to contribute much-needed evidence to inform IPTsc implementation and deployment guidelines to support scale-up in target countries. This includes:
  - Evidence for community-based seasonal administration of IPTsc in Burkina Faso
  - Evidence for perennial school-based administration of IPTsc in Uganda.

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Thank you

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