March 29th, 2022

New Nets Project interim results

Evidence from pilot evaluations

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PATH

1 Project background & overview

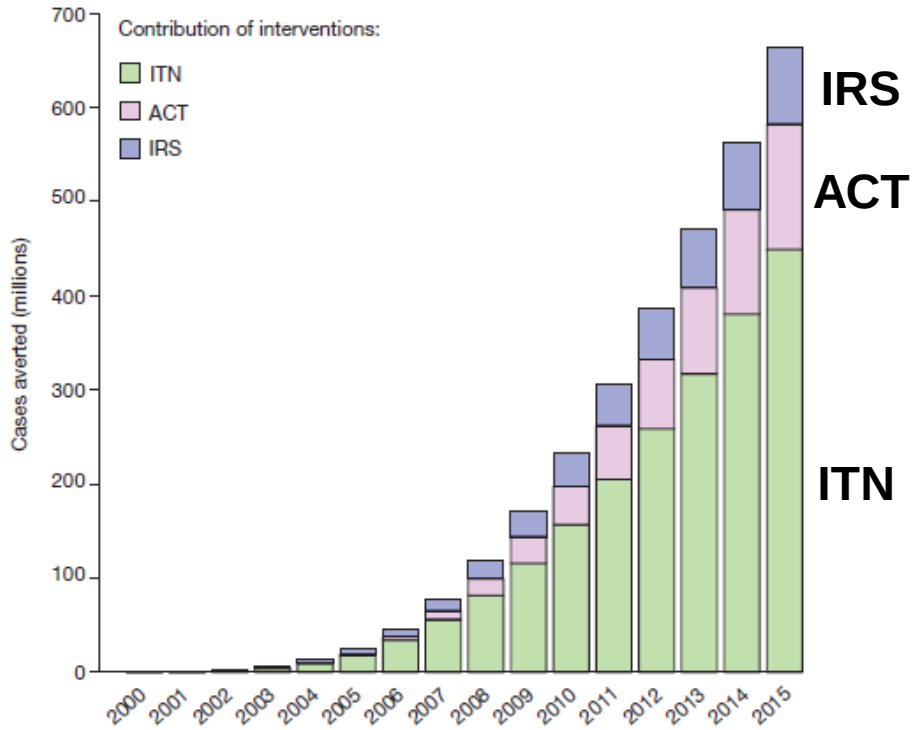
2 Interim results – Mozambique

3 Interim results – Burkina Faso

4 Key lessons to date

Background

A proven tool: **ITNs**

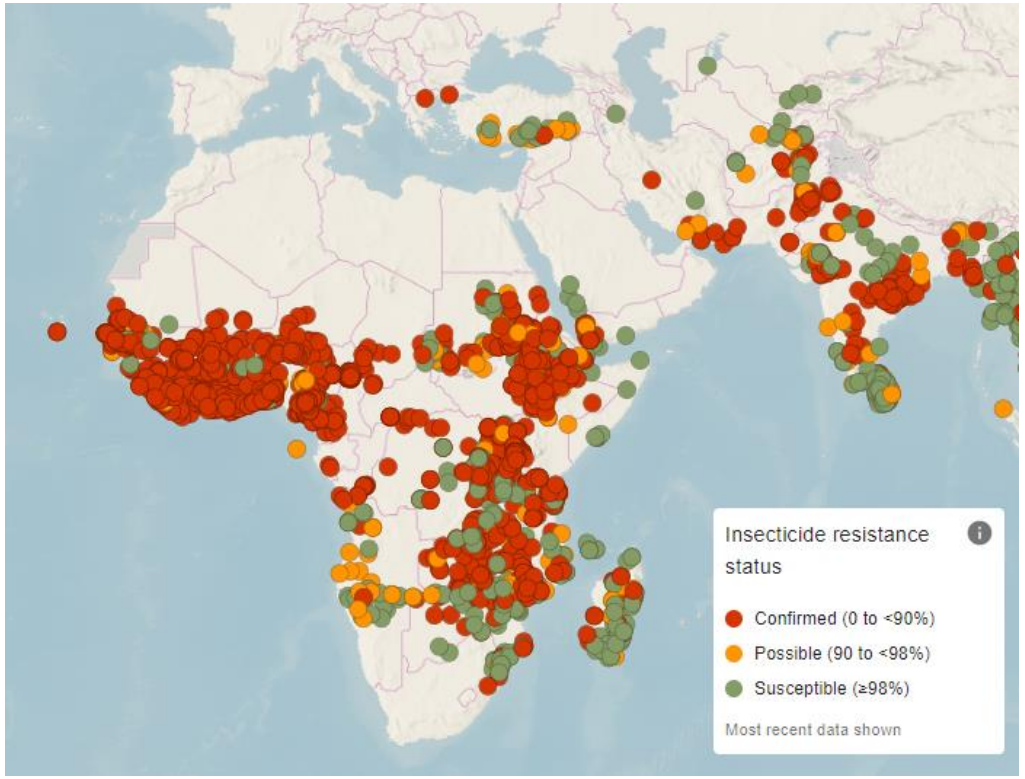


2000-2015

- 663 million clinical cases of malaria averted
- 68% of malaria cases averted by ITN
- 11% of malaria cases averted by IRS

The effect of malaria control on *Plasmodium falciparum* in Africa between 2000 and 2015, S. Bhatt et al, Sep 2015

The challenge: **insecticide resistance**



https://apps.who.int/malaria/maps/threats

Interim results – interpret with caution

Project overview

The New Nets Project

The New Nets Project (NNP), funded by Unitaid and the Global Fund and primed by IVCC, helps to pilot the next generation of nets, **dual-active ingredient ITNs.**

pyrethroid-only	**pyrethroid + synergist**	**pyrethroid + chlorfenapyr**	**pyrethroid + pyriproxyfen**
standard ITNs	PBO ITNs	Interceptor® G2 ITN	Royal Guard® ITN

- These new nets
  - Are more expensive
  - Still need a WHO policy recommendation

- NNP will help
  - Remove market barriers and **improve access** to dual-active ingredient ITNs
  - **Build the evidence** needed for WHO policy recommendation

PATH

Interim results – interpret with caution

The NNP will support research and enhanced surveillance activities to evaluate the impact of the different ITN types (2020 – 2022)

- Epidemiology
- Entomology
- Anthropology
- Cost-effectiveness
- Durability monitoring

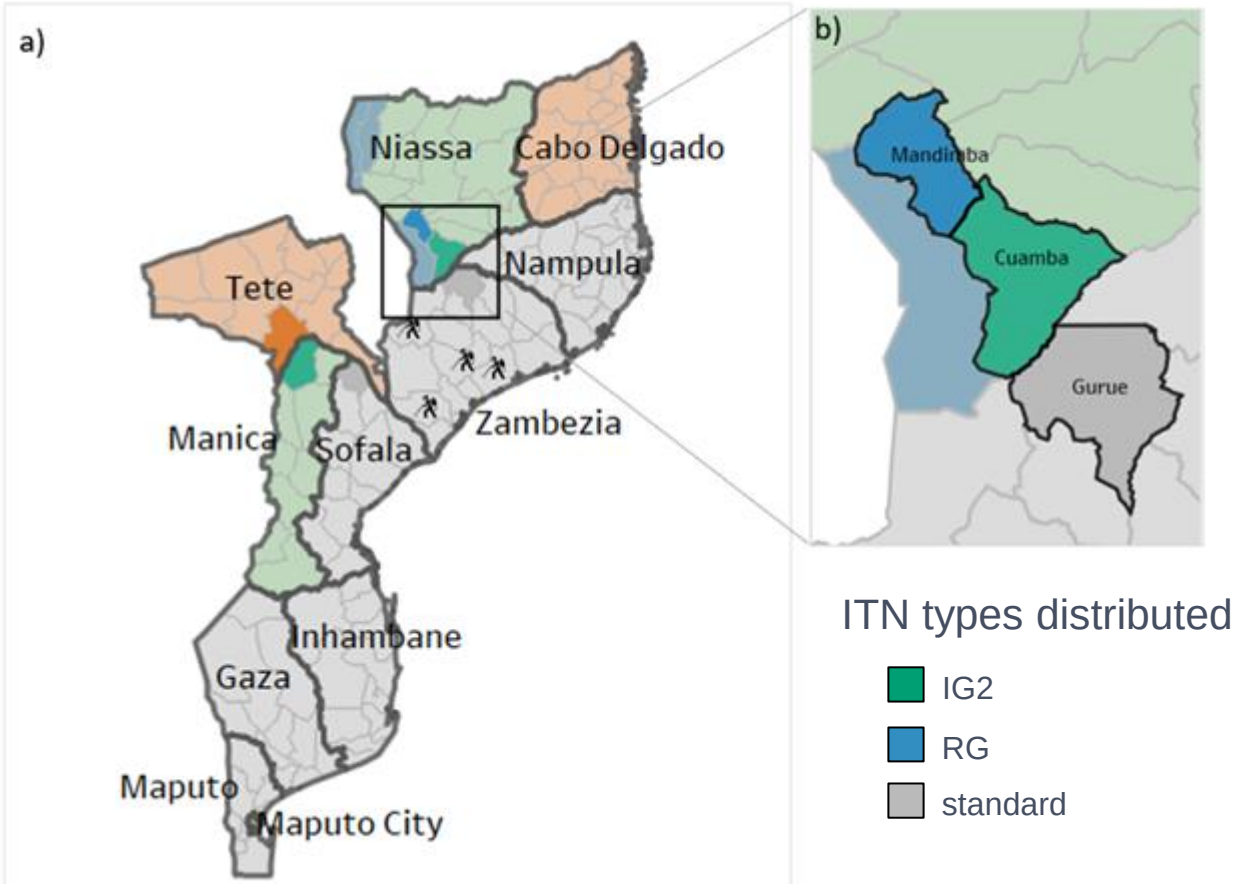
Mozambique - interim results

Dr. Baltazar Candrinho
Director, NMCP Mozambique

Study design

Northern Mozambique

a) 2020 ITN distribution campaign; b) pilot study districts

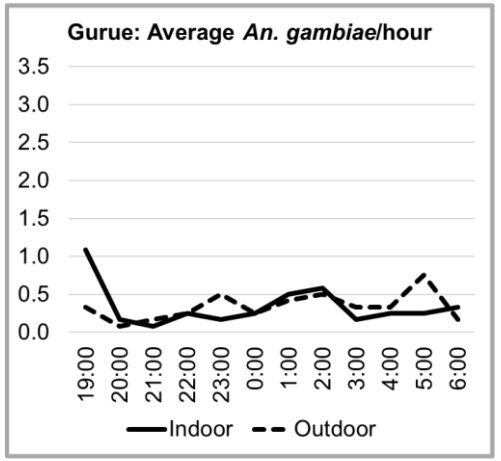


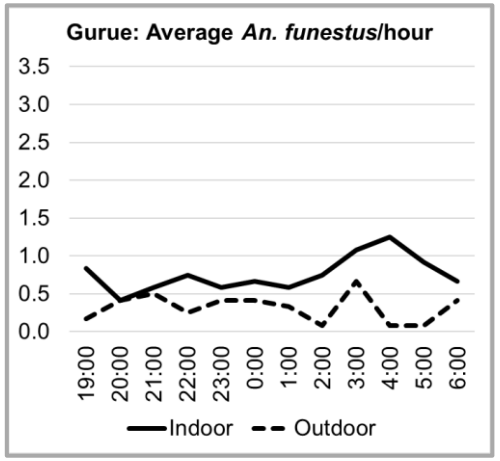
Interim results – interpret with caution

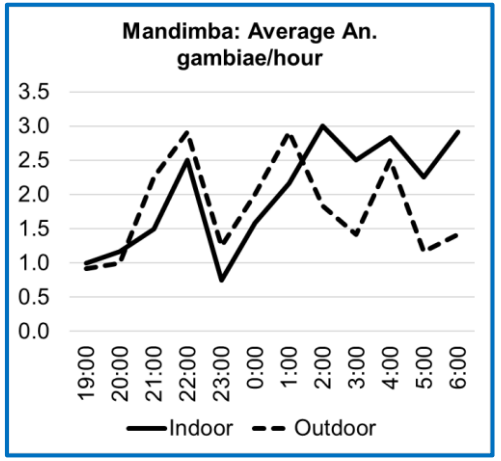
Vector landscape

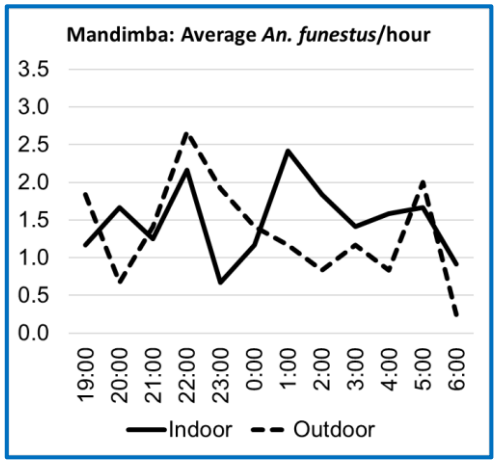
Northern Mozambique

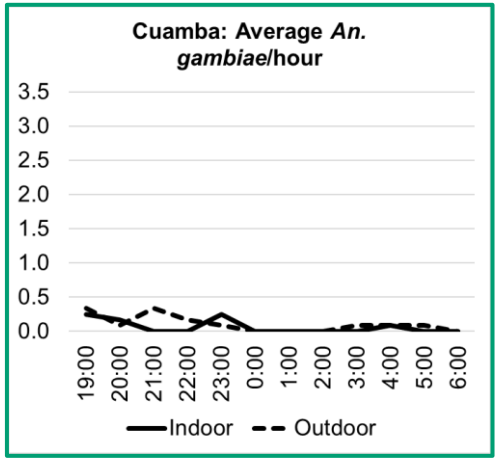
Nightly biting patterns of dominant vectors by district











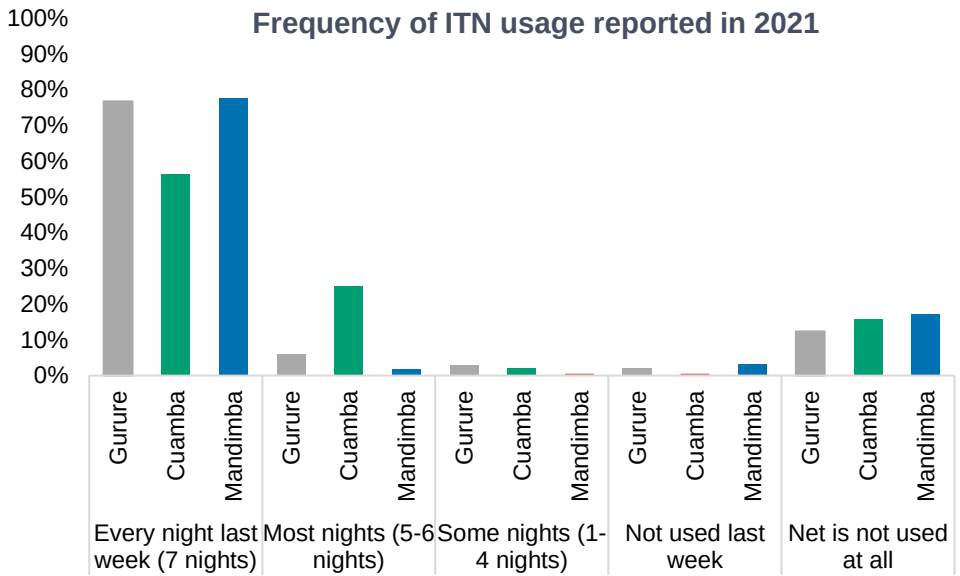
- Mix of *An. gambiae* s.s. and *An. funestus*
- No obvious peaks hours for biting – consistent throughout the night
- High to moderate levels of pyrethroid resistance mitigated by PBO
- Roughly equal rates biting indoors and outdoors

Interim results – interpret with caution

ITN landscape

Northern Mozambique

	Gurue (standard ITNs)		Cuamba (IG2 ITNs)		Mandimba (RG ITNs)	
	2020	2021	2020	2021	2020	2021
Population that slept under a net last night (95% CI)	**23.0%** (21.3%–24.7%)	**87.4%** (82.8%–90.8%)	**19.4%** (17.9%–21.0%)	**67.9%** (57.0%–77.1%)	**17.0%** (15.5%–18.6%)	**81.6%** (74.7%–87.0%)
Population ITN access (95% CI)	**23.1%** (21.8%–24.4%)	**85.7%** (82.5%–88.8%)	**21.0%** (19.7%–22.3%)	**64.8%** (54.8%–74.8%)	**16.4%** (15.3%–17.6%)	**75.5%** (69.0%–82.3%)
Use given access*	**0.99**	**1.02**	**0.92**	**1.05**	**1.03**	**1.08**



- ITN access and usage went up significantly after the campaign
- Most ITNs were reported to have been used every night

Interim results – interpret with caution

Malaria burden to date

Northern Mozambique

	Gurue (standard ITNs)		Cuamba (IG2 ITNs)		Mandimba (RG ITNs)	
	2020	2021	2020	2021	2020	2021
Population that slept under a net last night (95% CI)	**23.0%** (21.3%–24.7%)	**87.4%** (82.8%–90.8%)	**19.4%** (17.9%–21.0%)	**67.9%** (57.0%–77.1%)	**17.0%** (15.5%–18.6%)	**81.6%** (74.7%–87.0%)
Population ITN access (95% CI)	**23.1%** (21.8%–24.4%)	**85.7%** (82.5%–88.8%)	**21.0%** (19.7%–22.3%)	**64.8%** (54.8%–74.8%)	**16.4%** (15.3%–17.6%)	**75.5%** (69.0%–82.3%)
Use given access*	**0.99**	**1.02**	**0.92**	**1.05**	**1.03**	**1.08**

- ITN access and usage went up significantly after the campaign

	Gurue (standard ITNs)		Cuamba (IG2 ITNs)		Mandimba (RG ITNs)	
	2020	2021	2020	2021	2020	2021
Malaria prevalence for children under 5 years old (RDT+) (95% CI)	**64.9%** (54.8%–75.0%)	**52.5%** (42.9%–61.9%)	**47.5%** (38.1%–57.0%)	**29.4%** (20.9%–39.5%)	**66.0%** (57.5%–74.4%)	**46.2%** (38.2%–54.4%)

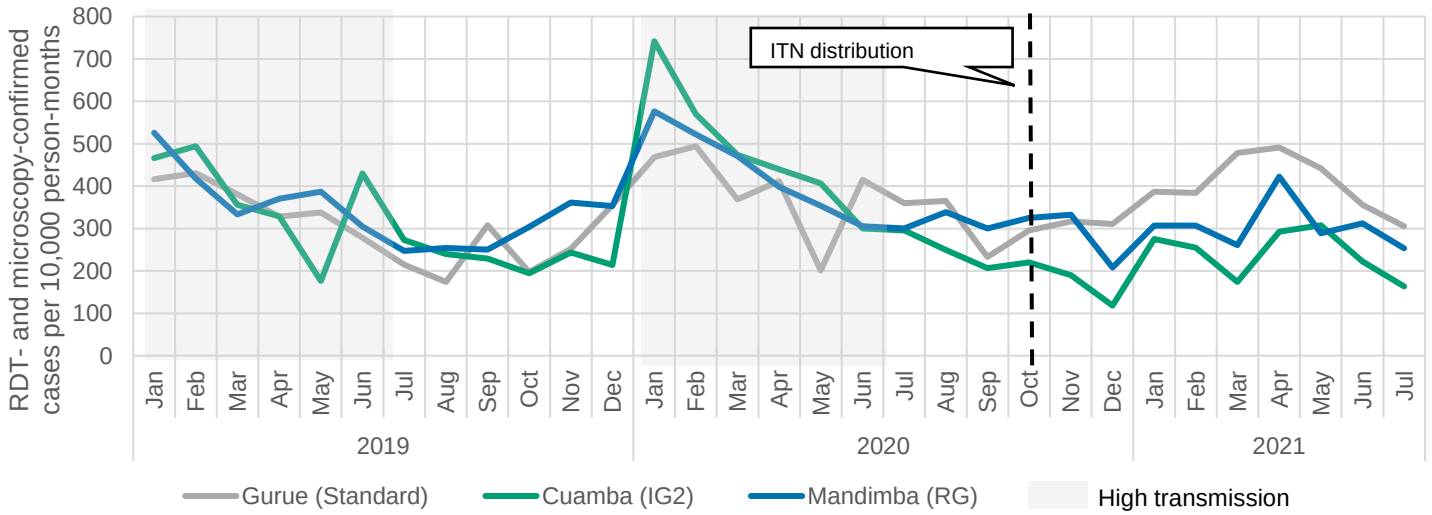
- **Malaria burden decreased significantly as well**
  - **~19% in Gurue (standard)**
  - **~38% in Cuamba (IG2)**
  - **~30% in Mandimba (RG)**

Interim results – interpret with caution

Malaria burden to date

Northern Mozambique

Average monthly incidence rate (per 10,000 person-months) by district, 2019–2020



Difference-in-difference (DiD) comparison of malaria incidence with next-generation ITNs and standard pyrethroid ITNs

	2021 year 1 (Jan–June) change from baseline	DiD relative to standard ITNs
Gurue (standard ITNs)	**8%** (−3% to 24%)	
Cuamba (IG2 ITNs)	**−48%** (−52% to −40%)	**56%**
Mandimba (RG ITNs)	**−28%** (−31% to −23%)	**36%**

Passive malaria case incidence rates from 2020 to 2021 indicated:

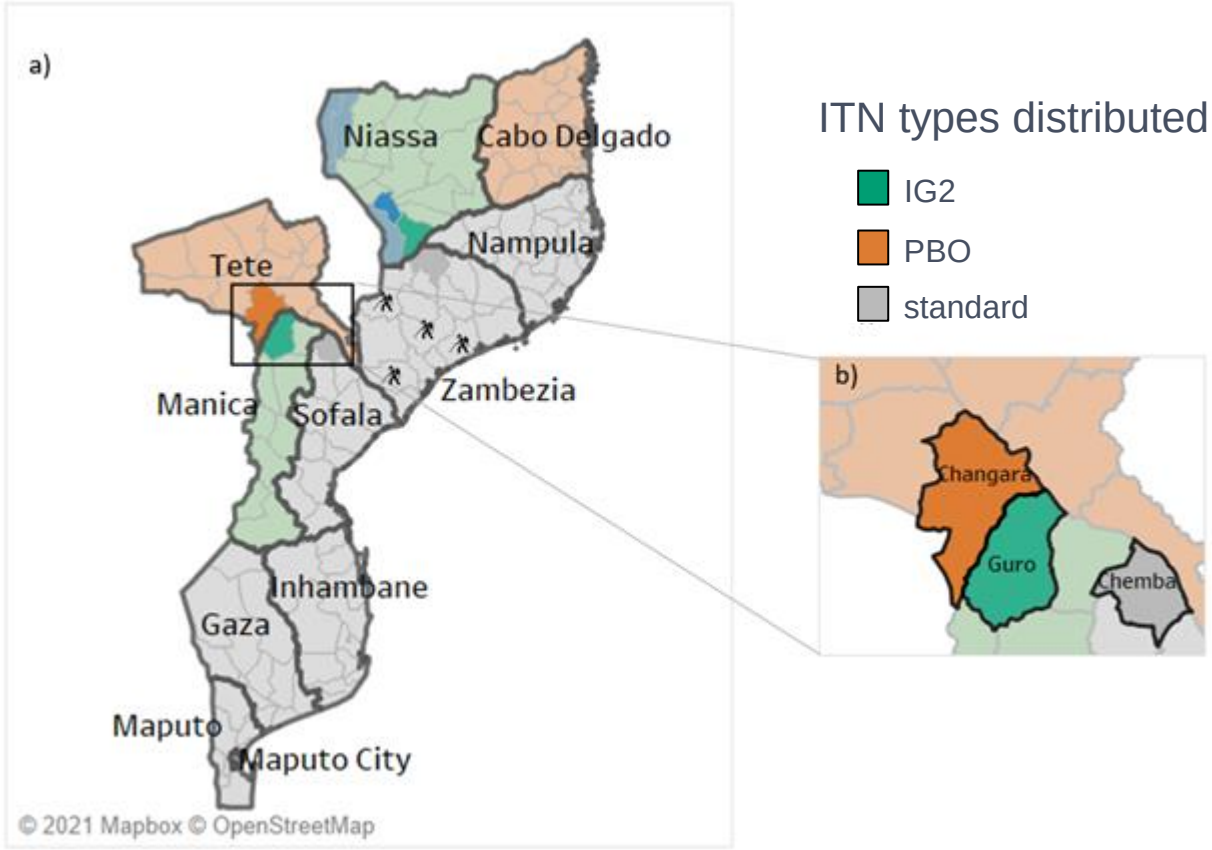
- Similar number of cases in Gurue (standard)
- ~28% fewer cases in Mandimba (RG)
- ~48% fewer cases in Cuamba (IG2)

Interim results – interpret with caution

Study design

Western Mozambique

a) 2020 ITN distribution campaign; b) pilot study districts



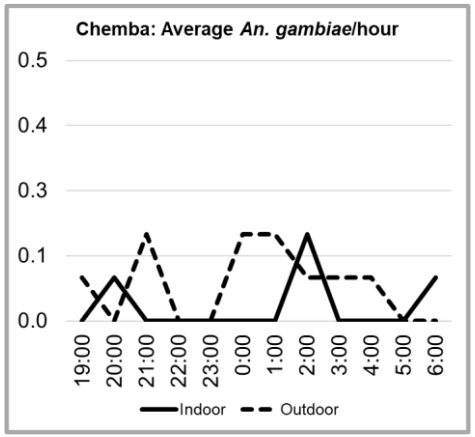
Interim results – interpret with caution

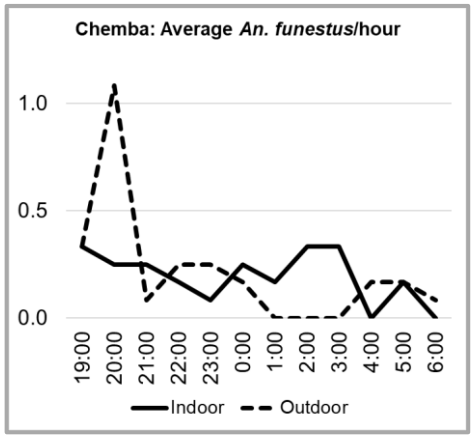
Vector landscape

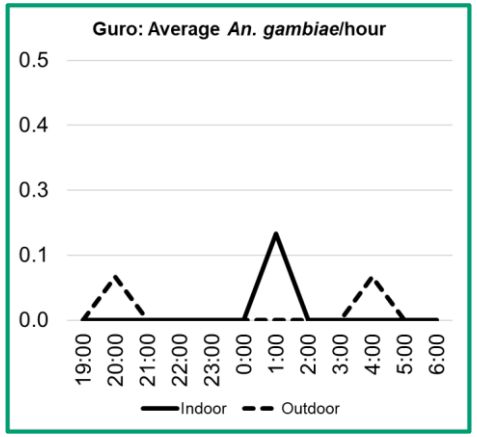
Western Mozambique

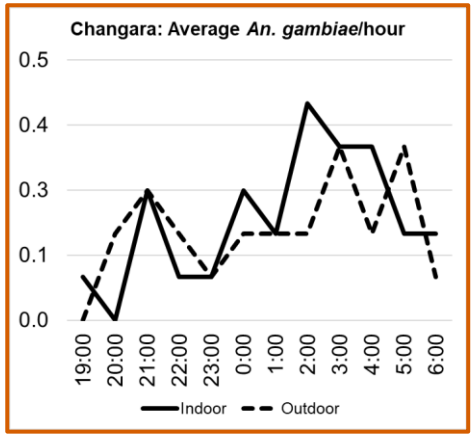
- Mix of *An. gambiae* s.s. and *An. funestus*
- No obvious peaks hours for biting – consistent throughout the night
- High to moderate levels of pyrethroid resistance mitigated by PBO
- Roughly equal rates of biting indoors and outdoors

Nightly biting patterns of the dominant vector species







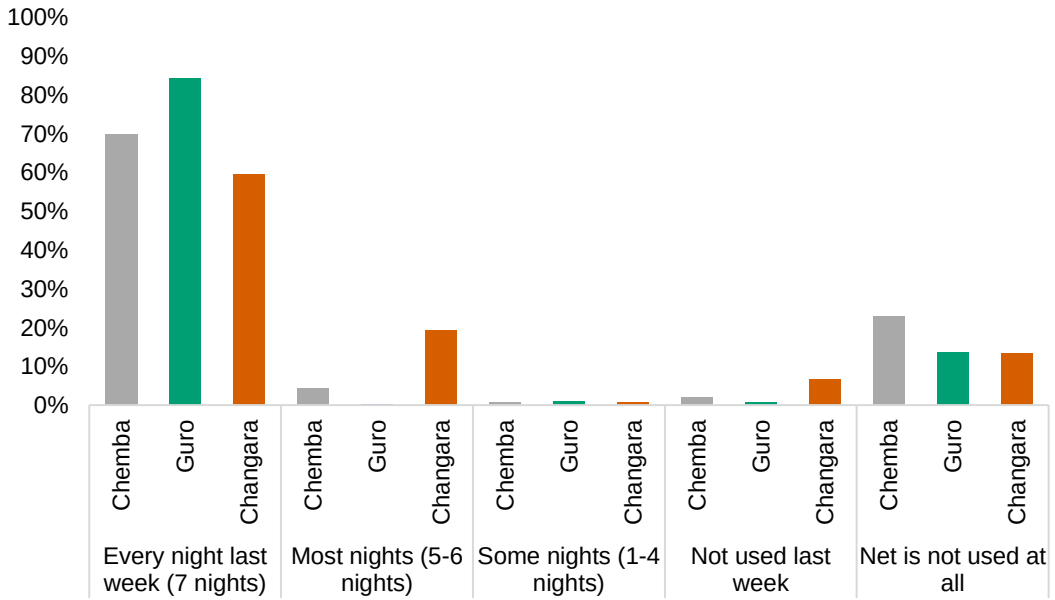


Interim results – interpret with caution

ITN landscape

Western Mozambique

	Chemba (Standard ITNs)		Guro (IG2 ITNs)		Changara (PBO ITNs)	
	2020	2021	2020	2021	2020	2021
Population that slept under a net last night (95% CI)	**33.3%** (32.1%–34.7%)	**90.1%** (87.1%-92.4%)	**18.5%** (17.2%–19.8%)	**92.8%** (90.4%–94.7%)	**23.0%** (21.8%–24.2%)	**84.6%** (80.5%–88.0%)
Population ITN access (95% CI)	**30.4%** (29.3%–31.6%)	**86%** (82.0%–90.1%)	**18.8%** (17.5%–20.1%)	**88.9%** (86.8%–91.1%)	**26.3%** (24.9%–27.6%)	**84.2%** (81.1%–87.3%)
Use given access*	**1.10**	**1.05**	**0.98**	**1.04**	**0.88**	**1.00**



- ITN access and usage went up significantly after the campaign
- Most ITNs were reported to have been used every night

Interim results – interpret with caution

Malaria burden to date

Western Mozambique

	Chemba (Standard ITNs)		Guro (IG2 ITNs)		Changara (PBO ITNs)	
	2020	2021	2020	2021	2020	2021
Population that slept under a net last night (95% CI)	**33.3%** (32.1%–34.7%)	**90.1%** (87.1%-92.4%)	**18.5%** (17.2%–19.8%)	**92.8%** (90.4%–94.7%)	**23.0%** (21.8%–24.2%)	**84.6%** (80.5%–88.0%)
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Use given access*	**1.10**	**1.05**	**0.98**	**1.04**	**0.88**	**1.00**

- ITN access and usage went up significantly after the campaign

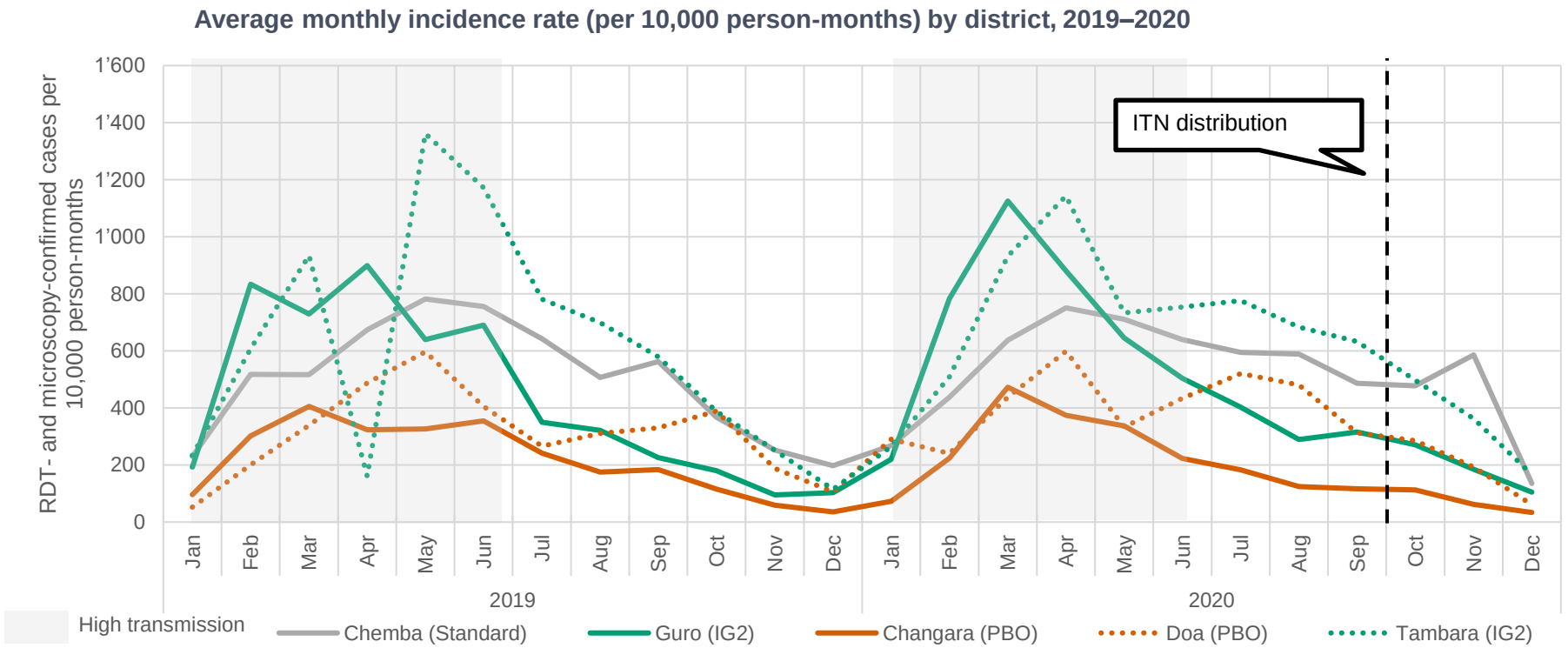
	Chemba (Standard ITNs)		Guro (IG2 ITNs)		Changara (PBO ITNs)	
	2020	2021	2020	2021	2020	2021
Malaria prevalence for children under 5 years old (RDT+) (95% CI)	**44.3%** (36.5%–52.1%)	**39.0%** (31.3%–47.2%)	**17.1%** (11.6%–22.7%)	**3.8%** (2.2%– 6.7%)	**5.7%** (2.3%–9.1%)	**2.1%** (0.8%– 5.4%)

- **Malaria burden decreased significantly as well**
  - **~12% in Chemba (standard)**
  - **~77% in Guro (IG2)**
  - **~63% in Changara (PBO)**

Interim results – interpret with caution

Malaria burden to date

Western Mozambique



Post-campaign passive case data is still being processed.

Interim results – interpret with caution

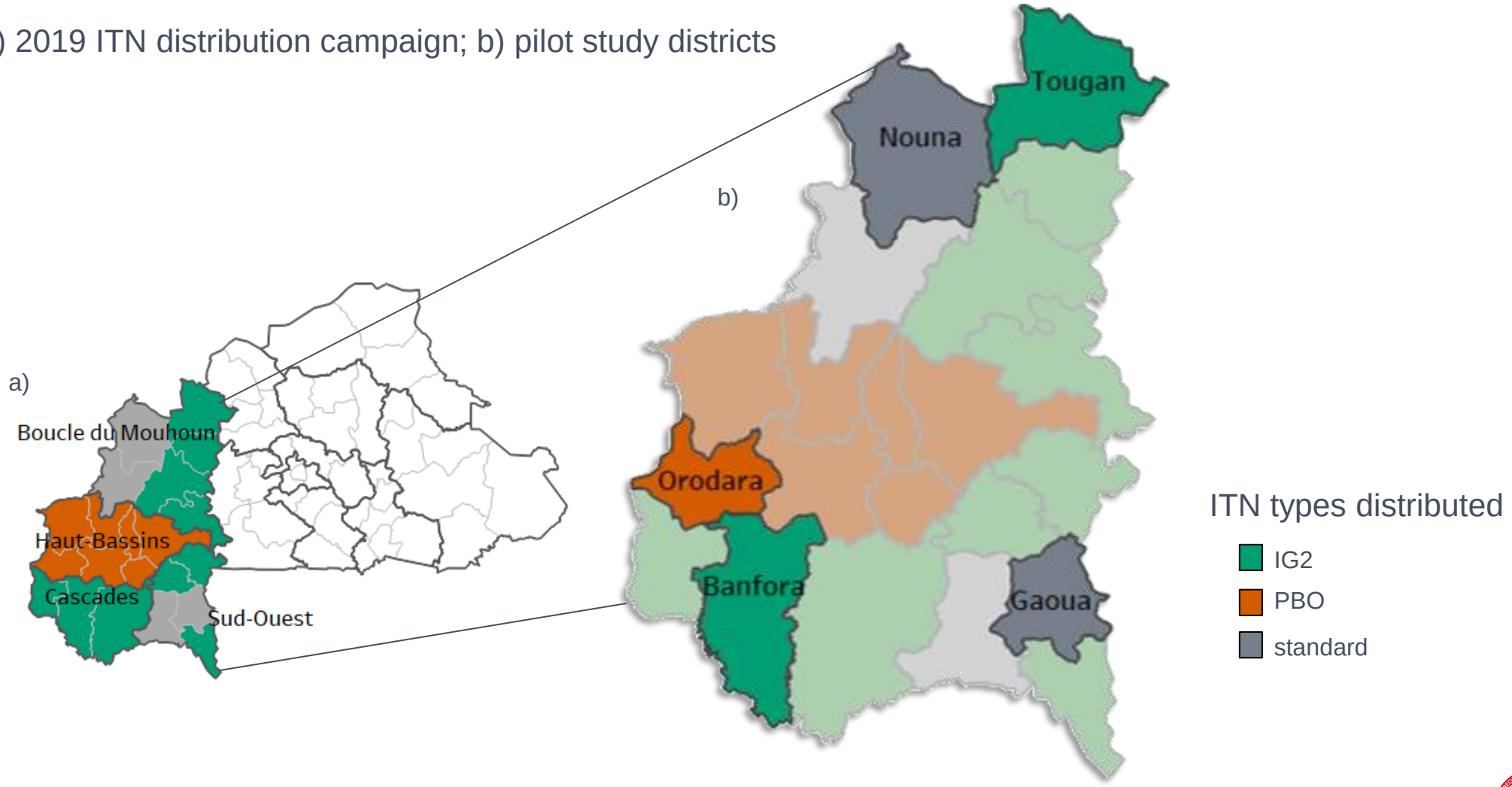
Burkina Faso – Interim Results

Dr. Adama Gansané
Director, CNRFP Burkina Faso

Study design

Burkina Faso

a) 2019 ITN distribution campaign; b) pilot study districts



Interim results – interpret with caution

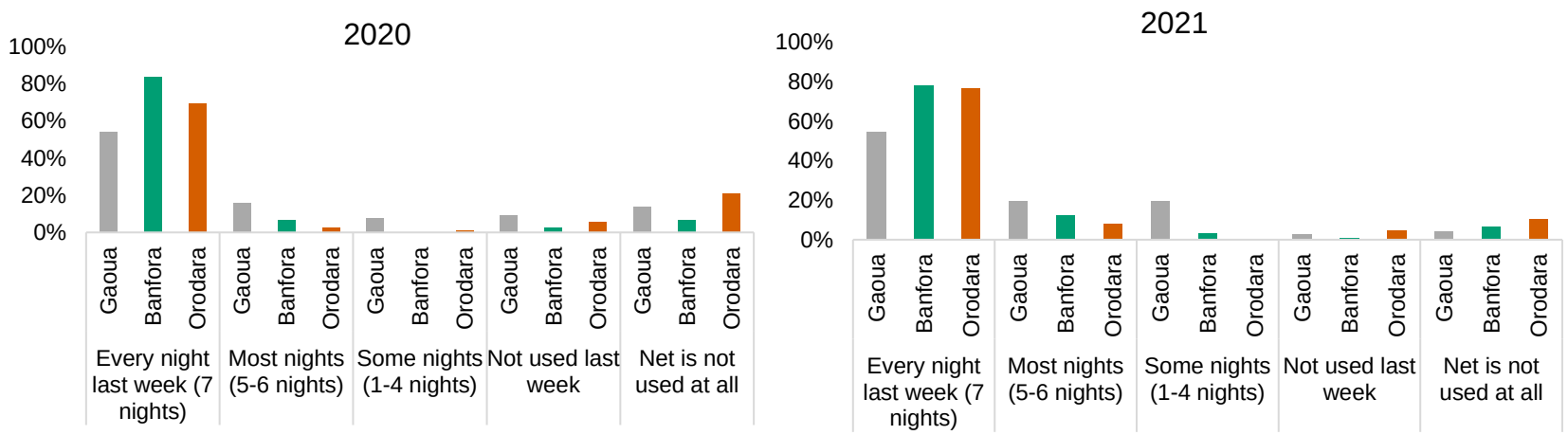
ITN landscape

Burkina Faso

	Gaoua (standard ITNs)			Banfora (IG2 ITNs)			Orodara (PBO ITNs)		
	2019	2020	2021	2019	2020	2021	2019†	2020	2021
Population that slept under a net last night (95% CI)	**20.8%** (18.6%–23.1%)	**44.2%** (40.9%–47.5%)	**37.0%** (30.5%–42.5%)	**67.7%** (64.9%–70.3%)	**90.4%** (88.5%–92.1%)	**82.8%** (79.0%–86.6%)	**78.8%** (76.1%–81.2%)	**84.8%** (82.3%–87.0%)	**83.5%** (79.9%–87.1%)
Population ITN access (95% CI)	**44.4%** (42.4%–46.2%)	**53.8%** (51.4%–56.2%)	**40.5%** (37.9%–43.1%)	**58.9%** (57.1%–60.7%)	**84.2%** (83.1%–85.3%)	**74.9%** (73.5%–76.2%)	**94.0%** (93.1%–94.9%)	**87.4%** (86.3%–88.5%)	**82.0%** (80.7%–83.3%)
Use given access*	**0.47**	**0.82**	**0.91**	**1.15**	**1.07**	**1.11**	**0.84**	**0.97**	**1.02**

- Increases in ITN access and use after the campaign were variable (remained low in Gaoua)
- Most ITNs were reported to have been used every night

Frequency of ITN usage reported in 2020 and 2021



†The ITN distribution campaign was complete at the time of the cross-sectional survey.
*Use given access is calculated by dividing use (population that slept under a net last night) by access. Values over 1 are possible given that the calculation is a ratio.

Interim results – interpret with caution

Malaria burden to date

Burkina Faso

	Gaoua (standard ITNs)			Banfora (IG2 ITNs)			Orodara (PBO ITNs)		
	2019	2020	2021	2019	2020	2021	2019†	2020	2021
Population that slept under a net last night (95% CI)	**20.8%** (18.6%–23.1%)	**44.2%** (40.9%–47.5%)	**37.0%** (30.5%–42.5%)	**67.7%** (64.9%–70.3%)	**90.4%** (88.5%–92.1%)	**82.8%** (79.0%–86.6%)	**78.8%** (76.1%–81.2%)	**84.8%** (82.3%–87.0%)	**83.5%** (79.9%–87.1%)
Population ITN access (95% CI)	**44.4%** (42.4%–46.2%)	**53.8%** (51.4%–56.2%)	**40.5%** (37.9%–43.1%)	**58.9%** (57.1%–60.7%)	**84.2%** (83.1%–85.3%)	**74.9%** (73.5%–76.2%)	**94.0%** (93.1%–94.9%)	**87.4%** (86.3%–88.5%)	**82.0%** (80.7%–83.3%)
Use given access*	**0.47**	**0.82**	**0.91**	**1.15**	**1.07**	**1.11**	**0.84**	**0.97**	**1.02**

- Increases in ITN access and use after the campaign were variable (remained low in Gaoua)

	Age group	Gaoua (standard ITNs)			Banfora (IG2 ITNs)			Orodara (PBO ITNs)		
		2019	2020	2021	2019	2020	2021	2019†	2020	2021
Malaria prevalence in children from CSS (RDT+) (95% CI)	<5	**81.0%** (74.9%–86.0%)	**48.9%** (41.9%–56.1%)	**21.1%** (15.5%–27.5%)	**39.6%** (33.0%–46.6%)	**18.4%** (13.5%–24.6%)	**11.6%** (7.4%–17.0%)	**28.4%** (22.4%–35.3%)	**3.7%** (1.8%–7.5%)	**2.1%** (0.6%–5.3%)
	5–10			**54.5%** (47.1% – 61.7%)			**36.1%** (29.3% – 43.4%)			**19.9%** (14.5% – 26.3%)

- **Timing of campaign associated with decreases in malaria prevalence through Year 2**
  - **~74%% in Gaoua (standard)**
  - **~71% in Banfora (IG2)**
  - **~93% in Orodara (PBO)**

†The ITN distribution campaign was complete at the time of the cross-sectional survey.
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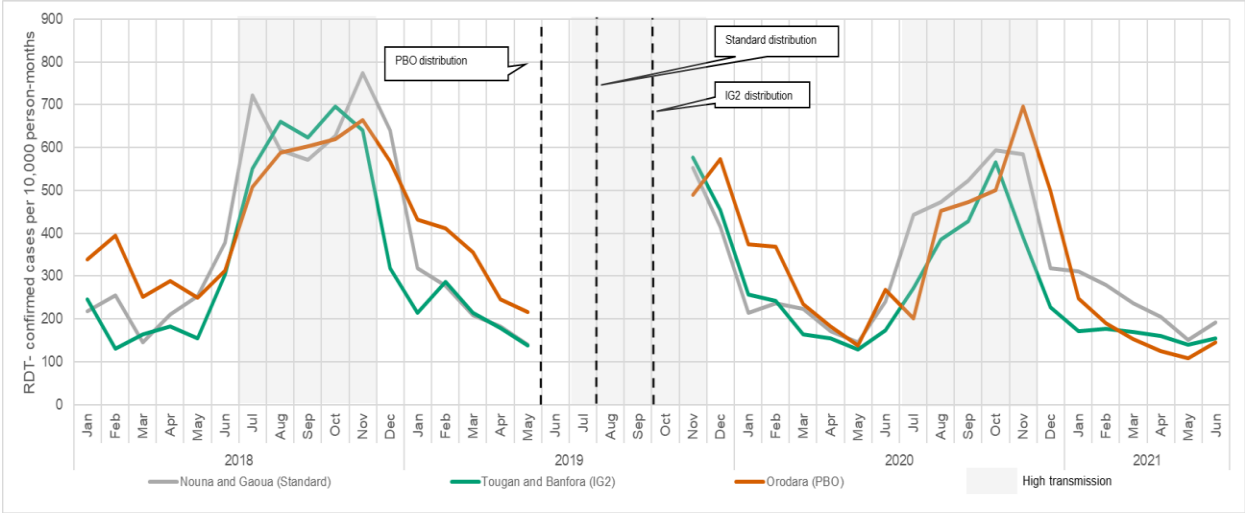
Interim results – interpret with caution

Malaria burden to date

Burkina Faso

Average monthly incidence rate (per 10,000 person-months) by ITNs, 2018–2021



Difference-in-difference (DiD) comparison of malaria incidence with next-generation ITNs and standard ITNs.

	Year 1 (November–May) change from baseline	Year 1 DiD relative to standard ITNs	Year 2 (June–May) change from baseline	Year 2 DiD relative to standard ITNs
Gaoua and Nouna (Standard ITNs)	**−18.4%** (−24.8% to −14.8%)		**−20.6%** (−24.9% to −17.5%)	
Banfora and Tougan (IG2 ITNs)	**−0.76%** (−6.1% to 1.8%)	**−18%**	**−35.3%** (−36.7% to −34.6%)	**14.7%**
Orodara (PBO ITNs)	**−22.9%** (−28.8% to −2.7%)	**4.5%**	**−26.4%** (−29.2% to −24.8%)	**5.8%**

Passive malaria case incidence in the two years after the ITN campaign indicated fewer malaria cases reported in each district:

- ~ 21% fewer in standard ITN districts
- ~ 35% fewer in IG2 districts
- ~ 26% fewer in the PBO district

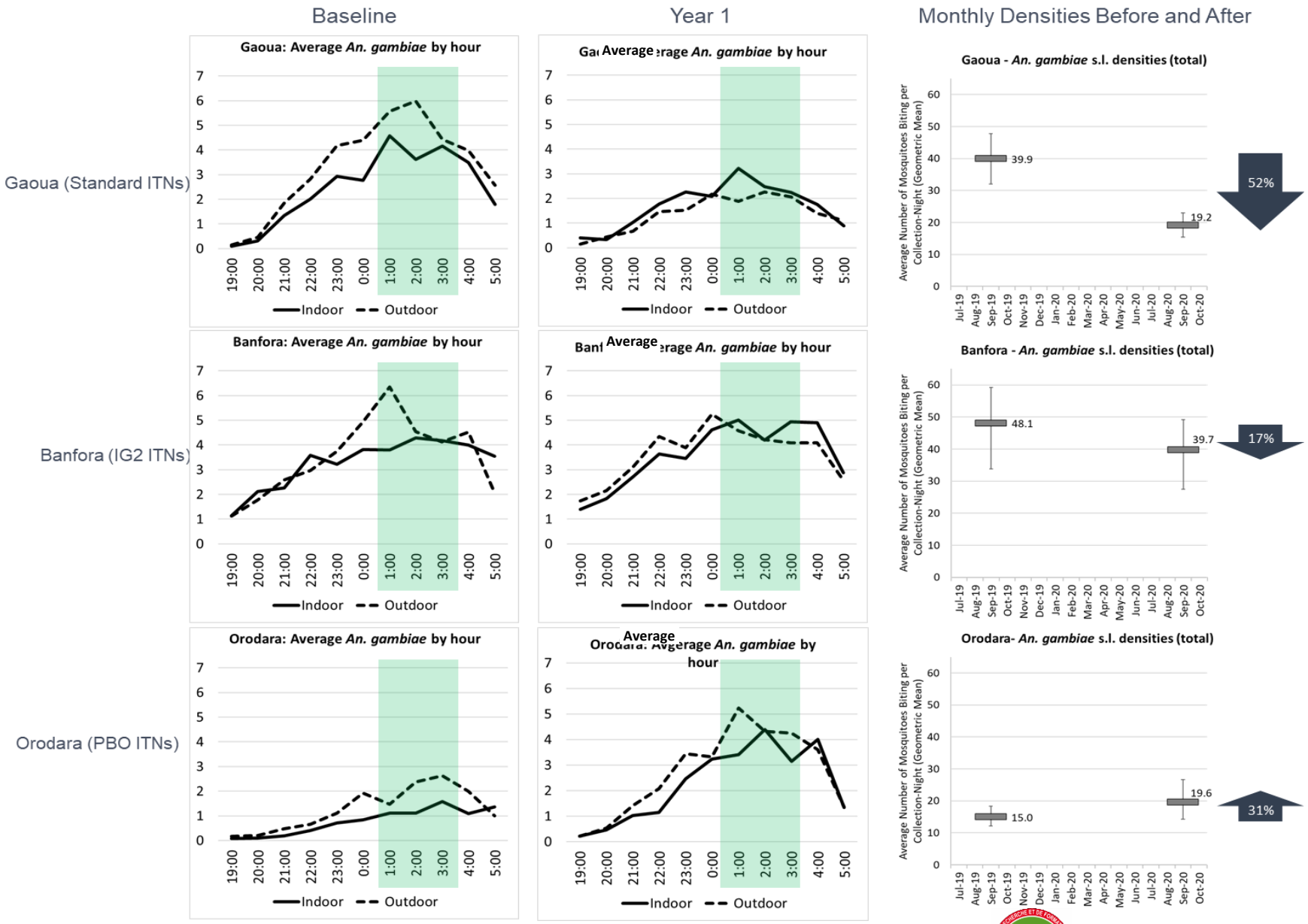
Interim results – interpret with caution

Vector landscape

Burkina Faso

- Mix of *Anopheles gambiae* s.s., *An. coluzzii, An. funestus*
- High levels of pyrethroid resistance by multiple mechanisms.
- Roughly equal rates of indoor and outdoor biting.
- Nightly variation in biting rates, with peak biting very early in the morning
- Some indication that increasing ITN coverage associated with decreased vector densities in the districts with the most mosquitoes (Gaoua and Banfora)

Nightly biting patterns of dominator vectors by district



Interim results – interpret with caution

Key issues

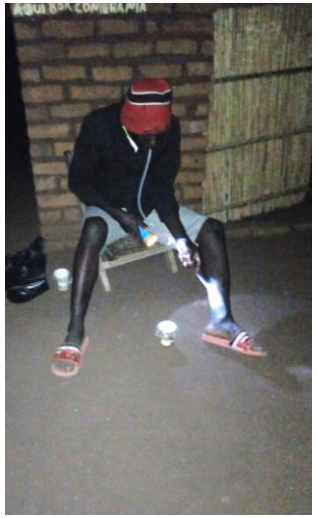
- Variability and diversity in malaria transmission dynamics across and within countries
- Variability and changes in other key malaria interventions (e.g., SMC expansion in Burkina Faso)
- Human and vector behavior could be an important factor in determining ITN effectiveness
- Next steps are ongoing. More complete and nuanced analyses will consider ITN access, durability of ITNs after more than one year, sleeping and ITN use patterns, climate factors, etc.

Key takeaways – interim results

- Mass ITN distributions (universal coverage campaigns) are strongly associated with increased ITN use and decreases in malaria transmission regardless of ITN type.
- In areas of moderate to high transmission with pyrethroid resistant vectors:
    - Distribution of any of the new net types (IG2, PBO, and RG ITNs) seem more effective at controlling malaria than campaigns distributing standard, pyrethroid-only ITNs.
    - May be less pronounced in West African settings with complex resistance profiles.
- Final results pending – please stay tuned!

Thank you – Obrigado – Merci

Questions, comments & discussion



BACKUP SLIDES FOLLOW

For discussion, as appropriate

Rwanda


rbc
Rwanda
Biomedical
Centre
Healthy People, Wealthy Nation


UR
UNIVERSITY OF
RWANDA

Vector landscape

Rwanda

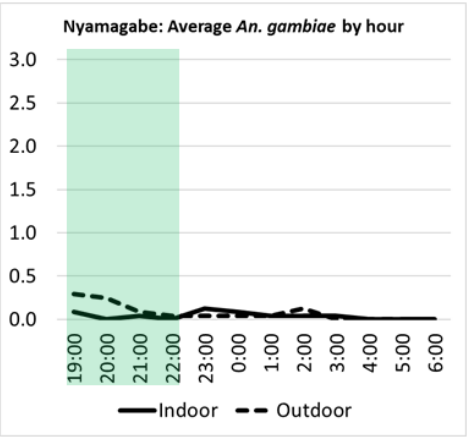
- Mix of *An. gambiae* s.s., *An*. *funestus*, *An. arabiensis.*
- Low to moderate levels of pyrethroid resistance—mitigated by PBO.
- Roughly equal rates of indoor and outdoor biting.

- Overall, relatively low rates of biting
- No obvious peaks – consistent throughout the night

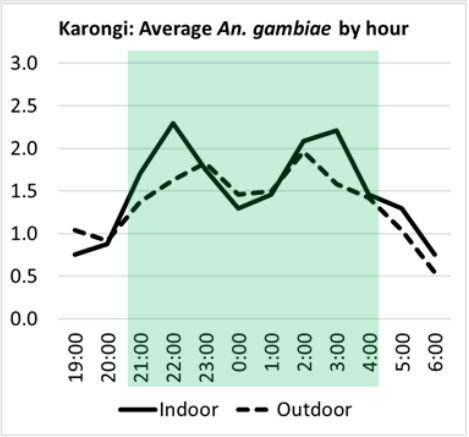
Nightly biting patterns of dominator vectors by district

Baseline

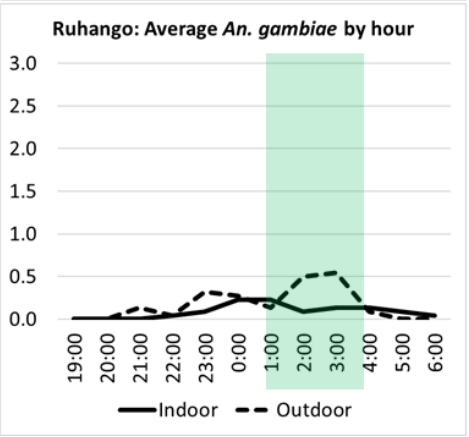
Nyamagabe (Standard ITNs)



Karongi (IG2 ITNs)



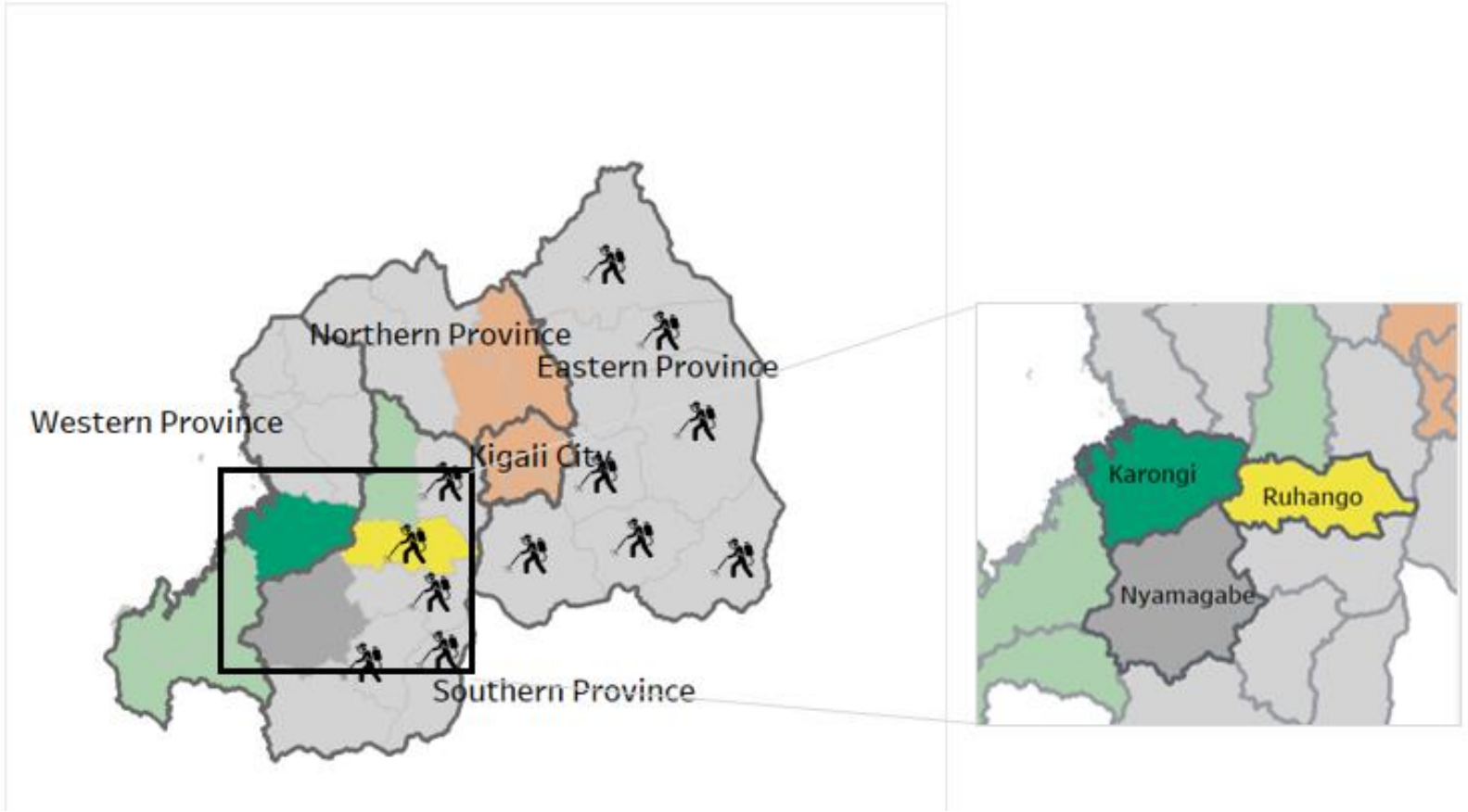
Ruhango (Standard ITNs + IRS)



Interim results – interpret with caution

Study design

Rwanda



2020 ITN distribution campaign

Pilot Study Districts

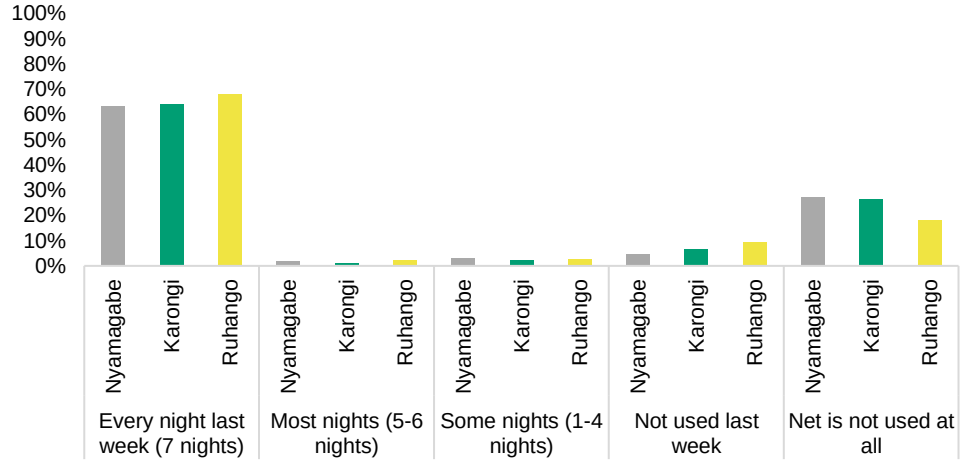
Interim results – interpret with caution

ITN landscape

Rwanda

	Nyamagabe (Standard ITNs)		Karongi (IG2 ITNs)		Ruhango (Standard ITNs + IRS)	
	Feb* 2020	Dec 2020	Feb 2020	Dec 2020	Feb* 2020	Dec 2020
Population that slept under a net last night (95% CI)	**70.5%** (66.8%–74.0%)	**68.7%** (65.0%–72.2%)	**68.2%** (64.5%–71.8%)	**70.9%** (67.3%–74.3%)	**73.3%** (69.8%–76.6%)	**78.8%** (75.4%–82.0%)
Population ITN access (95% CI)	**81.8%** (79.5%–84.1%)	**80.7%** (78.6%–82.7%)	**82.2%** (79.8%–84.7%)	**86.1%** (84.3%–87.9%)	**88.1%** (86.5%–89.8%)	**88.6%** (87.2%–90.0%)
Use given access†	**0.86**	**0.85**	**0.83**	**0.82**	**0.83**	**0.89**

Proportion of bed nets used every night last week (7 nights), most nights (5-6 nights), some nights (1-4 nights), not used last week, and not used at all, December 2020.



† Use given access is calculated by dividing use (population that slept under a net last night) by access. Values over 1 are possible given that the calculation is a ratio.
*The ITN distribution campaign was ongoing at the time of the cross-sectional survey.

Interim results – interpret with caution

Malaria burden to date

Rwanda

Malaria prevalence for all ages (RDT+) (95% CI)

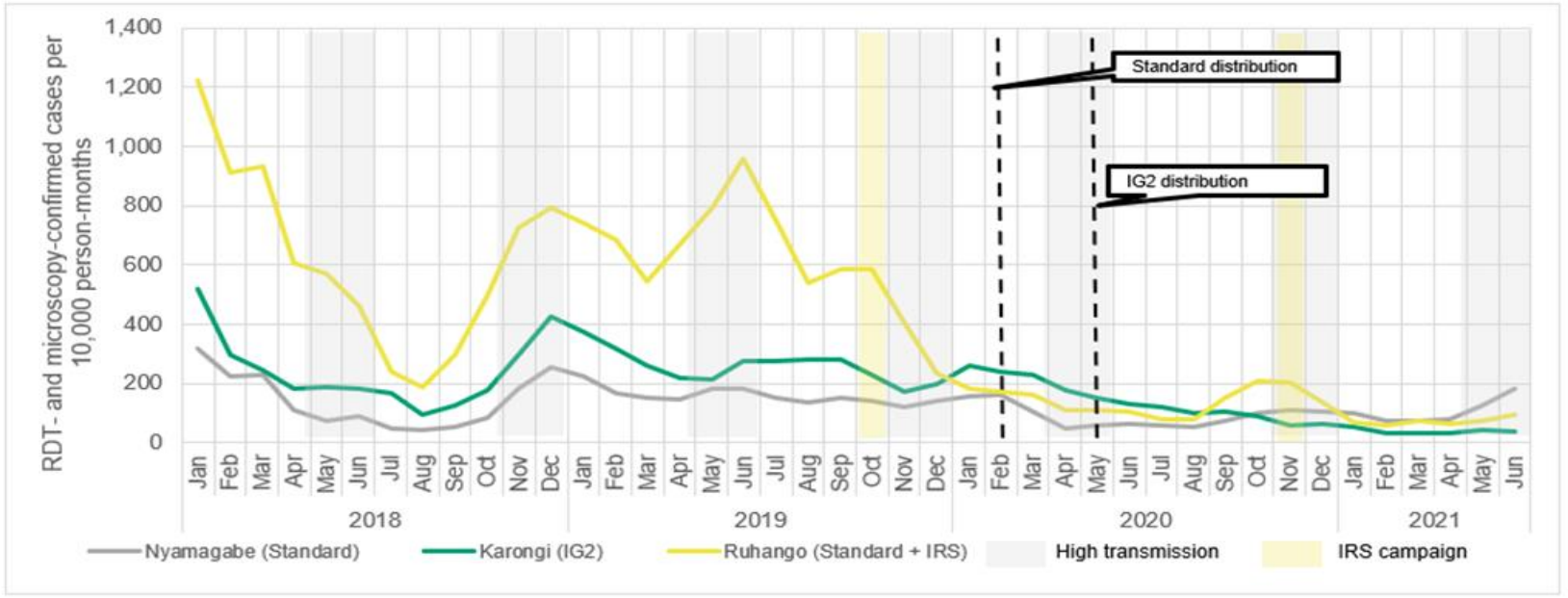
Nyamagabe (Standard ITNs)		Karongi (IG2 ITNs)		Ruhango (Standard ITNs + IRS)	
Feb* 2020	Dec 2020	Feb 2020	Dec 2020	Feb* 2020	Dec 2020
2.36% (1.14%–4.30%)	**2.70%** (1.36%–4.78%)	**2.47%** (1.24%–4.38%)	**2.69%** (1.40%–4.65%)	**1.33%** (0.49%–2.87%)	**5.24%** (3.27%–7.89%)

*The ITN distribution campaign was ongoing at the time of the cross-sectional survey.

Difference-in-difference (DiD) comparison of malaria incidence with next-generation ITNs, standard pyrethroid ITNs, and standard pyrethroid ITNs + IRS

	Year 1 (April–March) change from baseline	DiD relative to standard ITNs
Nyamagabe (Standard ITNs)	**−48%** (−53% to −45%)	
Karongi (IG2 ITNs)	**−62%** (−71% to −54%)	**13%**
Ruhango (Standard ITNs + IRS)	**−77%** (−78% to −75%)	**29%**

Average monthly incidence rate (per 10,000 person-months) by district, 2018–2020

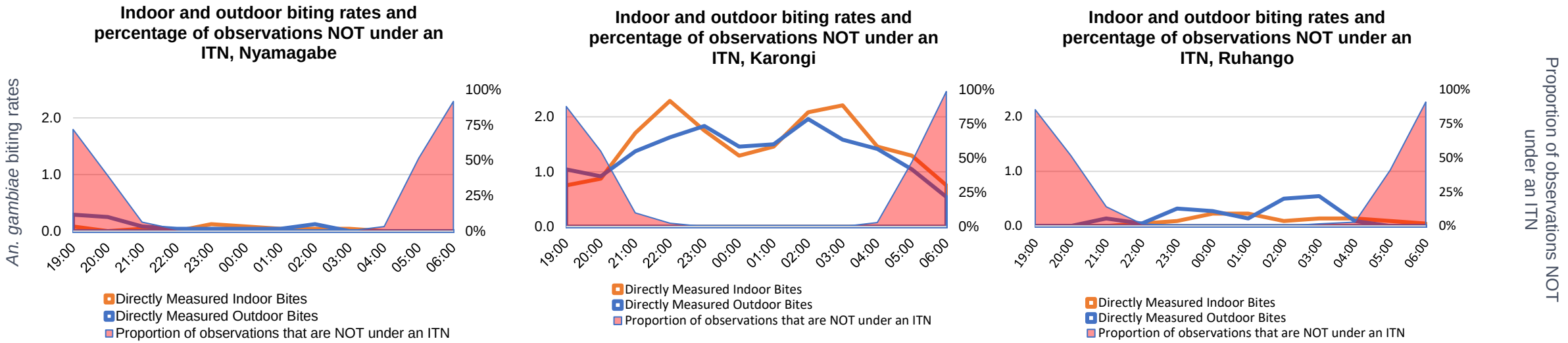


Interim results – interpret with caution

Vector landscape

Rwanda

Indoor and outdoor biting rates and percentage of observations not under an ITN by district.



First steps toward understanding the intersection of human and mosquito behaviors in driving malaria transmission risk: mapping the proportion of time (observations made) not under an ITN to indoor and outdoor biting rates.

Interim results – interpret with caution

Nigeria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Baseline vector landscape

Nigeria

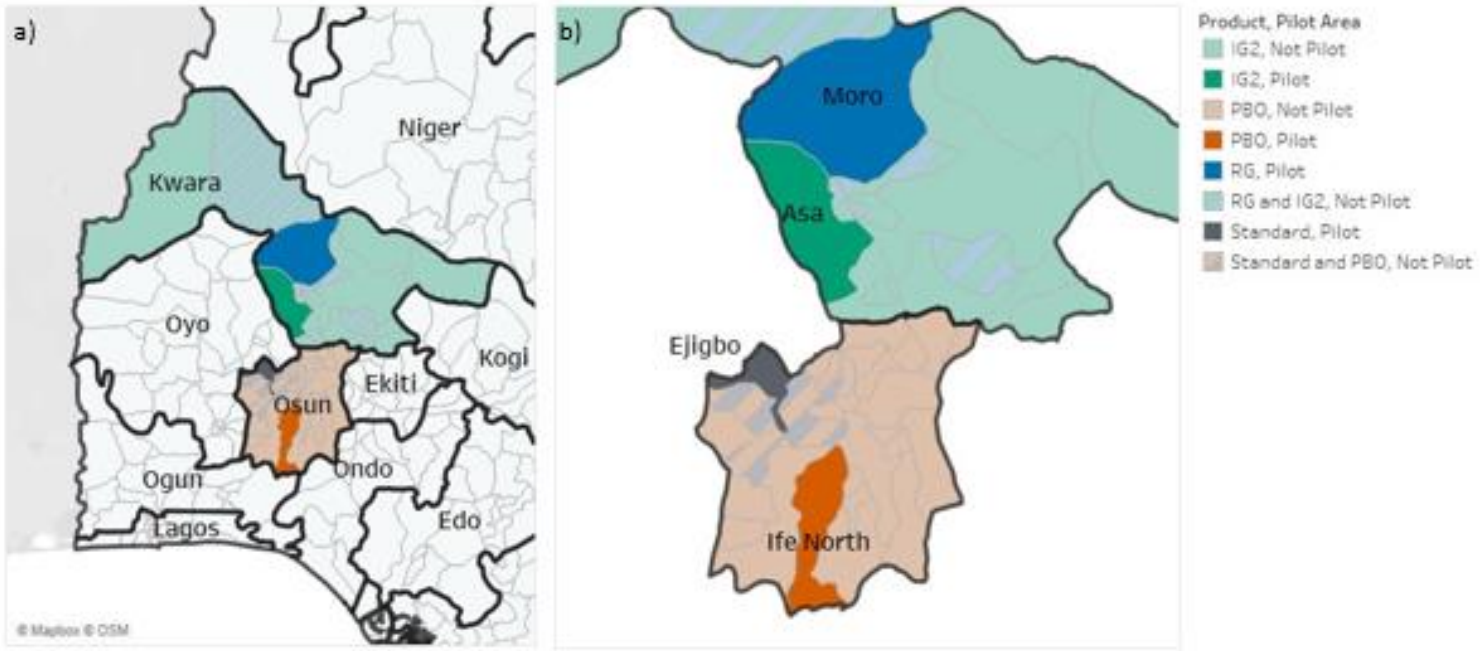
	Ejigbo (Standard ITNs)	Asa (IG2 ITNs)	Moro (RG ITNs)	Ife North (PBO ITNs)
	2020	2020	2020	2020
Most abundant vector (% of likely vector species collected)	*An. gambiae* s.l. (88%)	*An. gambiae* s.l. (100%)	*An. gambiae* s.l. (100%)	*An. funestus* s.l. (82%)
Second most abundant vector (% of all anophelines collected)	*An. funestus* s.l. (6%)	–	–	*An. gambiae* s.l. (14%)
***An. gambiae* molecular IDs**				
An. gambiae s.s.	73.3%	66.7%	73.4%	66.7%
An. coluzzii	26.7%	26.7%	21.5%	33.3%
An. arabiensis	–	2.5%	5.1%	–
Monthly CDC LT densities				
HLC nightly landing rates (*An. gambiae* s.l.)				
Indoor:outdoor ratio	0.92	9.75	2.50	10.00
Pyrethroid resistance profile	**MODERATE to HIGH: Partially mitigated by PBO**			
WHO tube test mortality	73%–94%	12%–38%	41%–57%	20%–71%

- Mix of *An. gambiae* s.s., *An. funestus, An. coluzzii, An. arabiensis.*
- Moderate to high levels of pyrethroid resistance—partially mitigated by PBO.
- Tendency for higher indoor than outdoor biting rates.

Interim results – interpret with caution

Study design

Nigeria



2020 ITN distribution campaign

Pilot Study Districts

ITN Types Distributed

- IG2
- PBO
- RG
- Standard

Interim results – interpret with caution

Malaria burden to date

Nigeria

Malaria prevalence for children under 5 years old (RDT+) (95% CI)

Ejigbo (Standard ITNs)	Asa (IG2 ITNs)	Moro (RG ITNs)	Ife North (PBO ITNs)
2020	2020	2020	2020
38.4% (33.8%–43.3%)	**63.1%** (58.3%–67.7%)	**49.9%** (45.0%–54.8%)	**48.3%** (43.5%–53.2%)

- Mix of *An. gambiae* s.s., *An. funestus, An. coluzzii, An. arabiensis.*
- Moderate to high levels of pyrethroid resistance—partially mitigated by PBO.
- Tendency for higher indoor than outdoor biting rates.

ITN use indicators

	Ejigbo (Standard ITNs)	Asa (IG2 ITNs)	Moro (RG ITNs)	Ife North (PBO ITNs)
	2020	2020	2020	2020
Population that slept under a net last night (95% CI)	**19.7%** (17.8%–21.7%)	**3.0%** (2.2%–3.9%)	**18.1%** (16.2%–20.1%)	**24.2%** (22.2%–26.3%)
Population ITN access (95% CI)	**26.9%** (25.2%–28.5%)	**4.4%** (3.6%–5.2%)	**17.1%** (15.6%–18.5%)	**24.4%** (22.8%–26.0%)
Use given access*	**0.73**	**0.68**	**1.05**	**0.99**

PATH

Interim results – interpret with caution