

Achieving optimal coverage with ITNs: Rethinking the status quo

Andrew Glover^{*1}, Hannah Koenker², Kate Kolaczinski³,
Thomas Churcher¹

¹ *MRC Centre for Global Infectious Disease Analysis, School of Public Health,
Imperial College London, UK*

² *PMI REACH Malaria, PATH, USA*

³ *The Global Fund, Geneva, Switzerland*

^{}a.glover18@imperial.ac.uk*

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- Universal coverage to optimal coverage
 - Was universal coverage achievable with the status quo?
 - How can optimal coverage now be achieved?
 - Additional considerations

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Universal to optimal coverage



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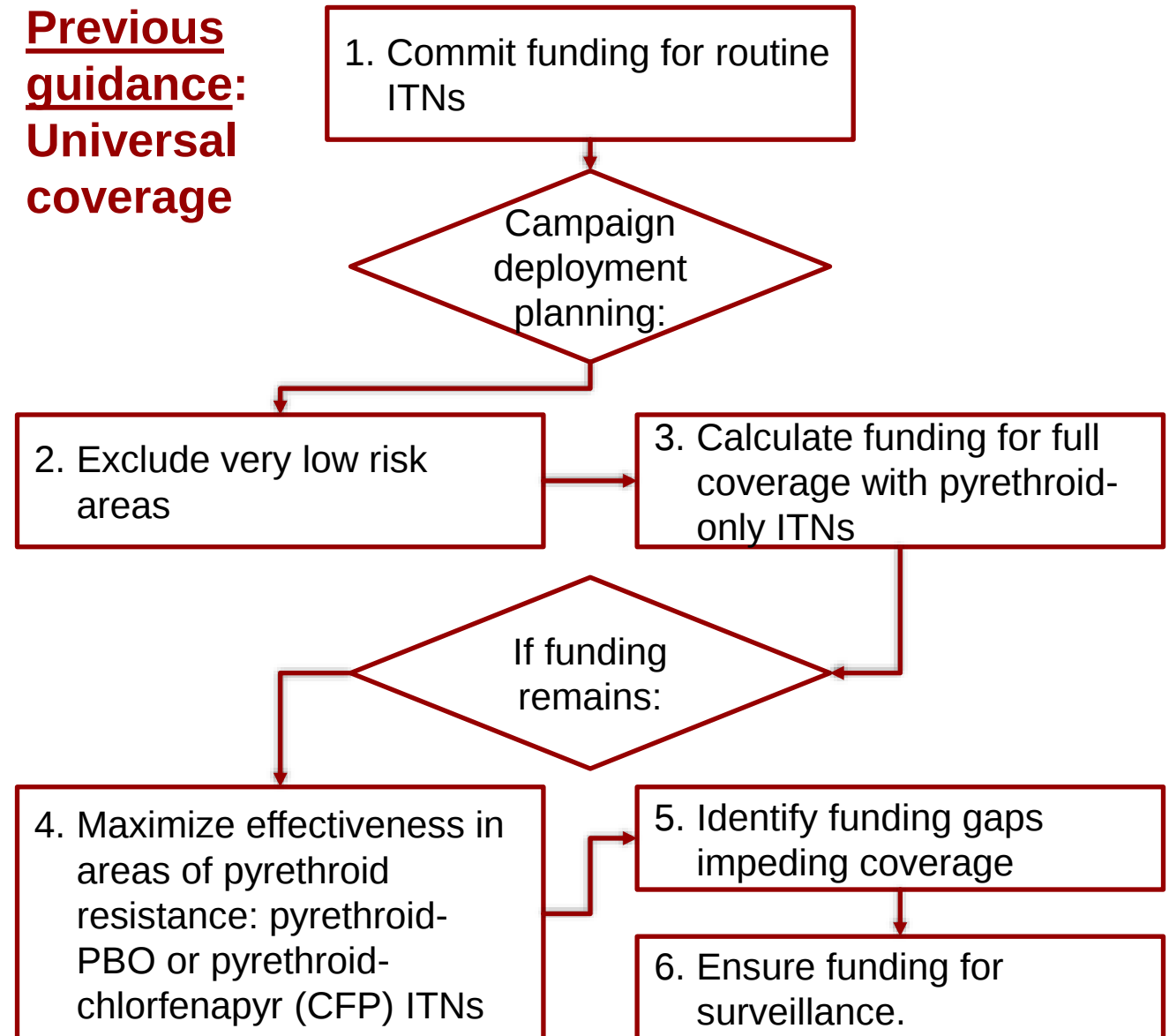
“Universal coverage is defined as 100%* access to, and use of, ITNs”

World Health Organization. WHO recommendations for achieving universal coverage with long-lasting insecticidal nets in malaria control. World Health Organization. 2013

*80% typically a minimum target

*Flowchart adapted from:
“Guidance on the prioritization of insecticide-treated nets in situations where resources are limited”. World Health Organization (2023)*

**Previous
guidance:
Universal
coverage**



Universal to optimal coverage



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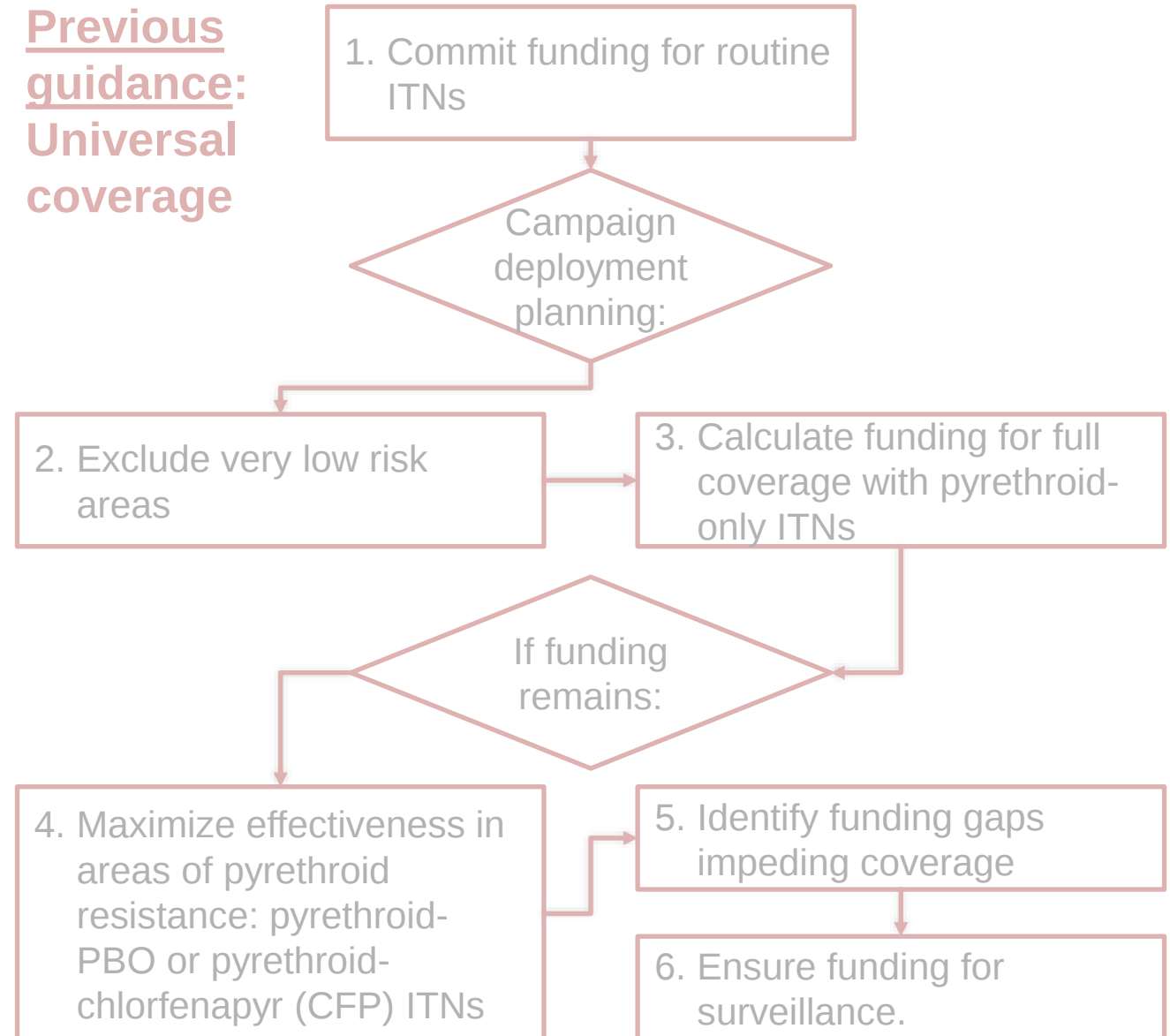
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Current guidance: Optimal coverage

"Guiding principles for prioritizing malaria interventions in resource-constrained country contexts to achieve maximum impact". World Health Organization (2024)

- **Prioritise routine** ITNs for infants and pregnant women.
- Intervention **scale and frequency** for optimal impact.
 - Exclusion of low transmission areas
 - Coverage and effectiveness **trade-offs**
- Areas with **pyrethroid resistance**:
 1. Pyrethroid-chlorfenapyr (-pyrrole)
 2. Pyrethroid-PBO
 3. Pyrethroid-pyriproxyfen
- **Surveillance** of insecticide resistance remains important

Previous guidance: Universal coverage





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What does optimal coverage mean to **you**?



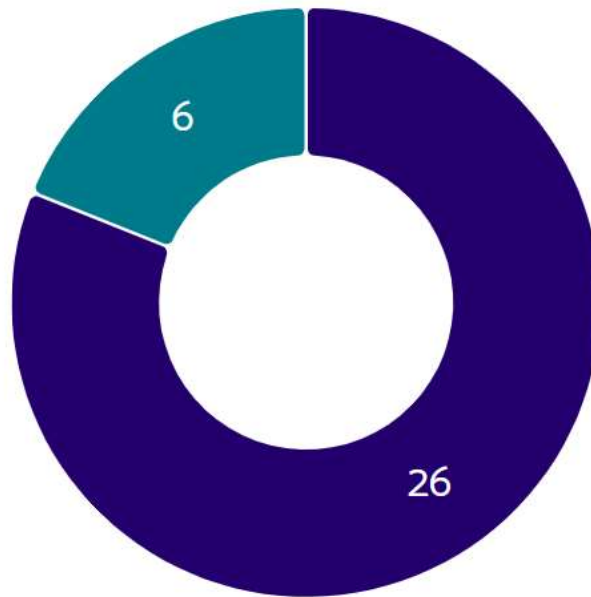
- 0 0% Deploying ITNs to maximize impact / Deploying bed nets to prevent malaria / Deploying ITNs to maximize coverage
- 0 0% Deploying ITNs to maximize impact / Deploying bed nets to prevent malaria / Deploying ITNs to maximize coverage
- 0 0% Deploying ITNs to maximize impact / Deploying bed nets to prevent malaria / Deploying ITNs to maximize coverage

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What does optimal coverage mean to **you**?



- 26 Deploying ITNs to maximise impact /
Déployer les MII pour un impact maximal /
Distribuir MII para máximo impacto
- 6 Deploying ITNs to maximise coverage /
Déployer les MII pour une couverture
maximale / Distribuir MII para máxima
cobertura

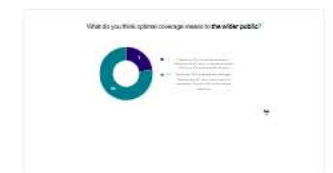
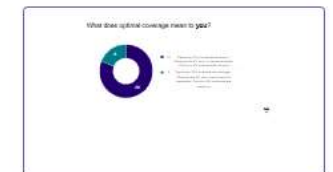


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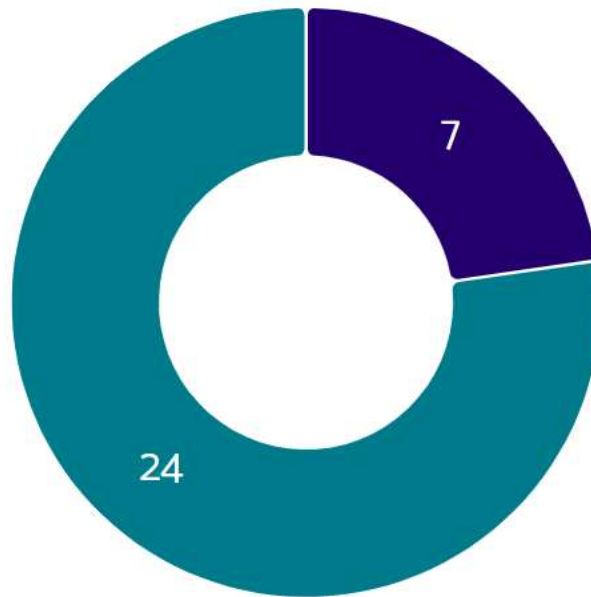


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What do you think optimal coverage means to **the wider public**?

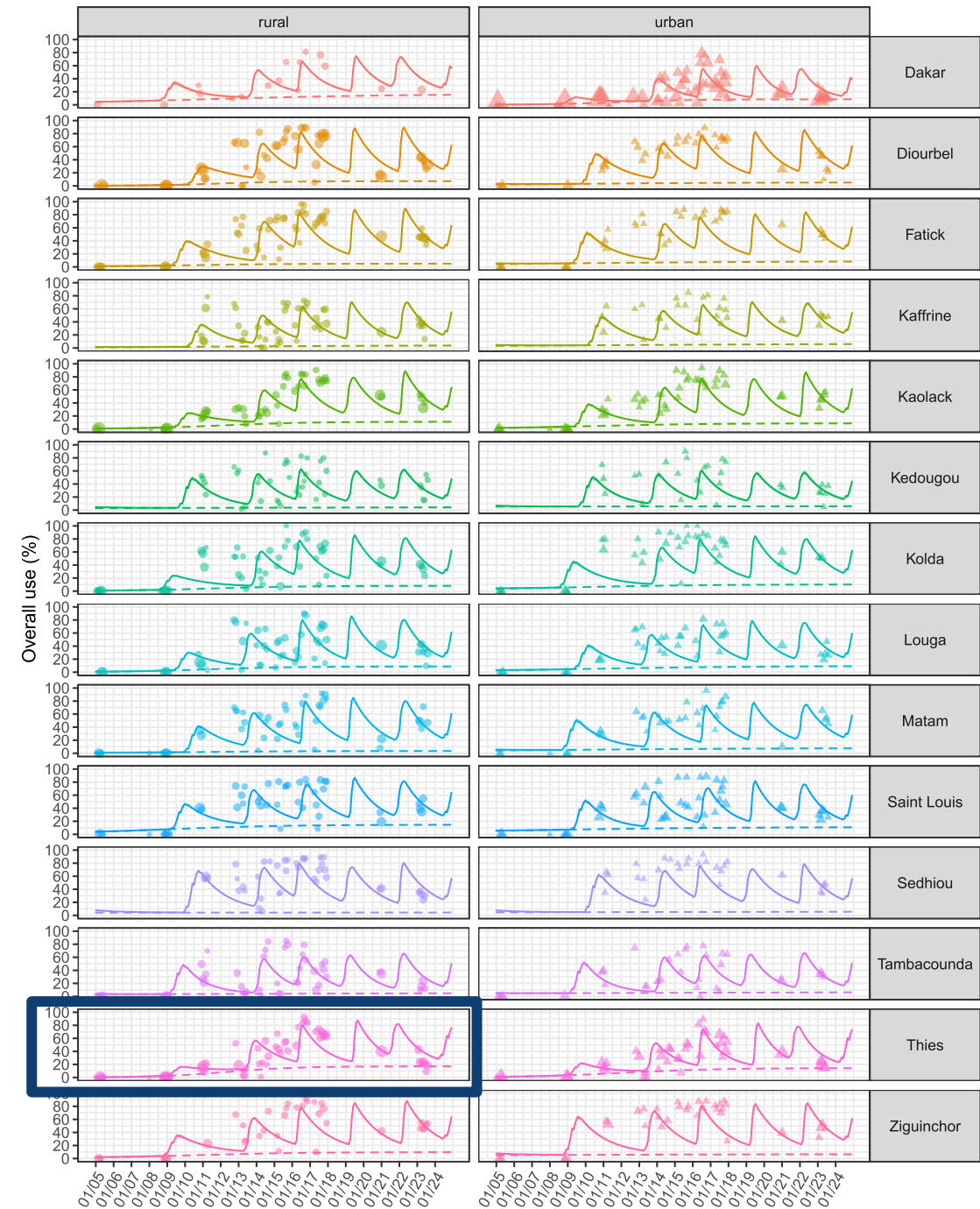
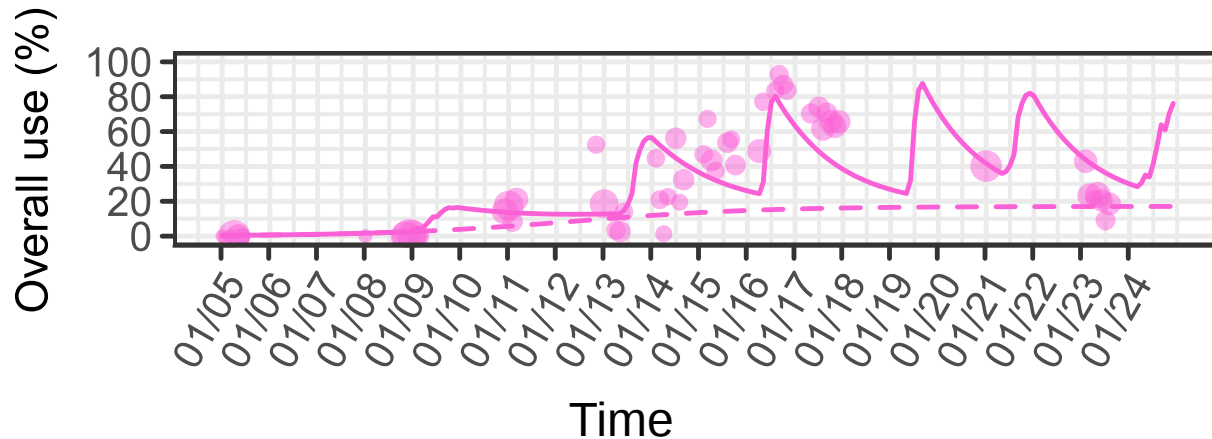


- 7 Deploying ITNs to maximise impact /
Déployer les MII pour un impact maximal /
Distribuir MII para máximo impacto
- 24 Deploying ITNs to maximise coverage /
Déployer les MII pour une couverture
maximale / Distribuir MII para máxima
cobertura

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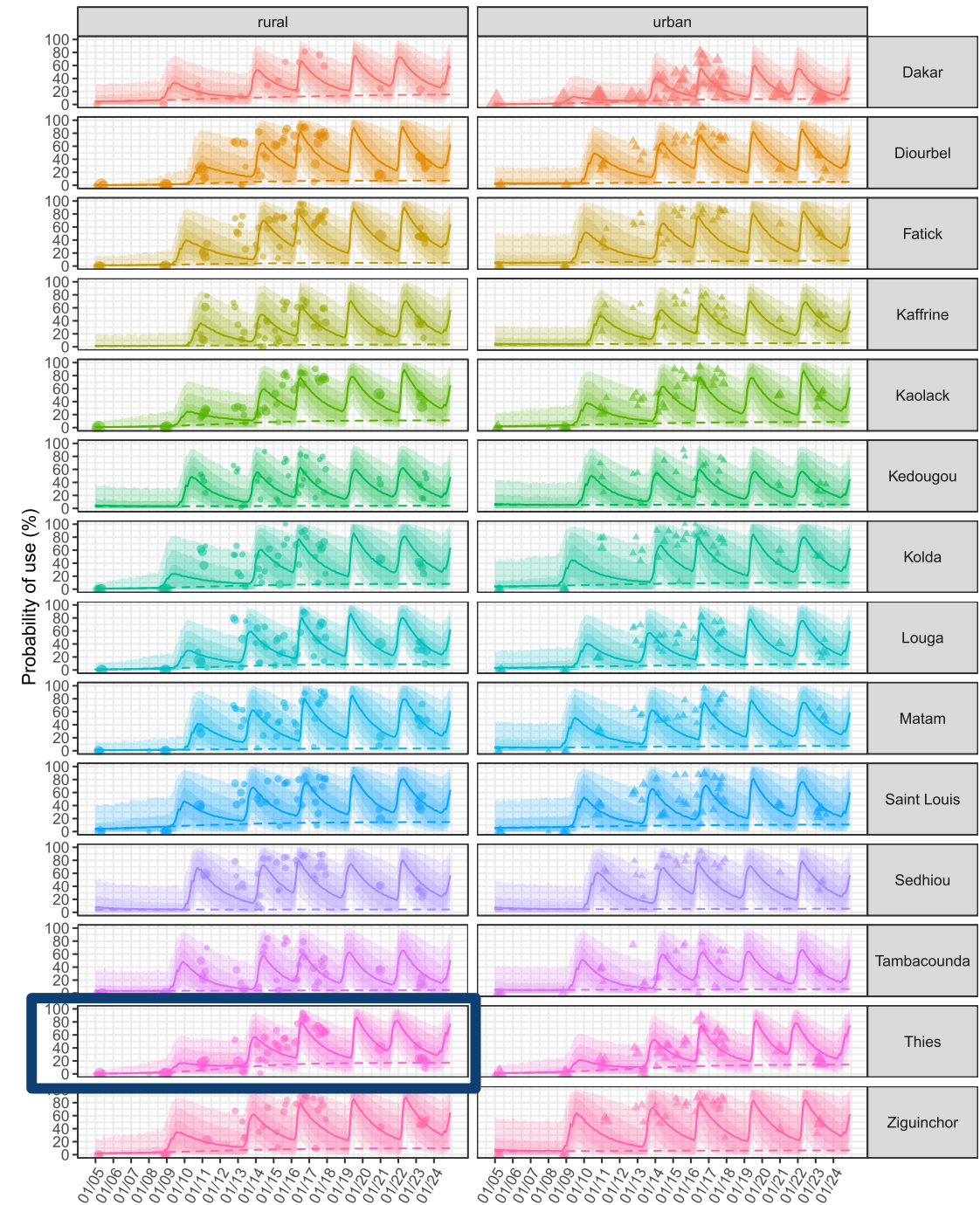
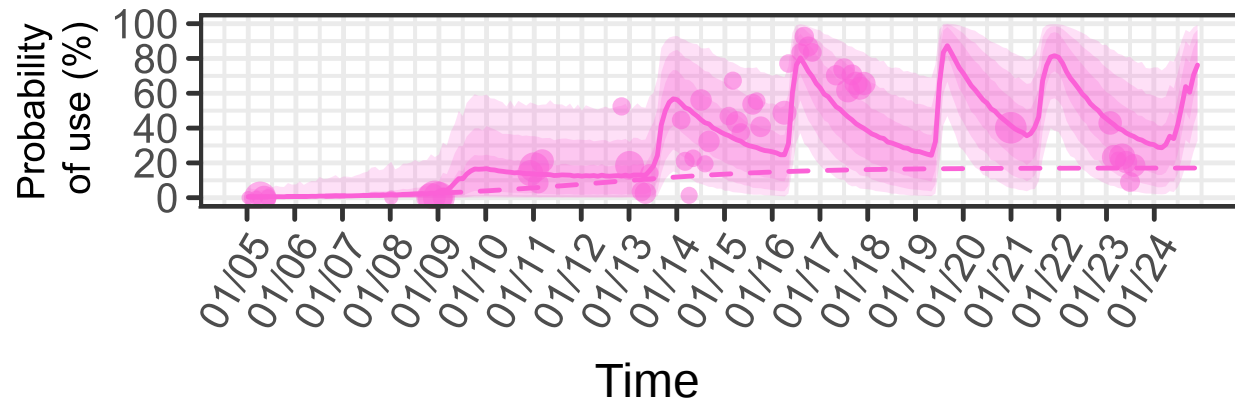
Historical use and access

- We fitted usage and access models to DHS & MIS data for subnational regions in 6 countries (Burkina Faso, Ghana, Malawi, Mali, Mozambique and Senegal)
- Surveys are snapshots that can be misleading
- Overall ITN use (and access) >80% achieved only briefly following mass campaigns



Historical use and access

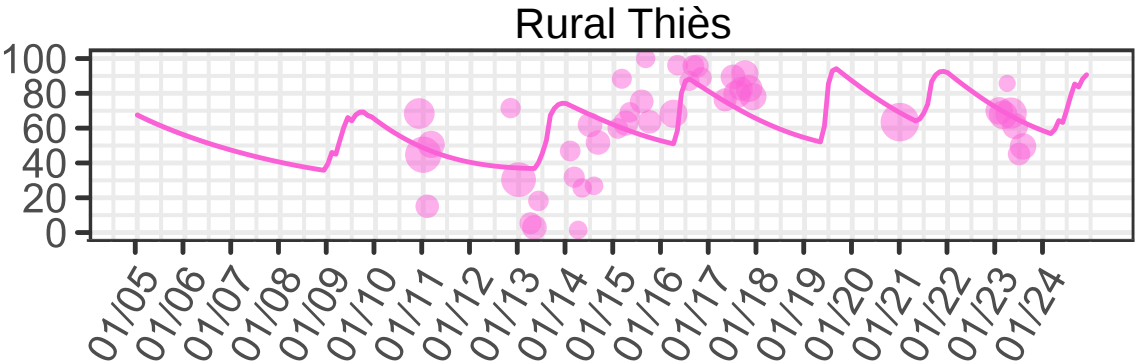
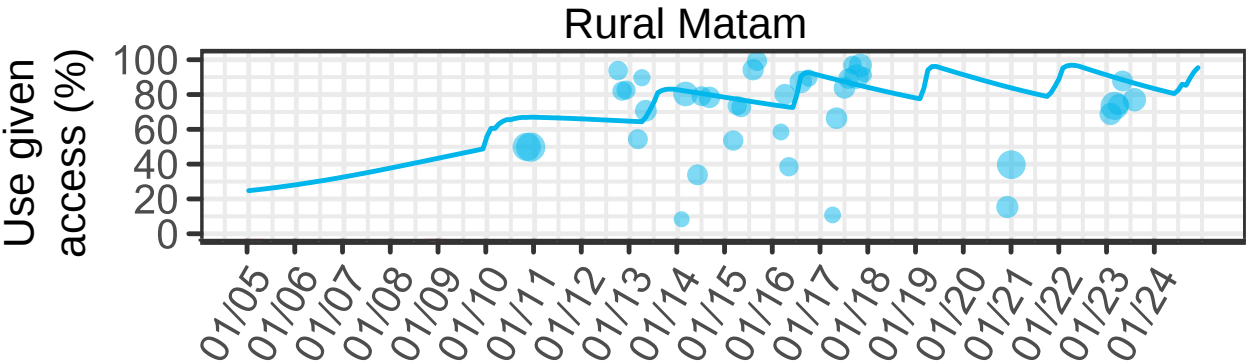
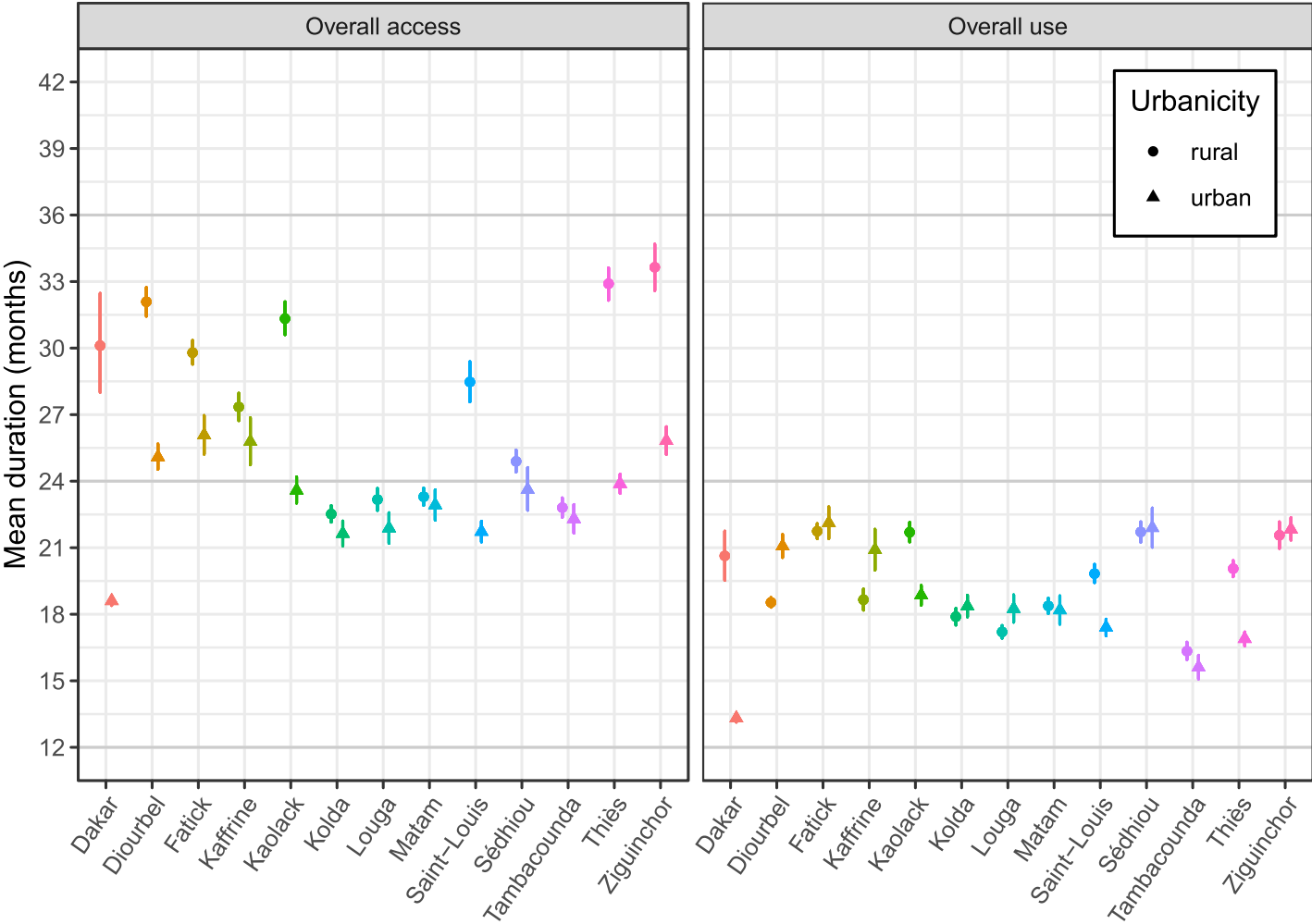
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- There is notable variability in use and access

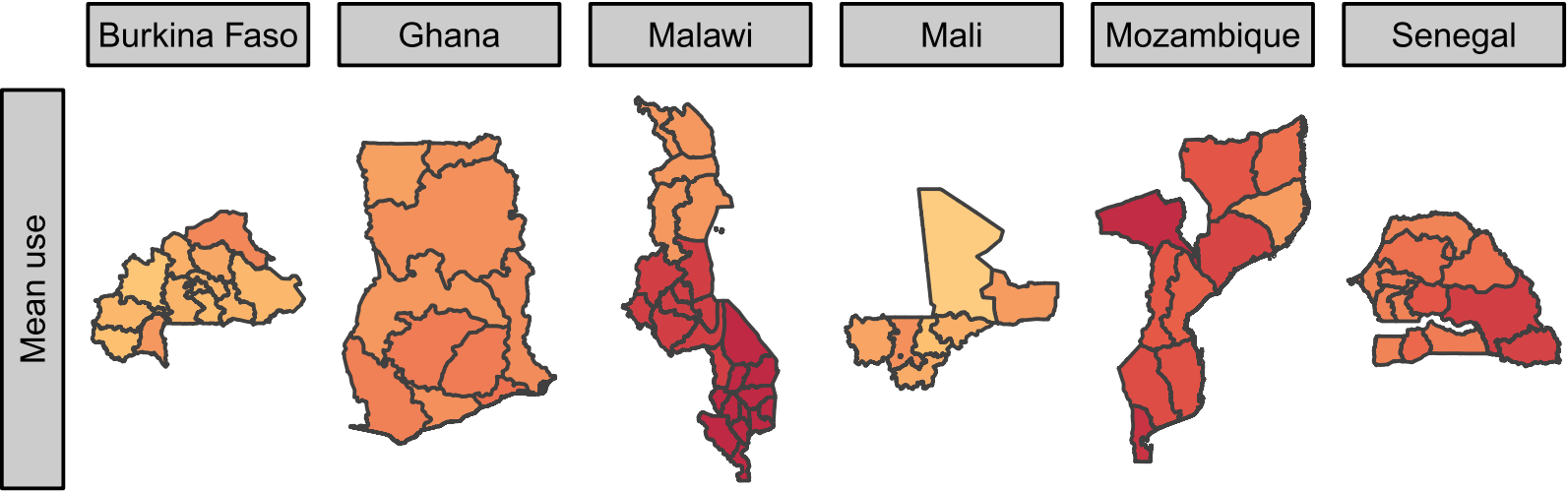


ITN retention

	Access	Use
Regions (n = 146) with mean duration greater than 3 years	12.3%	0.7%

- People **stop using ITNs faster** than they have access to them
- **Use given access declines over time** following a mass campaign





Campaign
interval:

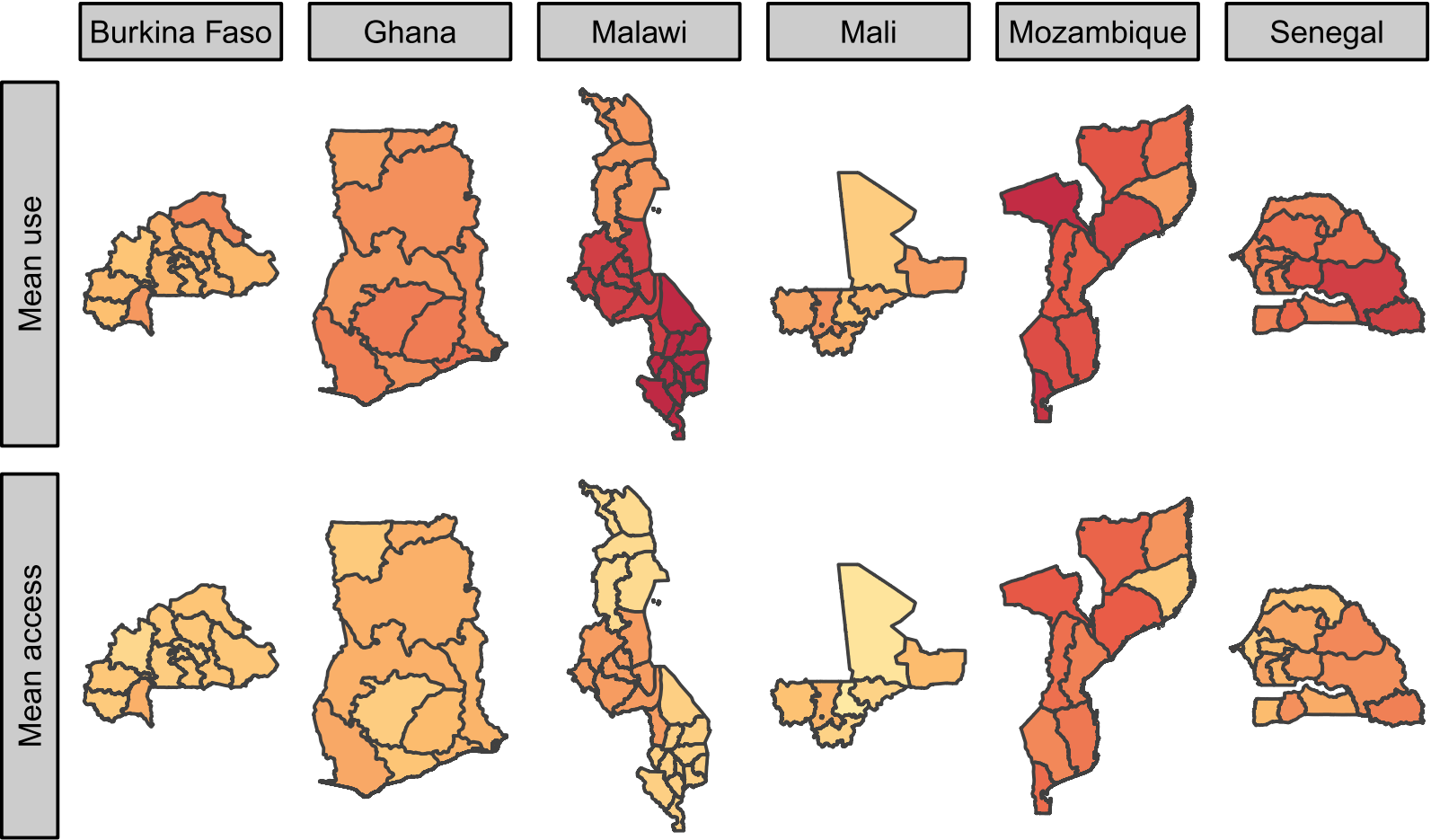
3-year

2-year

Overall mean
use:

47%

55%



Campaign interval:

3-year

2-year

Overall mean use:

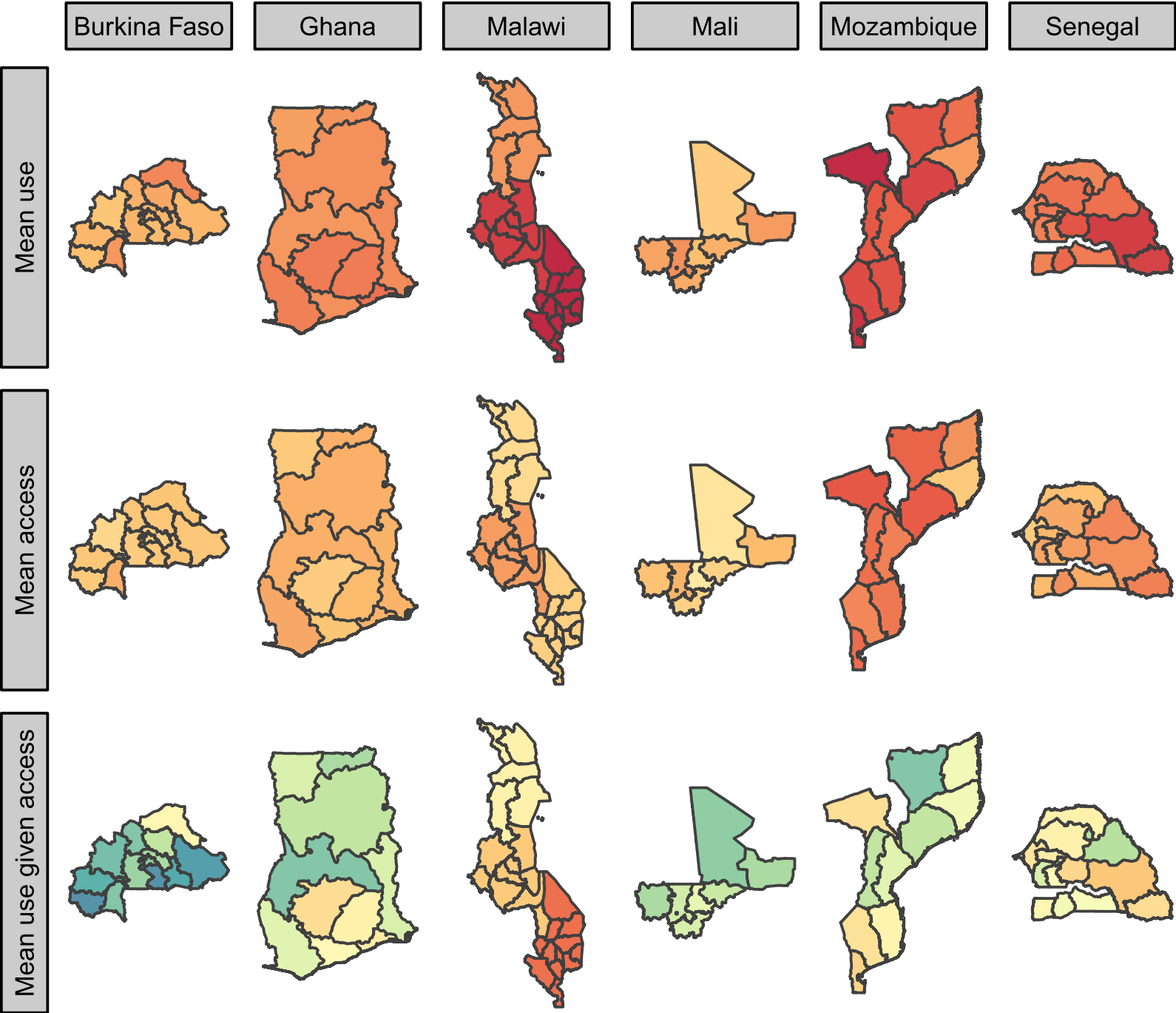
47%

55%

Overall mean access:

60%

67%



Campaign interval:

3-year

2-year

Overall mean use:

47%

55%

Overall mean access:

60%

67%

Overall mean use given access:

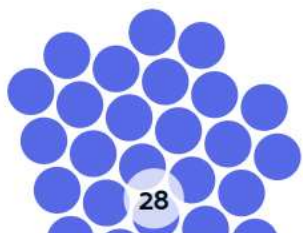
77%

89%



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Which of the following deployment approaches have you come across/had experience in?



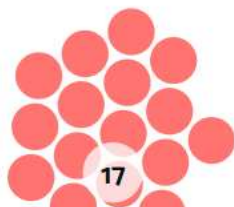
Universal coverage campaign / Campagne de couverture universelle / Campanha de cobertura universal



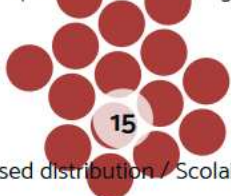
EPI distribution (PEV / PNI)



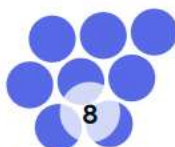
ITNs via mobile outreach clinics / MII via cliniques mobiles / MII via clínicas móveis



Targeted campaign for specific groups / campagne ciblée / campanha localizada (e.g. < 5)



School-based distribution / Scolaire / Escolar



ITNs via child health days / MII via journées santé de l'enfant / MII via dias de saúde infantil



ANC distribution (CPN)

0

ITNs for discharged severe malaria cases / MII après sortie – paludisme grave / MII pós-alta – malária grave



ITNs via vax campaigns / MII via campanhas de vacinação / MII via campanhas de vacinação

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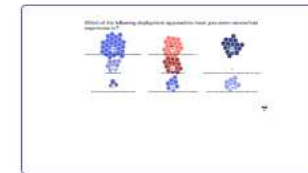
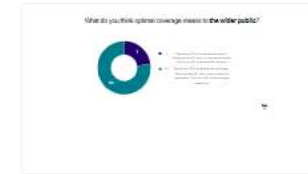
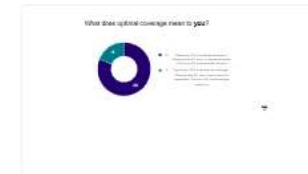


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Are there any other channels or strategies you have experience with?

Social marketing	Não	No
Emergency response	Integrated child health day campaigns	Subsidies/vouchers
Community	Community	Non
Non	Non	Private sector
Non	Non	No

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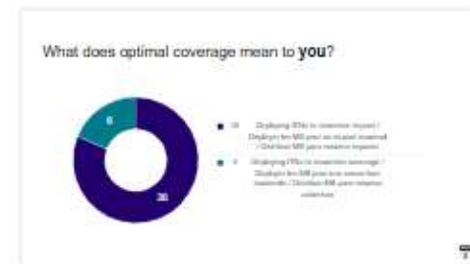


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If you had to reduce the number of ITNs distributed, what would **you** prefer?



- 12 Increase continuous distribution & stop mass campaigns / Renforcer continue & stopper masse / Reforçar contínua & parar massa
- 15 Maintain continuous & reduce ITNs per household in mass / Maintenir continue & réduire MII par ménage / Manter continua & reduzir MII por domicílio

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What does optimal coverage mean to you?

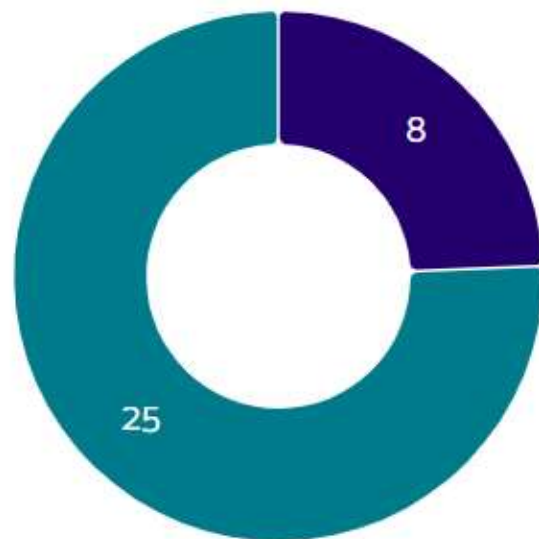


- 12 Optimal ITNs to coverage needed / Optimal for MII per household needed / Optimal MII per household needed
- 15 Optimal ITNs to coverage needed / Optimal for MII per household needed / Optimal MII per household needed



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If you had to reduce the number of ITNs distributed, what would **the public** prefer?



8

Increase continuous distribution & stop mass campaigns / Renforcer continue & stopper masse / Reforçar contínua & parar massa

25

Maintain continuous & reduce ITNs per household in mass / Maintenir continue & réduire MII par ménage / Manter continua & reduzir MII por domicílio

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Instructions

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What does optimal coverage mean to you?



- 8 Deploying ITNs to increase coverage / Deployer les MII pour augmenter la couverture / Distribuir MII para aumentar a cobertura
- 25 Deploying ITNs to increase coverage / Deployer les MII pour augmenter la couverture / Distribuir MII para aumentar a cobertura

33/51



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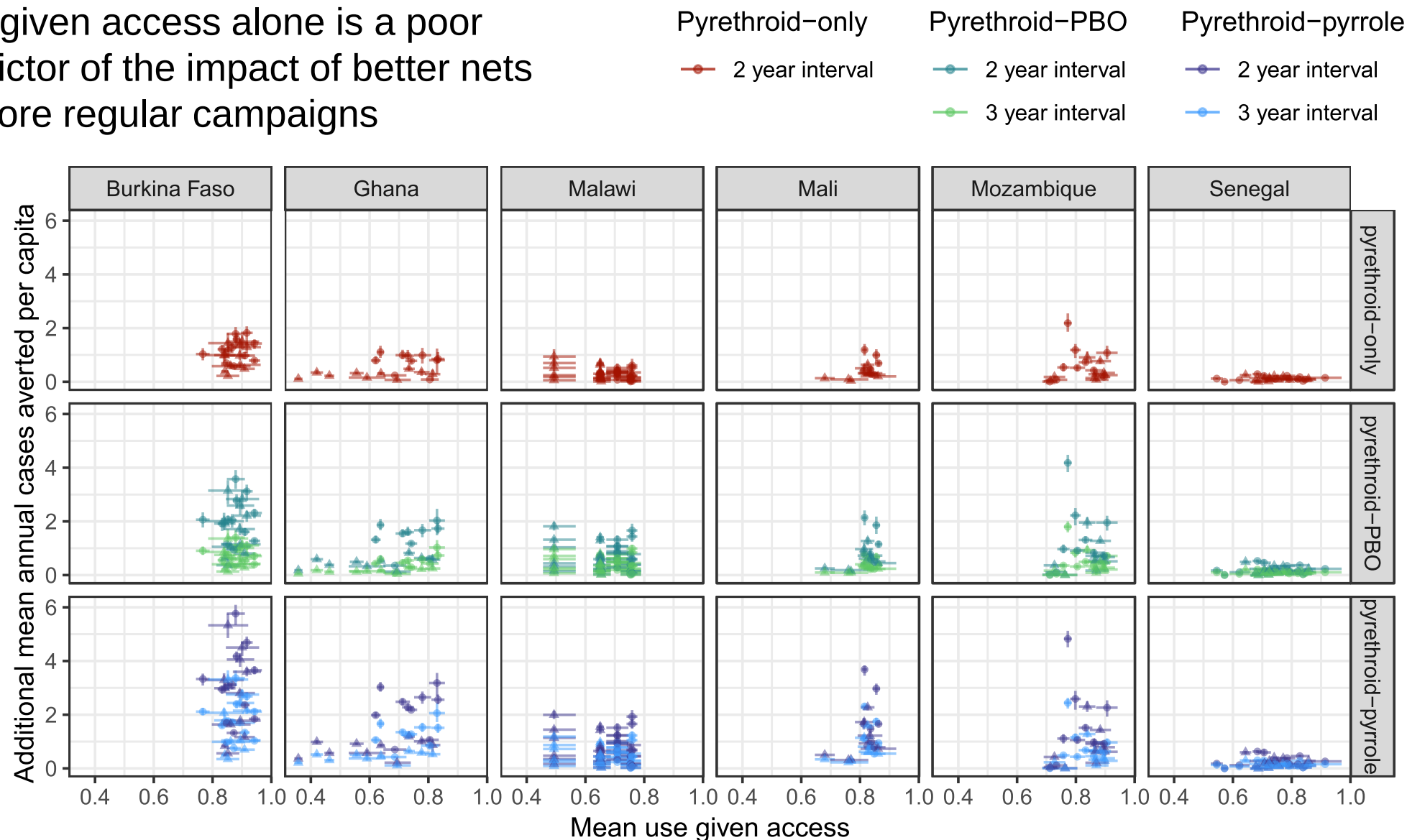
Approaches to maximising impact



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- Use given access alone is a poor predictor of the impact of better nets or more regular campaigns



Approaches to maximising impact



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- Net retention (access) alone is a poor predictor of the impact of better nets or more regular campaigns

Pyrethroid-only

— 2 year interval

Pyrethroid-PBO

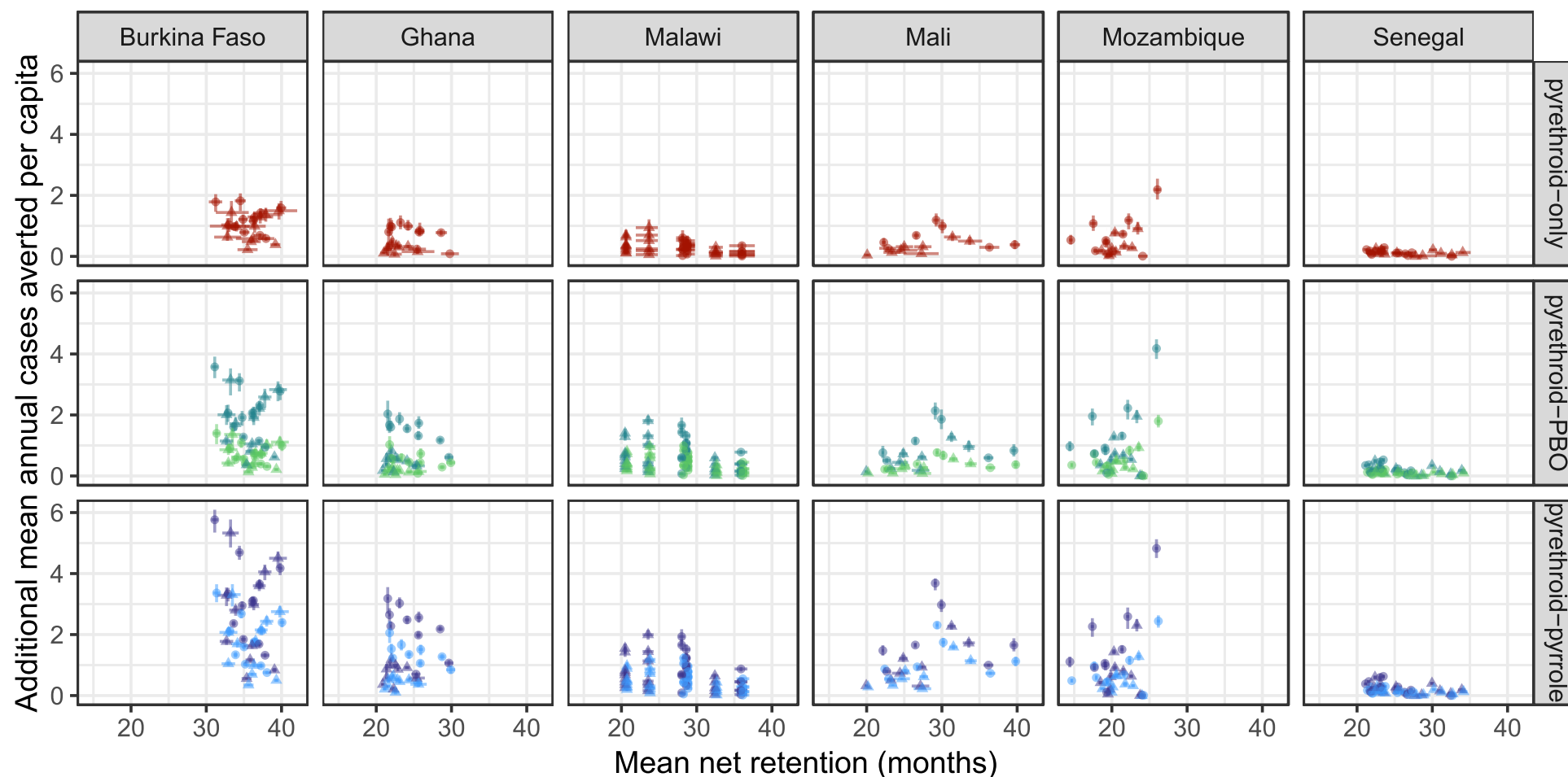
— 2 year interval

— 3 year interval

Pyrethroid-pyrrole

— 2 year interval

— 3 year interval



Approaches to maximising impact



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- The benefit of increased frequency and switching to better ITNs is greatest (and clearest) in **high transmission** settings

Pyrethroid-only

— 2 year interval

Pyrethroid-PBO

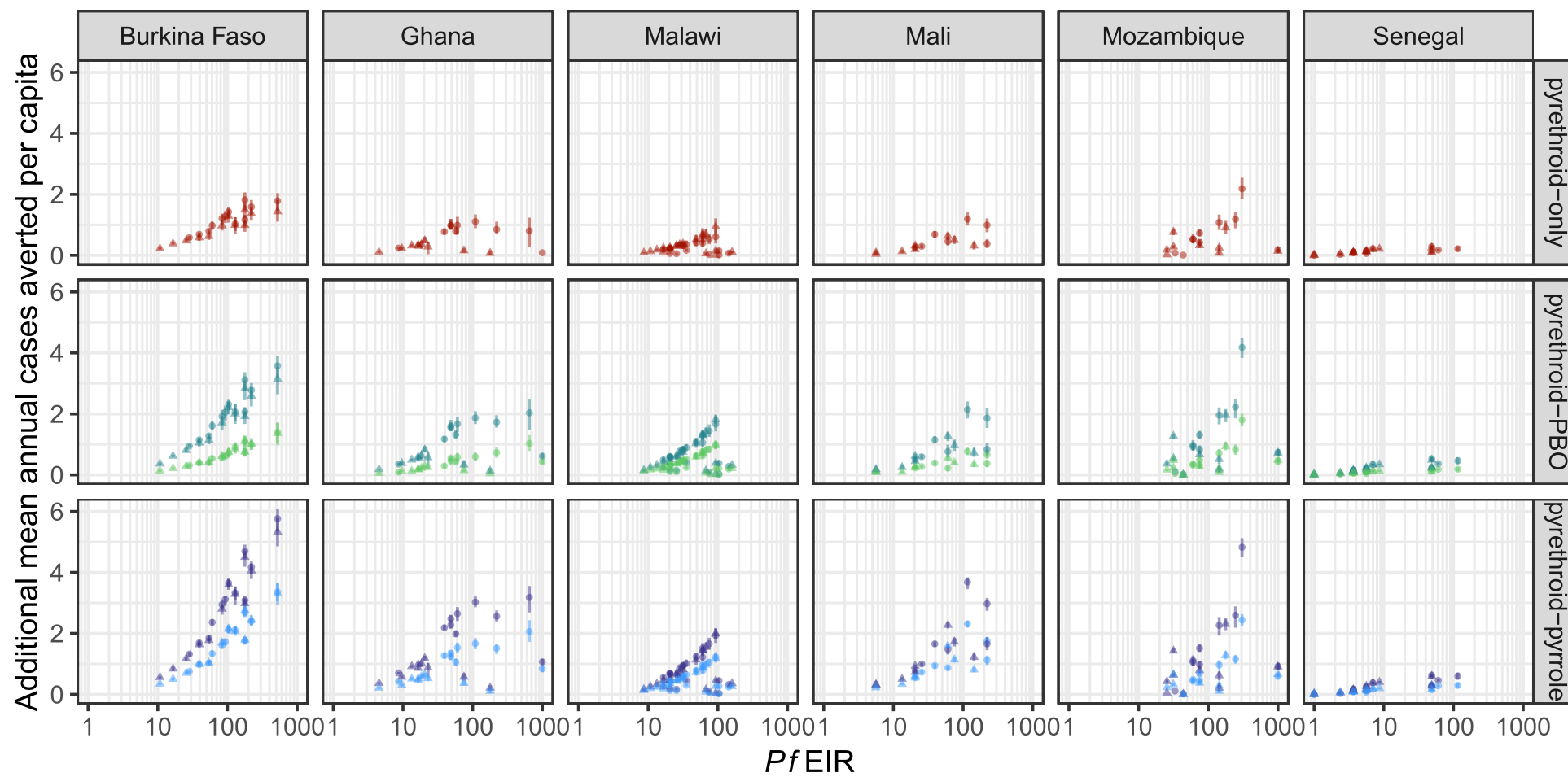
— 2 year interval

— 3 year interval

Pyrethroid-pyrrole

— 2 year interval

— 3 year interval

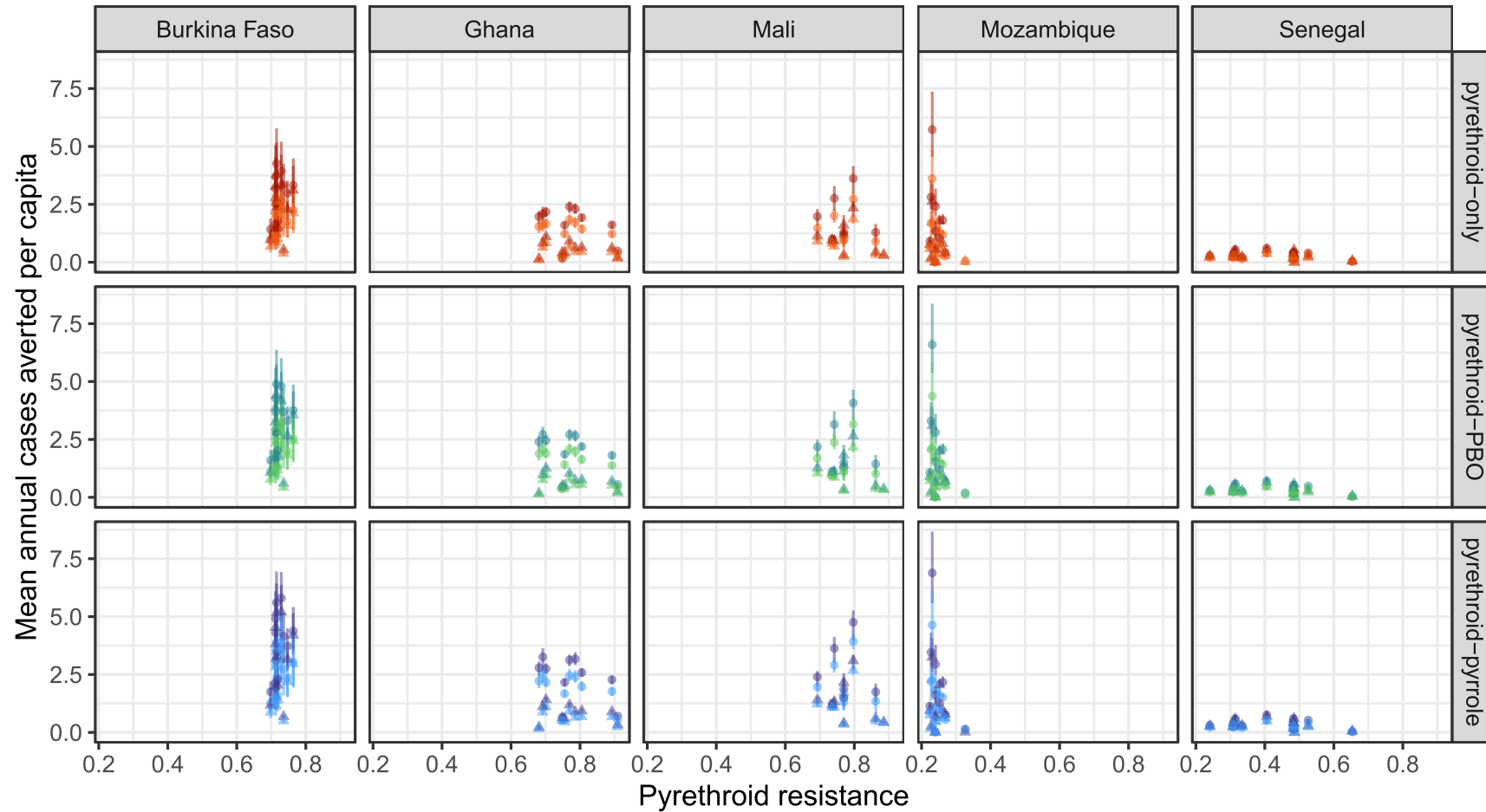


Pyrethroid resistance is also a poor predictor of impact



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Pyrethroid-only

● 2 year interval

● 3 year interval

Pyrethroid-PBO

● 2 year interval

● 3 year interval

Pyrethroid-pyrrole

● 2 year interval

● 3 year interval

Urbanicity

● rural

▲ urban

Approaches to maximising impact

Continuous channels only

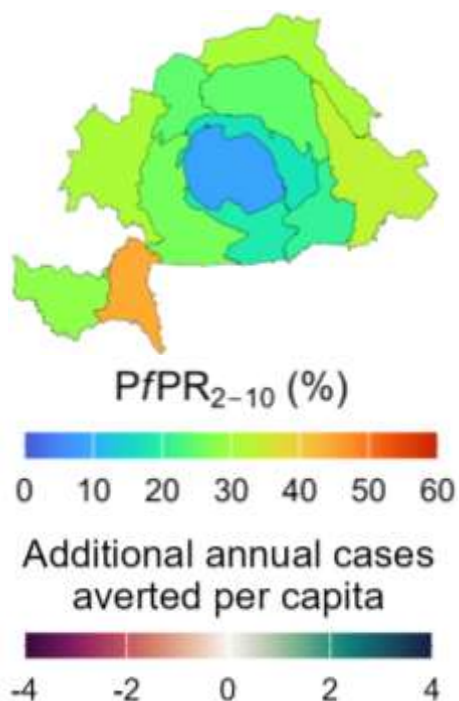
None Urban Rural All



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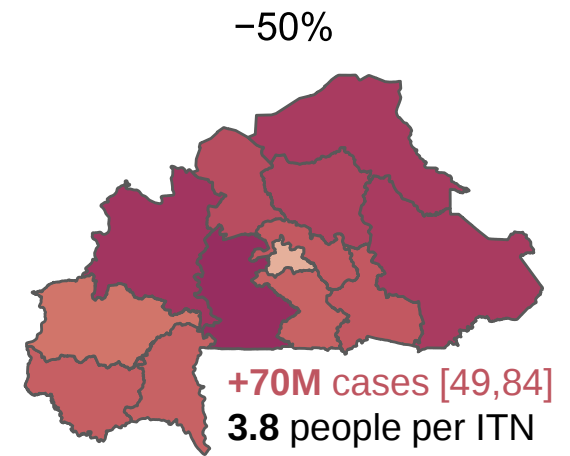
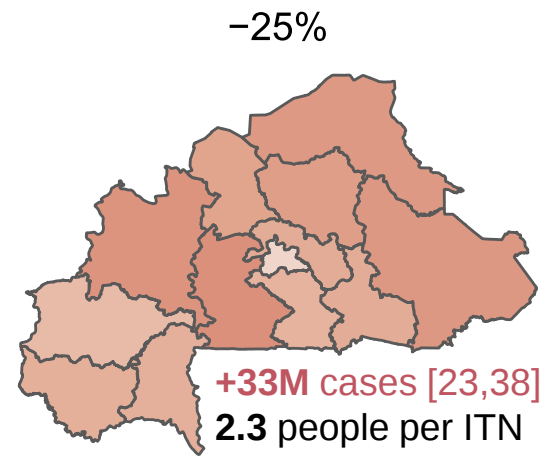
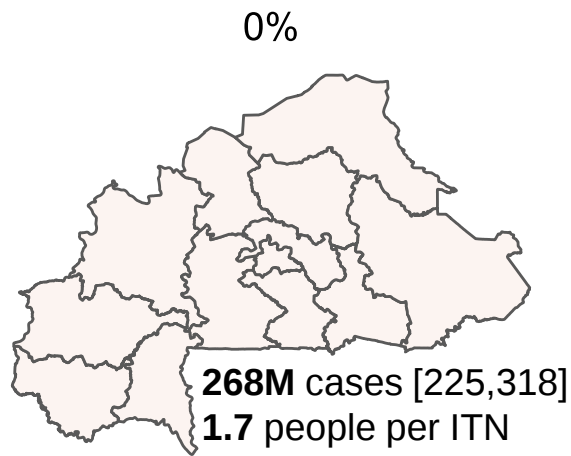
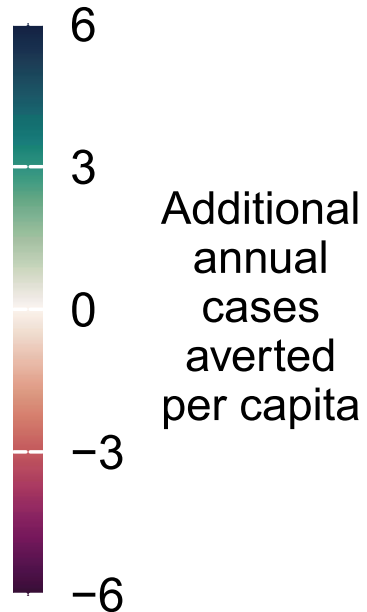
3-year pyrethroid-only campaigns:
62.9M [36.6, 82.3]
 ann. cases averted
 Avg. ann. cost **\$37.5M**
8.0M avg. ann. ITNs



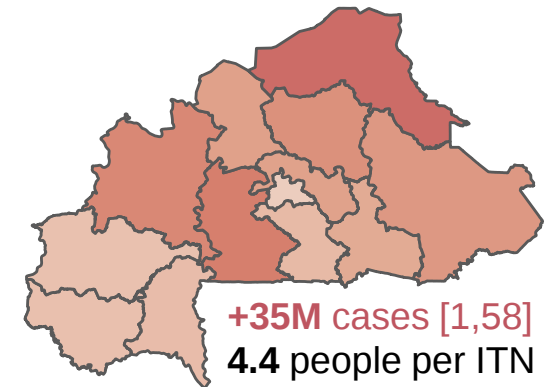
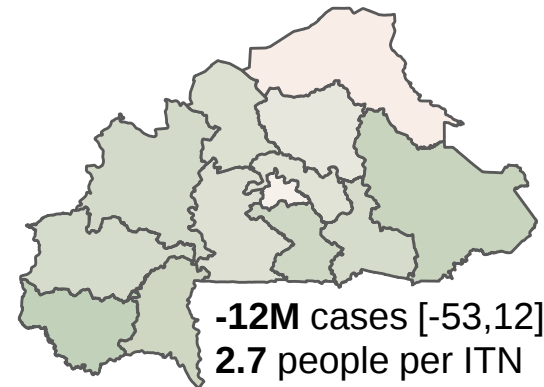
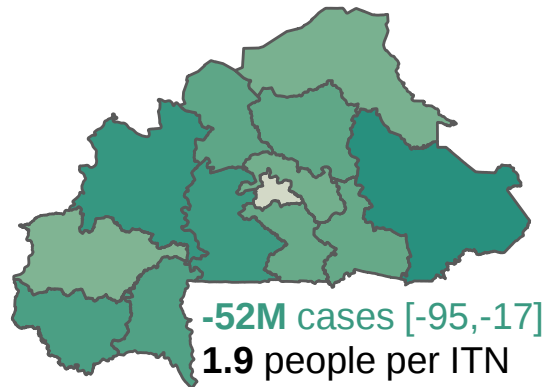
Pyrethroid-pyrrole strategy	Reduced coverage & equivalent cost	Equivalent coverage & increased cost	Equivalent coverage with deprioritisation
3-year campaign intervals M ann. cases averted Mean ann. ITNs/cost	 81.0 [52.2, 107] 7.1M / \$37.5M	 85.2 [55.0, 113] 8.0M / \$42.5M	 84.3 [71.4, 129] 6.7M / \$35.7M
2-year campaign intervals M ann. cases averted Mean ann. ITNs/cost	 96.0 [73.7, 124] 6.8M / \$36.1M	 122 [96.2, 147] 11.0M / \$58.8M	 107 [87.3, 180] 7.0M / \$37.1M

Change to budget: (3-year intervals)

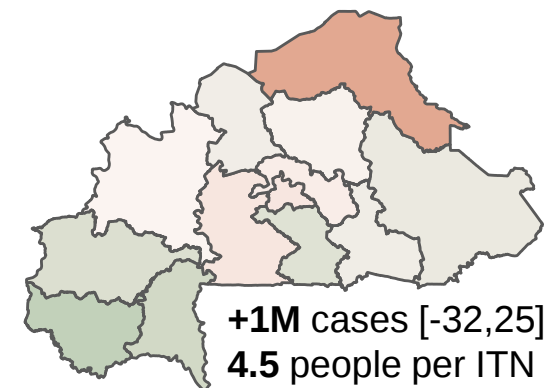
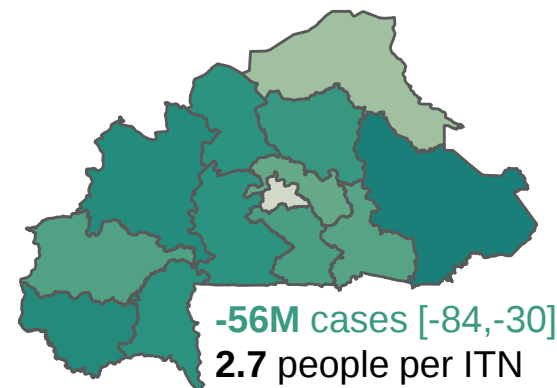
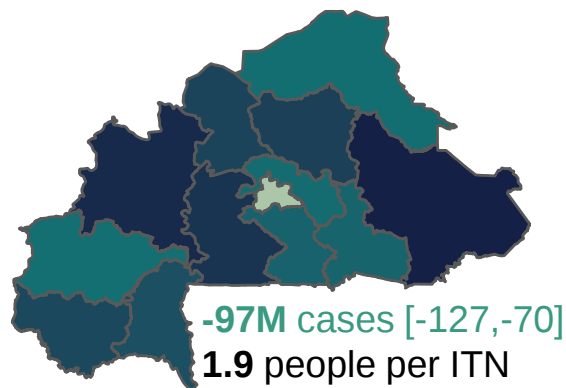
- 630k routine ITNs distributed annually in all scenarios
- Budget achieved by increasing campaign procurement ratios (people per ITN)



Pyrethroid-only



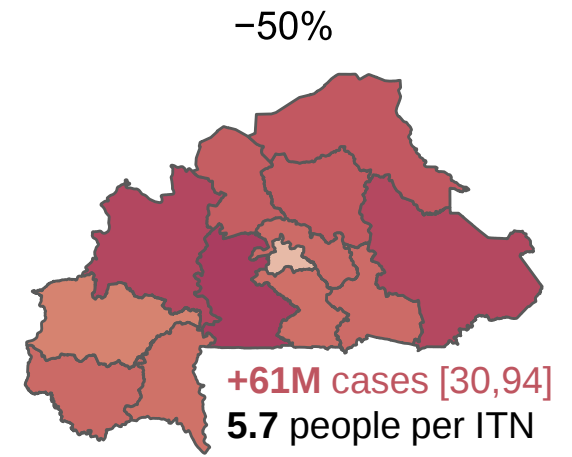
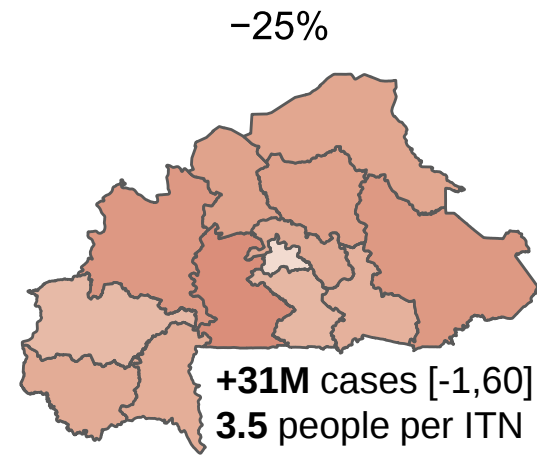
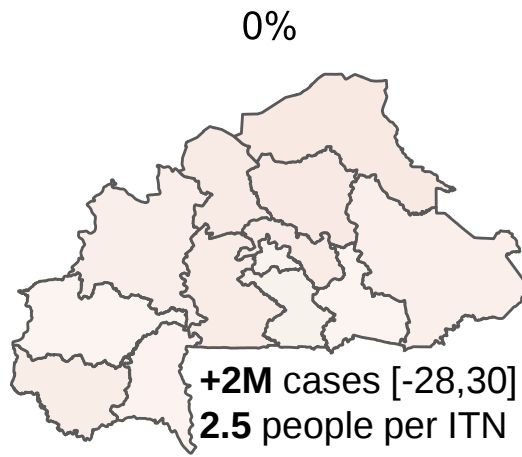
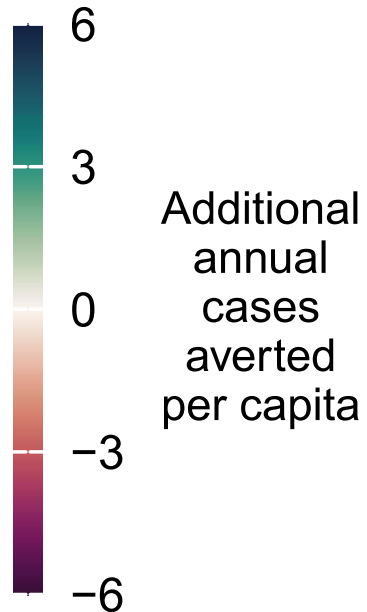
Pyrethroid-PBO



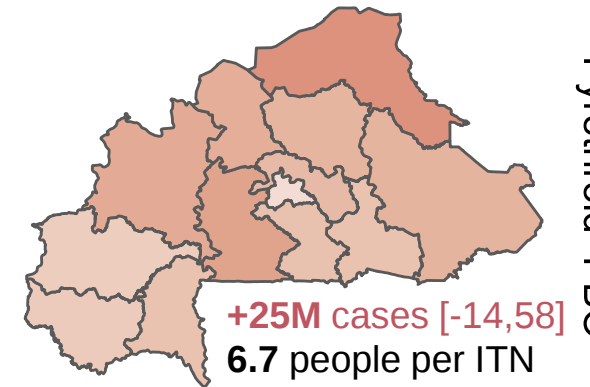
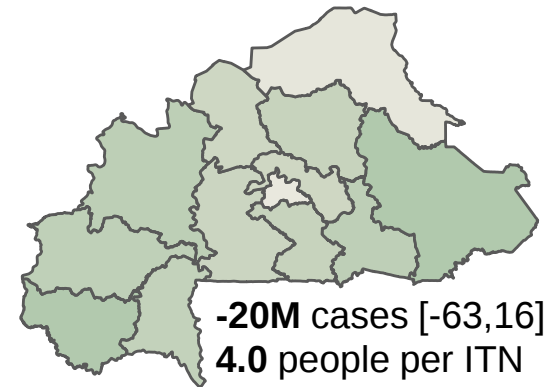
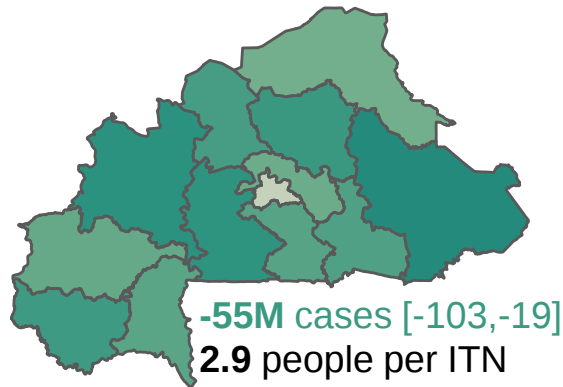
Pyrethroid-Pyrole

Change to budget: (2-year intervals)

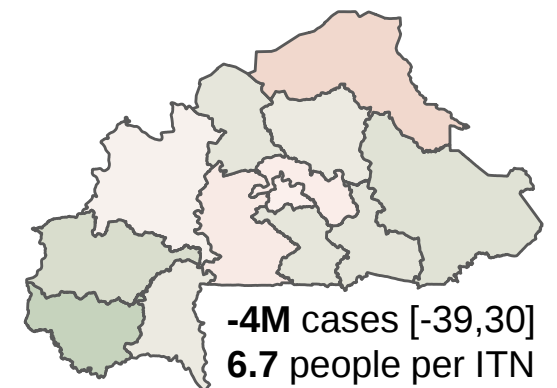
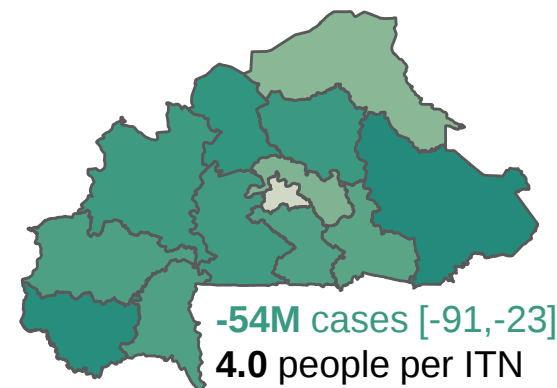
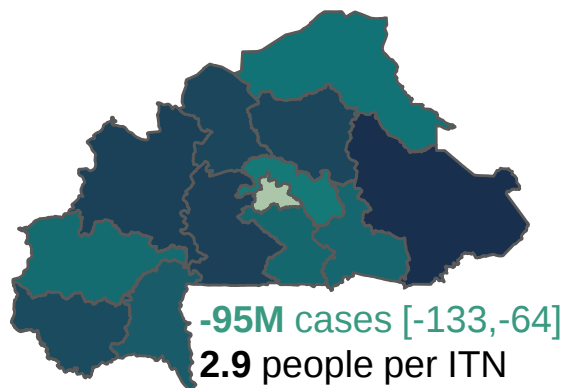
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Pyrethroid-only



Pyrethroid-PBO

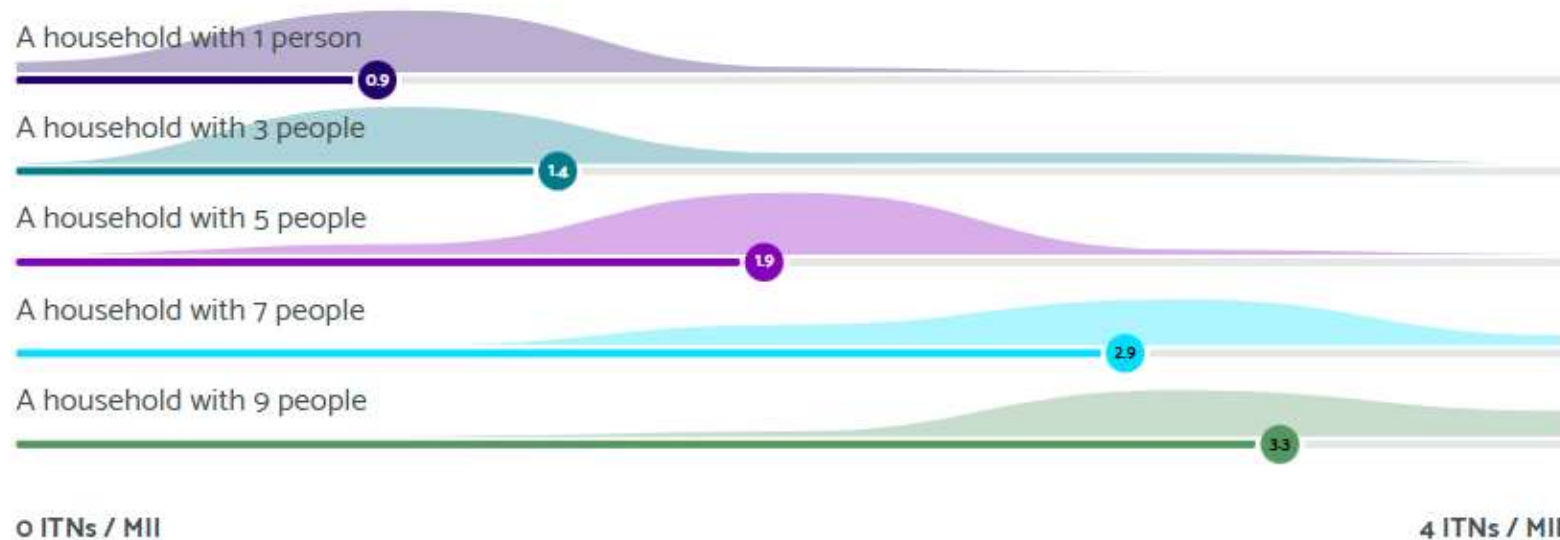


Pyrethroid-Pyrole



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For a mass campaign where you distributed 1 ITN for every 3 people in a household, how many would you give to the following household sizes:



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What does optimal coverage mean to you?

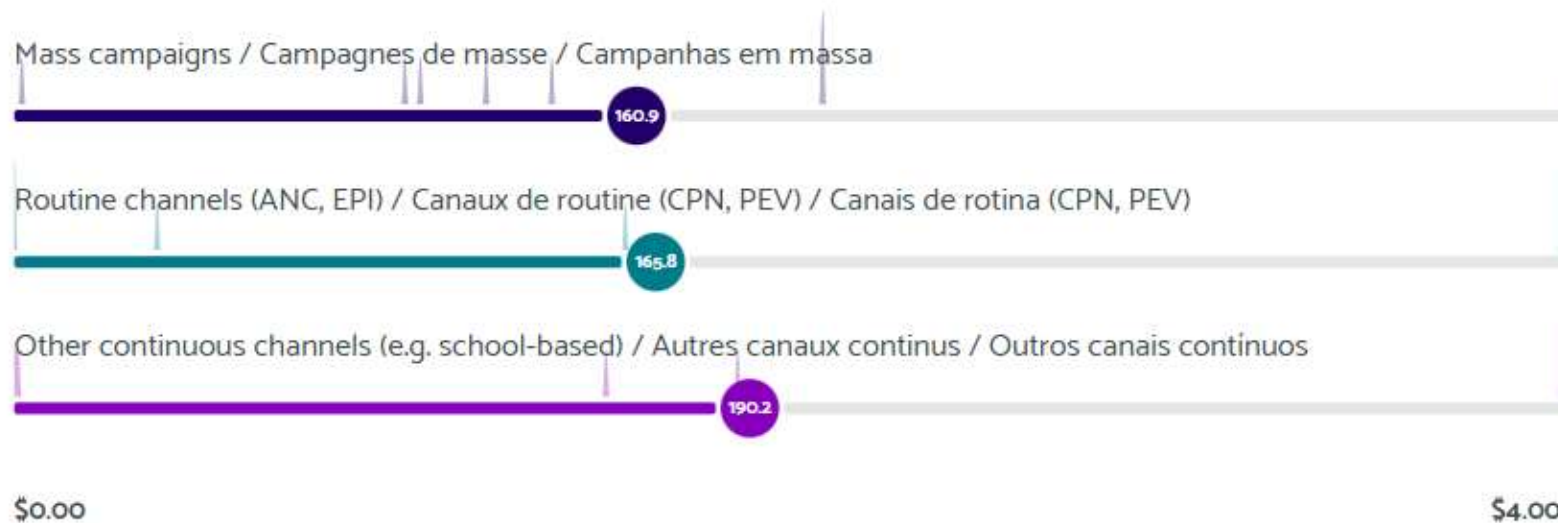


- 36 Deploying ITNs to maximize impact / Deploying for MII per person in target population / Deploying MII per person in target population
- 6 Deploying ITNs to maximize coverage / Deploying for MII per person in target population / Deploying MII per person in target population



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Excluding procurement costs, what was the estimated distribution cost per ITN for each channel in the last country you supported (in US cents)?



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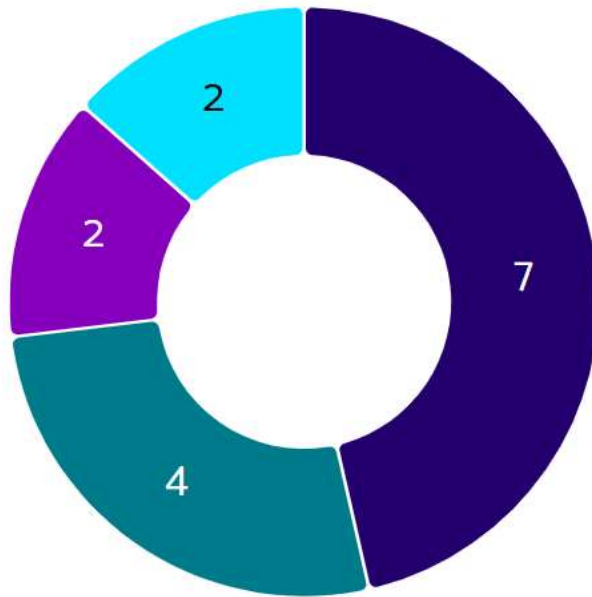
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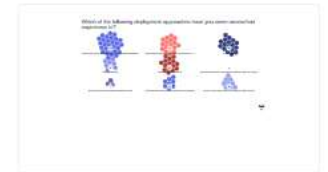
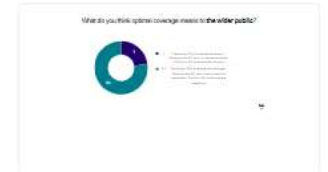
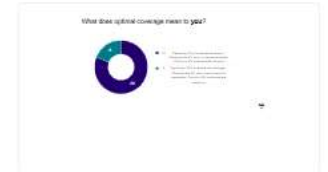


- 38 Deploying ITNs to maximize impact / Deploying for MS prior to impact maximization / Deploying MS prior to impact maximization
- 31 Deploying ITNs to maximize coverage / Deploying for MS prior to impact maximization / Deploying MS prior to impact maximization
- 31 Deploying ITNs to maximize impact / Deploying for MS prior to impact maximization / Deploying MS prior to impact maximization

Do you think a distribution cost under 1 USD per ITN is achievable in any setting (i.e. for any channel in any country)?



- 7 No (unachievable in all settings / inatteignable dans tous les contextes / inatingível em todos os contextos)
- 4 Possibly (achievable for some settings / dans certains contextes / em alguns contextos)
- 2 Probably (achievable in most settings / dans la plupart des contextes / na maioria dos contextos)
- 2 Yes (achievable in all settings / atteignable dans tous les contextes / atingível em todos os contextos)



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If you could drop one thing from a mass campaign budget, what would it be?

household mobilization
voucher cost launch events
microplanning big overhead
personnel cost reduction of steps
warehousing launch event training
microplanning workshop
removal of use of paper storage costs
vouchers cost flag-off events
warehousing costs
official campaign launch

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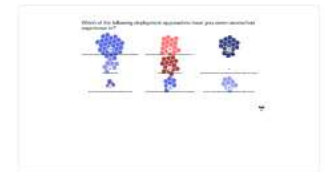
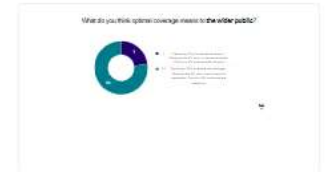
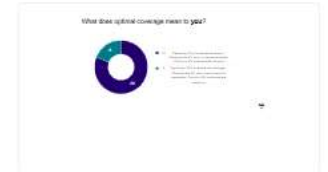


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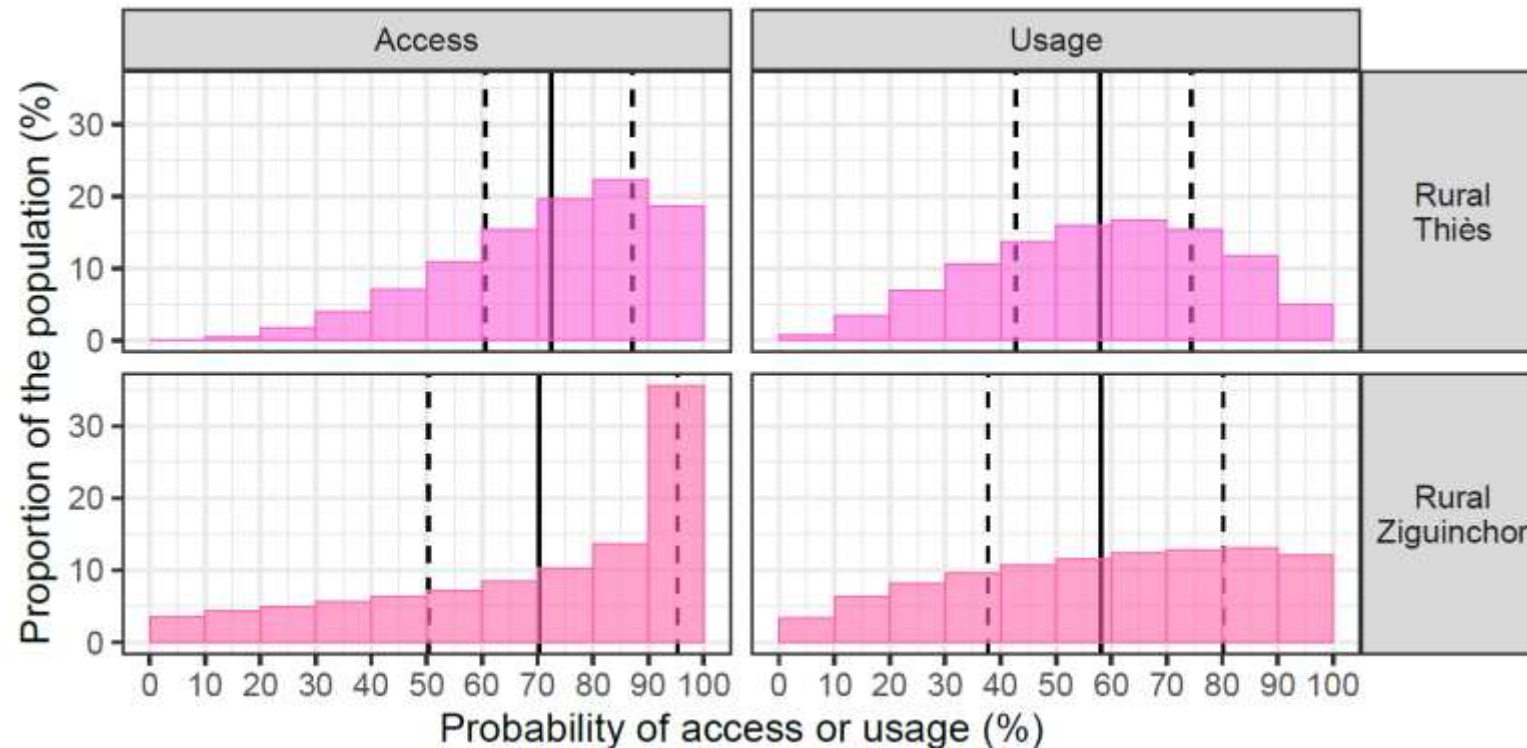
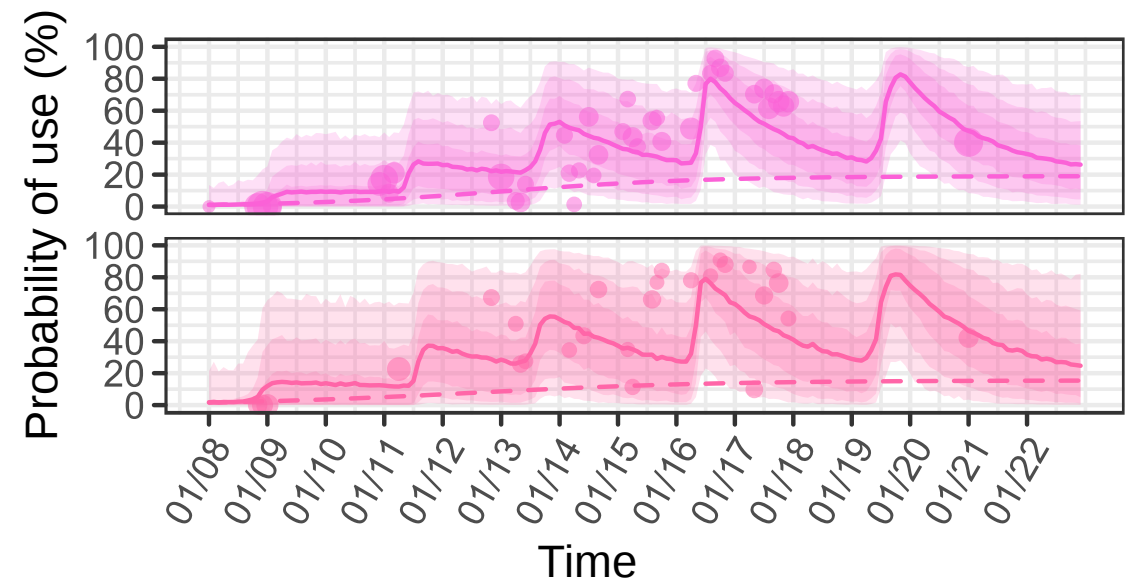
Choose a slide to present



- Universal coverage to optimal coverage
- Was universal coverage achievable with the status quo?
- How can optimal coverage now be achieved?
- Additional considerations

Considerations for subnational tailoring: equity of use and access

- Overall use of ITNs is **not evenly distributed** within sub-national regions
- Overall use of ITNs is more unevenly distributed in some regions than others



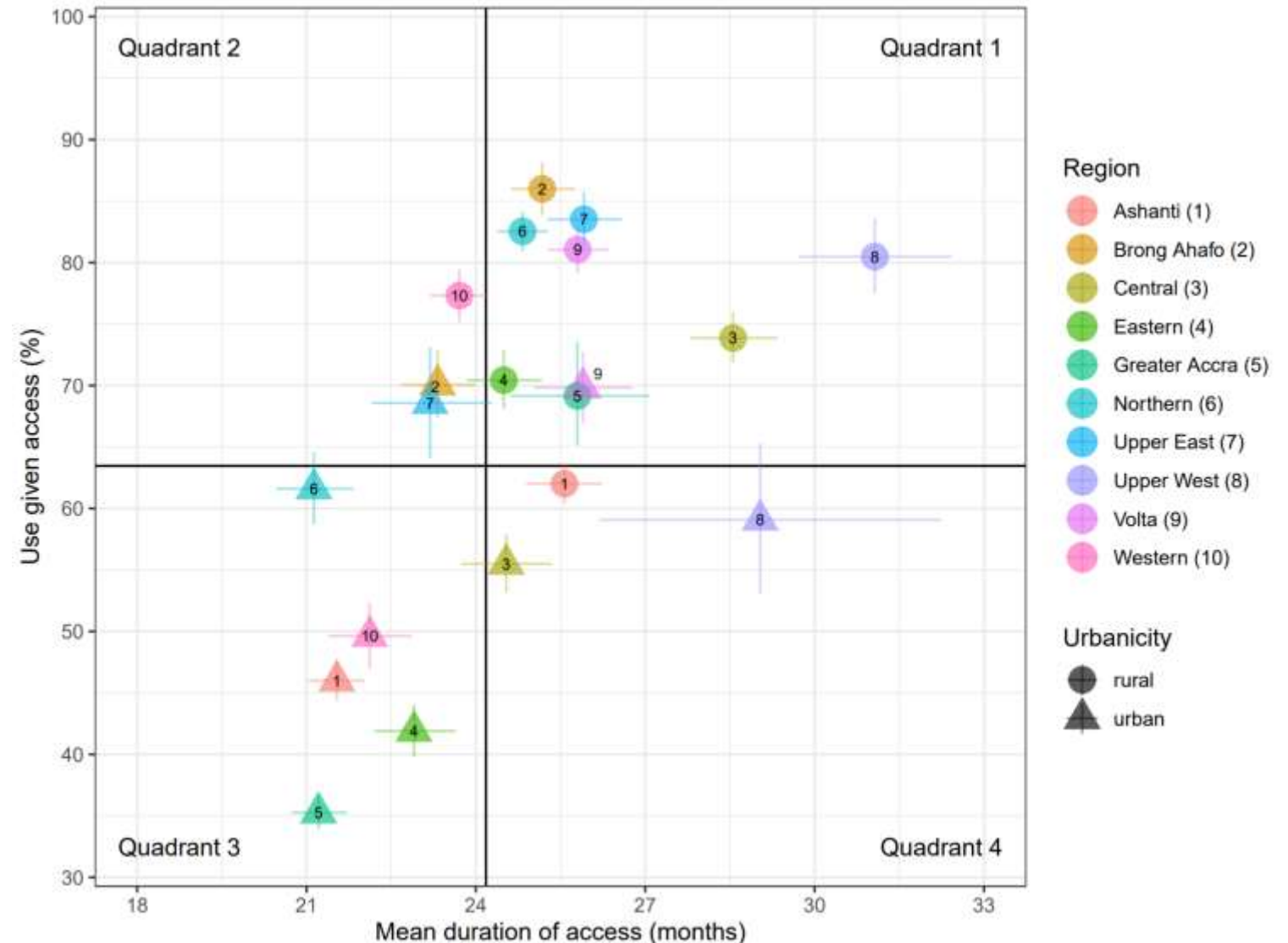
Considerations for subnational tailoring: ITN retention and use given access



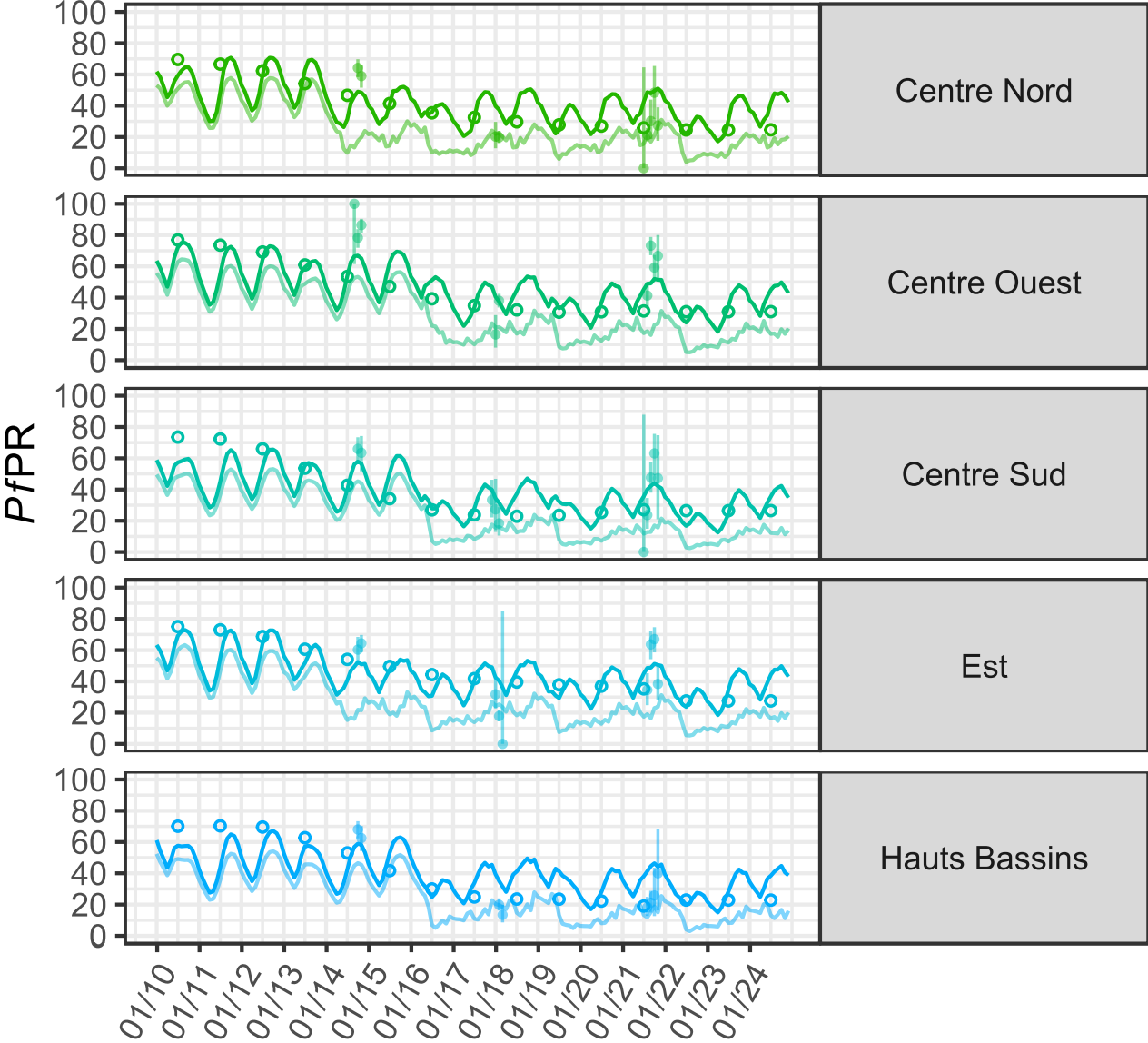
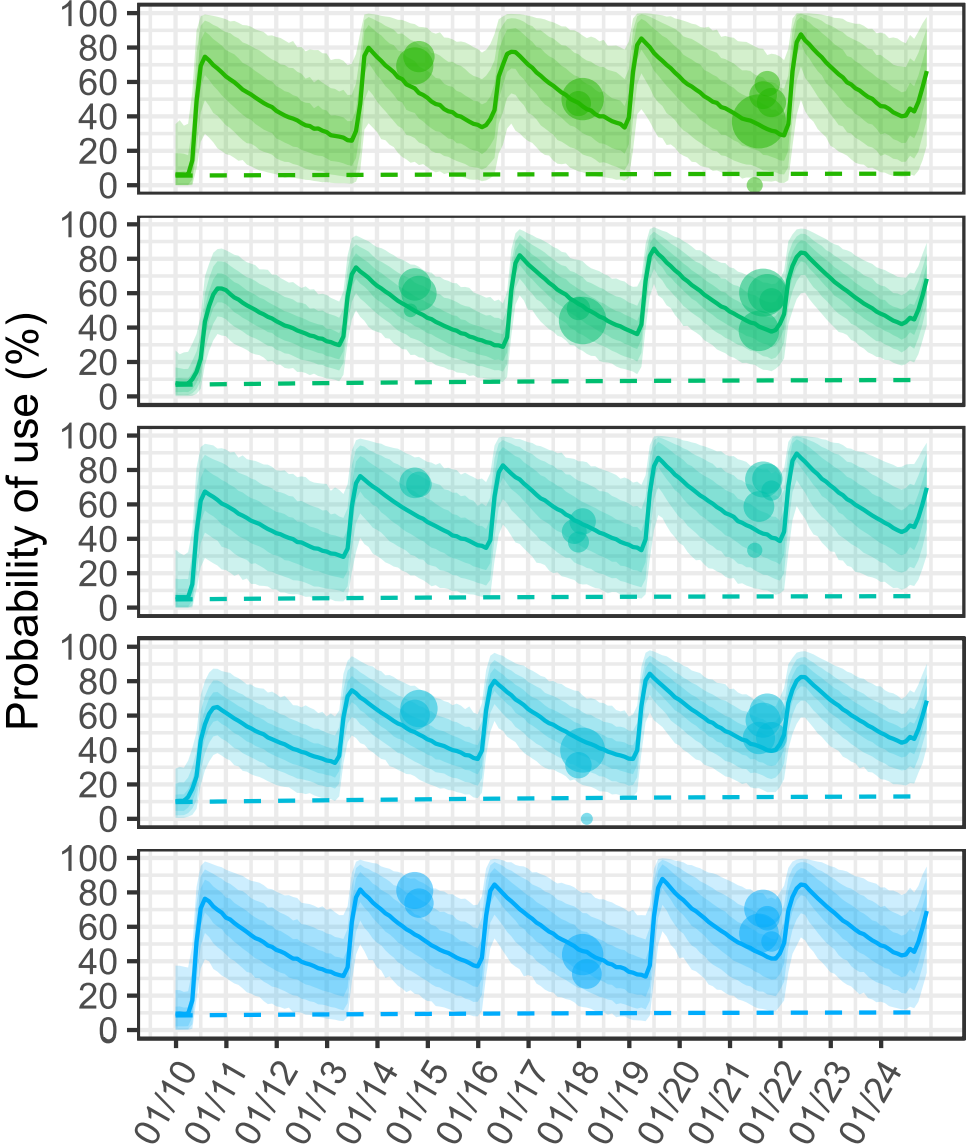
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- In areas of low use given access (quadrants 3 and 4) social behavioural change interventions **may** improve overall use
- Prioritising more regular distribution of ITNs in areas of **high retention** (quadrants 1 and 4) may be more **effective**, but more regular campaigns when **retention is low** (quadrants 2 and 3) may be **more equitable**



Considerations for campaign intervals: *Pf*PR rebounds over time

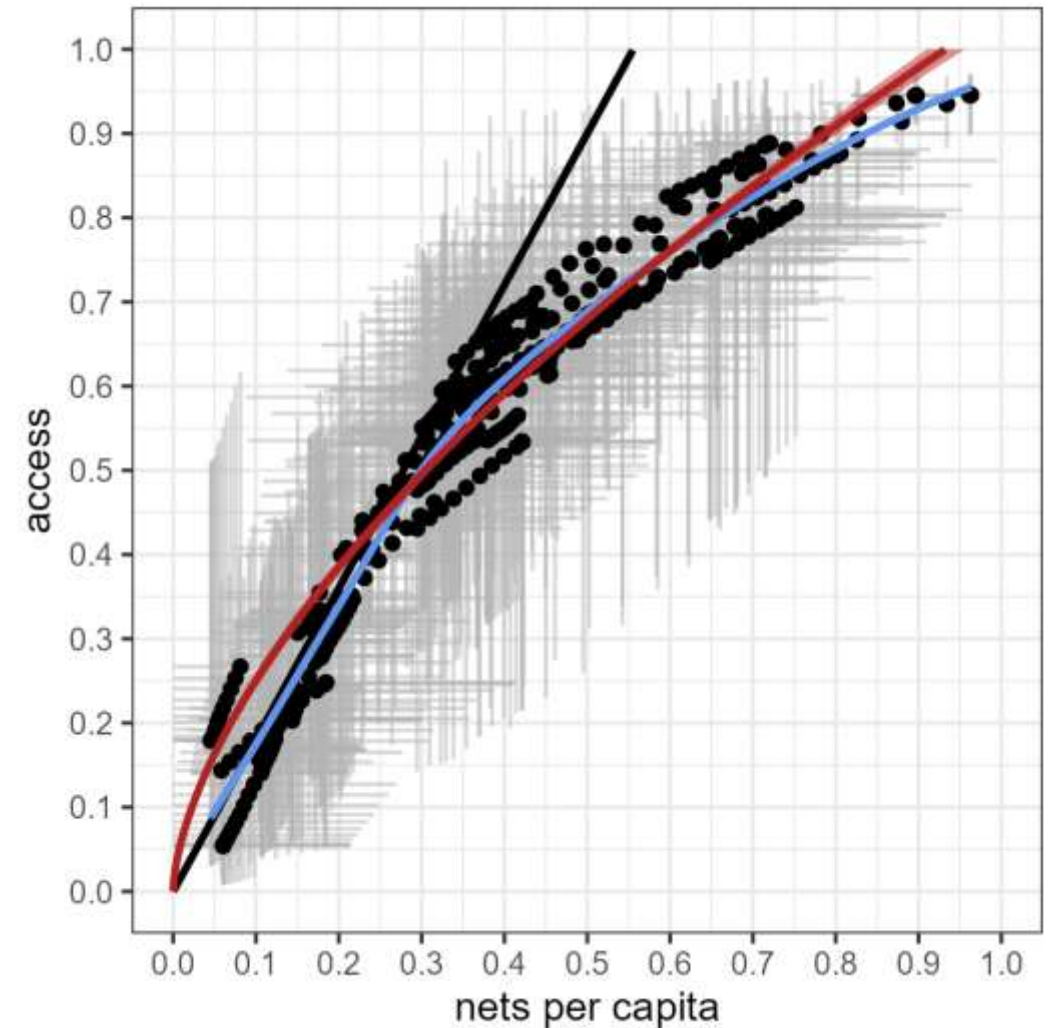
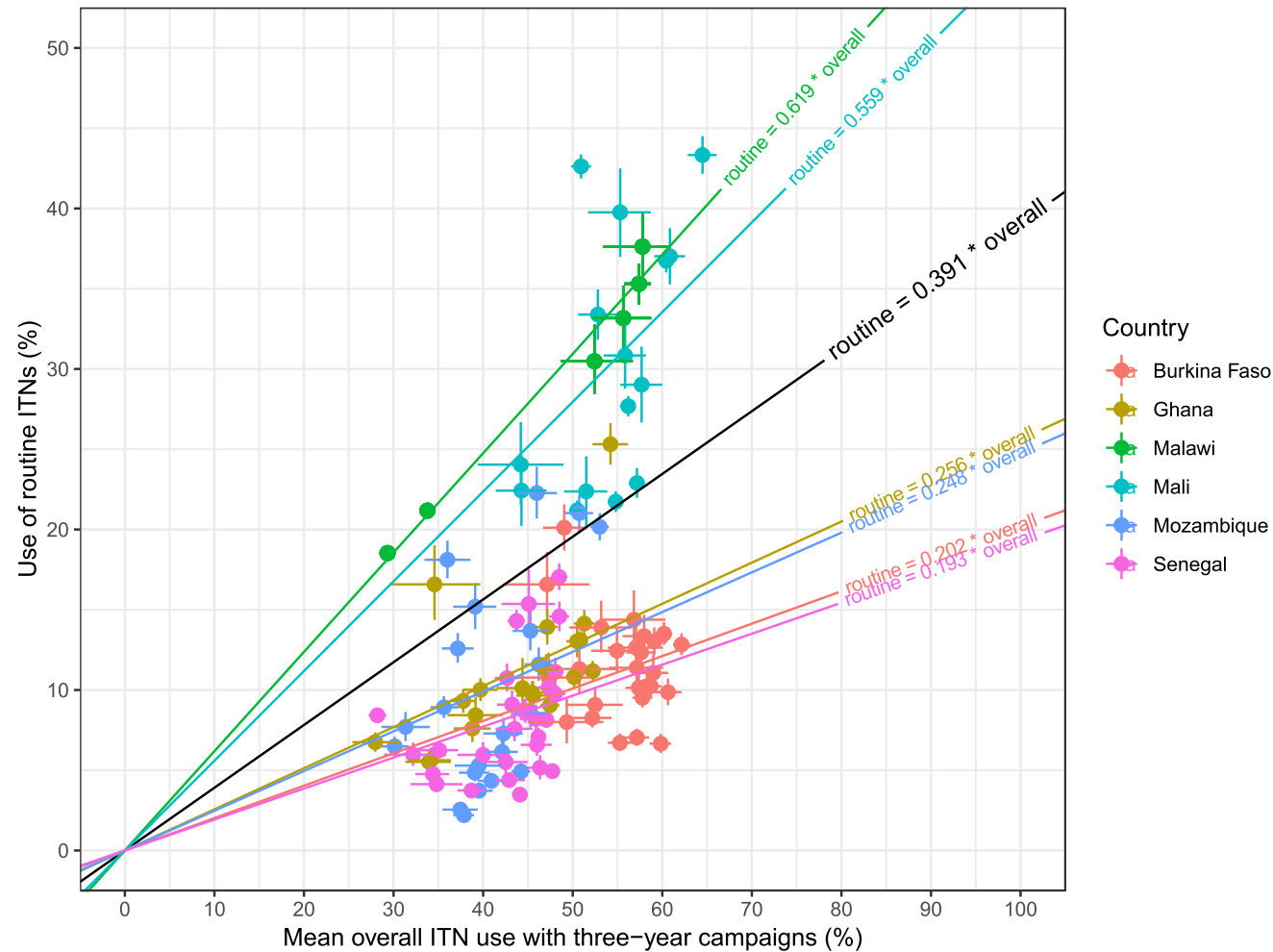


Considerations for distribution channels: 39% of used ITNs from routine channels



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Adapted from: Bertozzi-Villa, A. et al. Nature Communications 12, 1–12 (2021).

-
- **Universal coverage was not consistently achieved** anywhere but was (briefly) achieved after mass campaigns in most regions
 - **Transmission intensity** best predicts the impact of switching to more regular campaigns and/or better ITNs
 - **Prioritising higher-transmission** settings may be optimal under fixed budgets in some settings
 - Switching to **fewer, but better nets** could avert:
 - **More cases** for the **same cost**
 - **Similar numbers of cases** under **reduced budgets**