



BILL & MELINDA
GATES *foundation*



MDA + IRS IN UGANDA: modelling and practice

ASTMH Symposium #141

IRS and Drug-Based Malaria Control: Interaction, Timing and Next Steps

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October 31, 2018
New Orleans




THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH

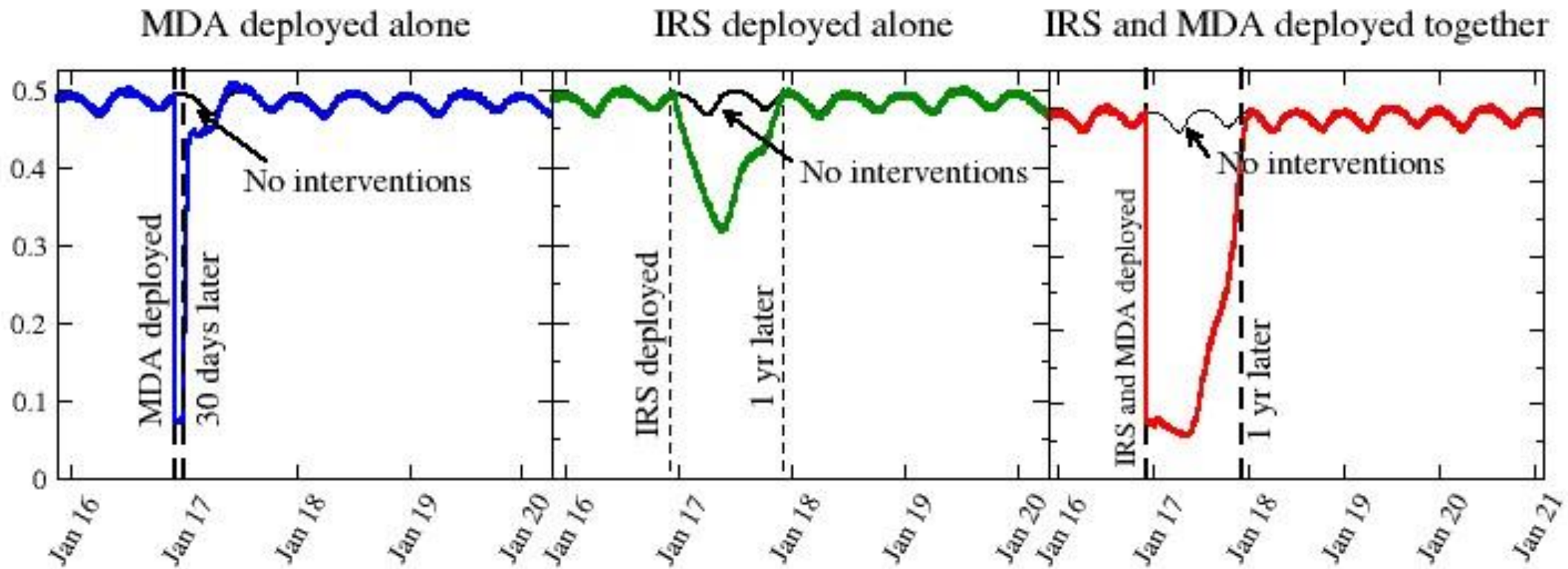


MDA + IRS in Uganda: Modelling and Practice

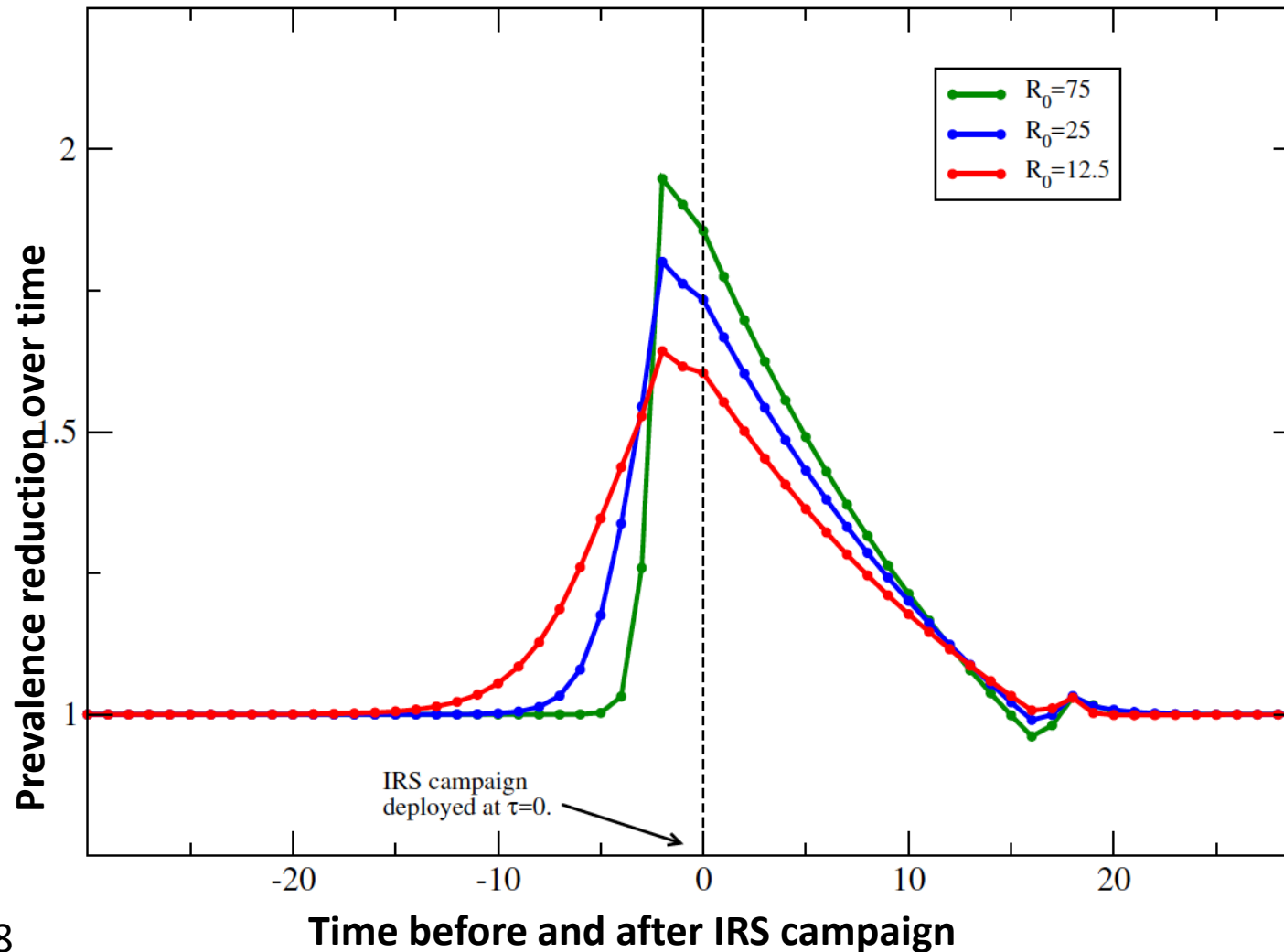
Outline

- 
- **Modeling MDA + IRS timing**
 - **Study set-up & preliminary results**
 - **Do the results make sense?**

Openmalaria Modelling: IRS prolongs MDA impact for duration of insecticide efficacy

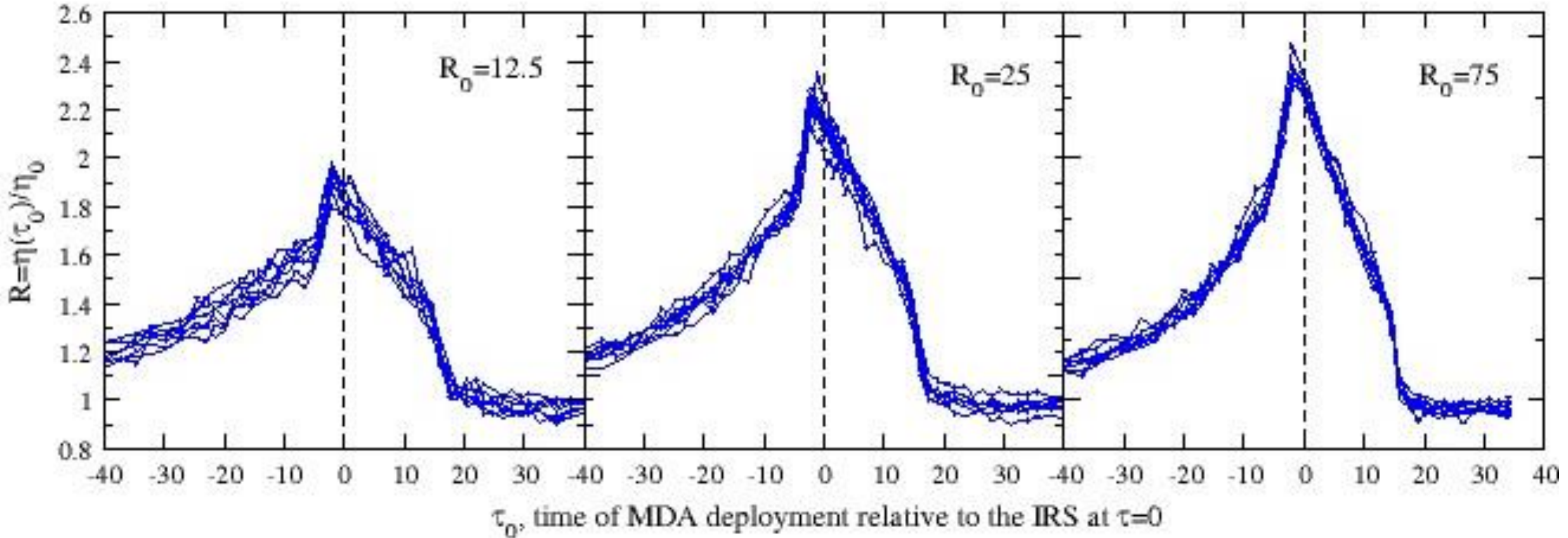


Ross-MacDonald Modelling: Synchronous timing is best, impact scales with R_0



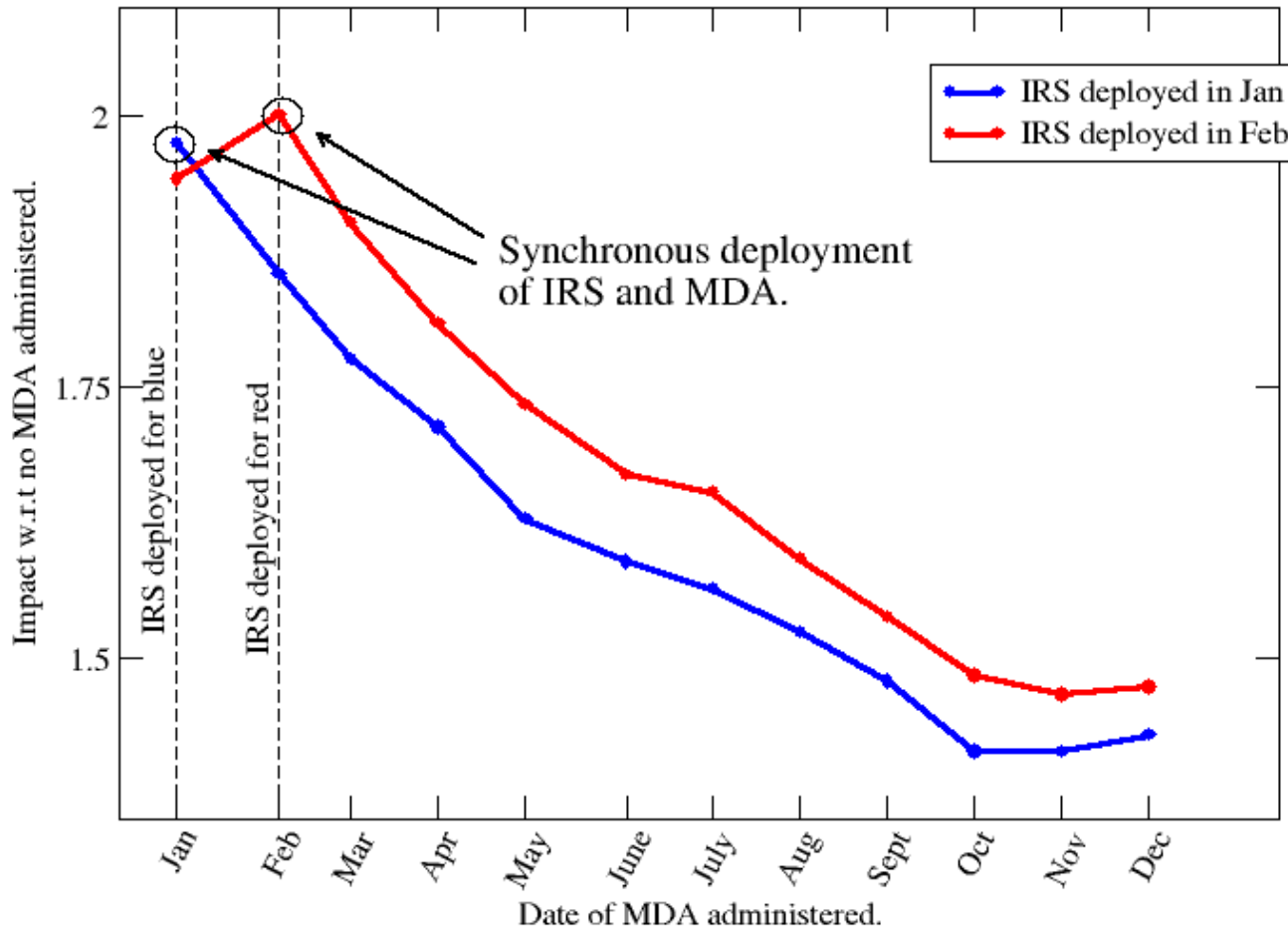
Elliott R, Smith D, Echodu,
D. (2018)
Submitted.

Same effect in *Openmalaria*: Co-timing impact grows with transmission intensity



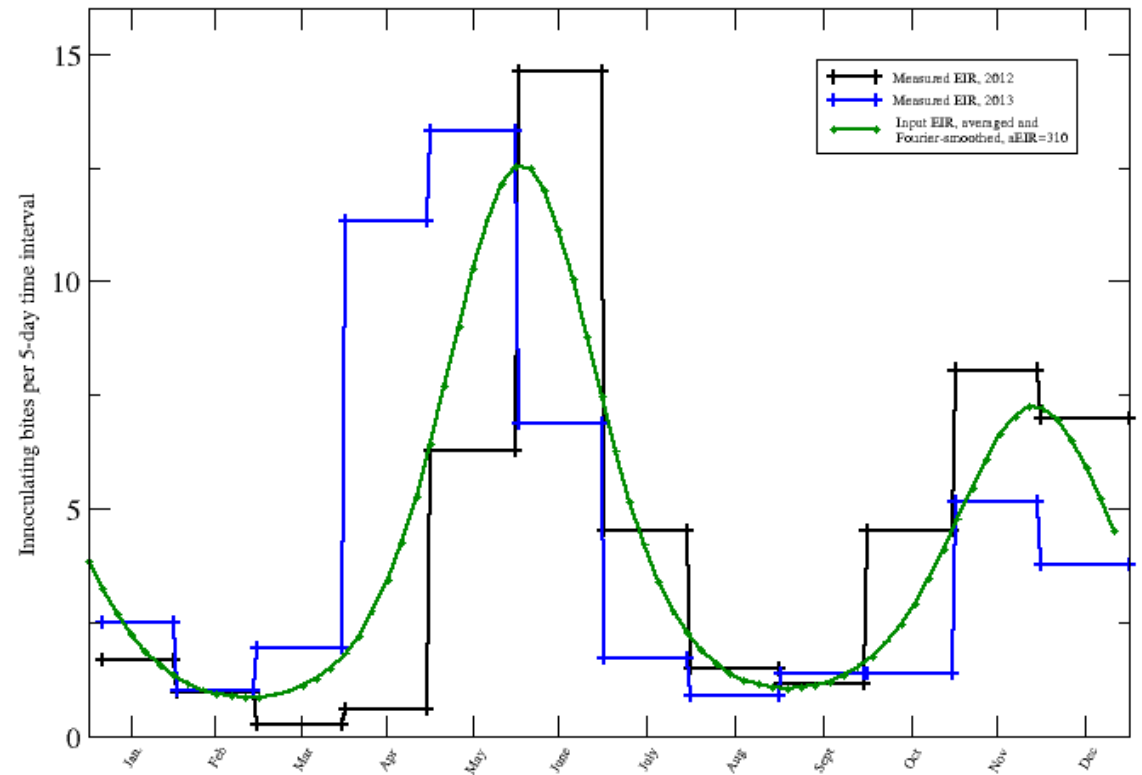
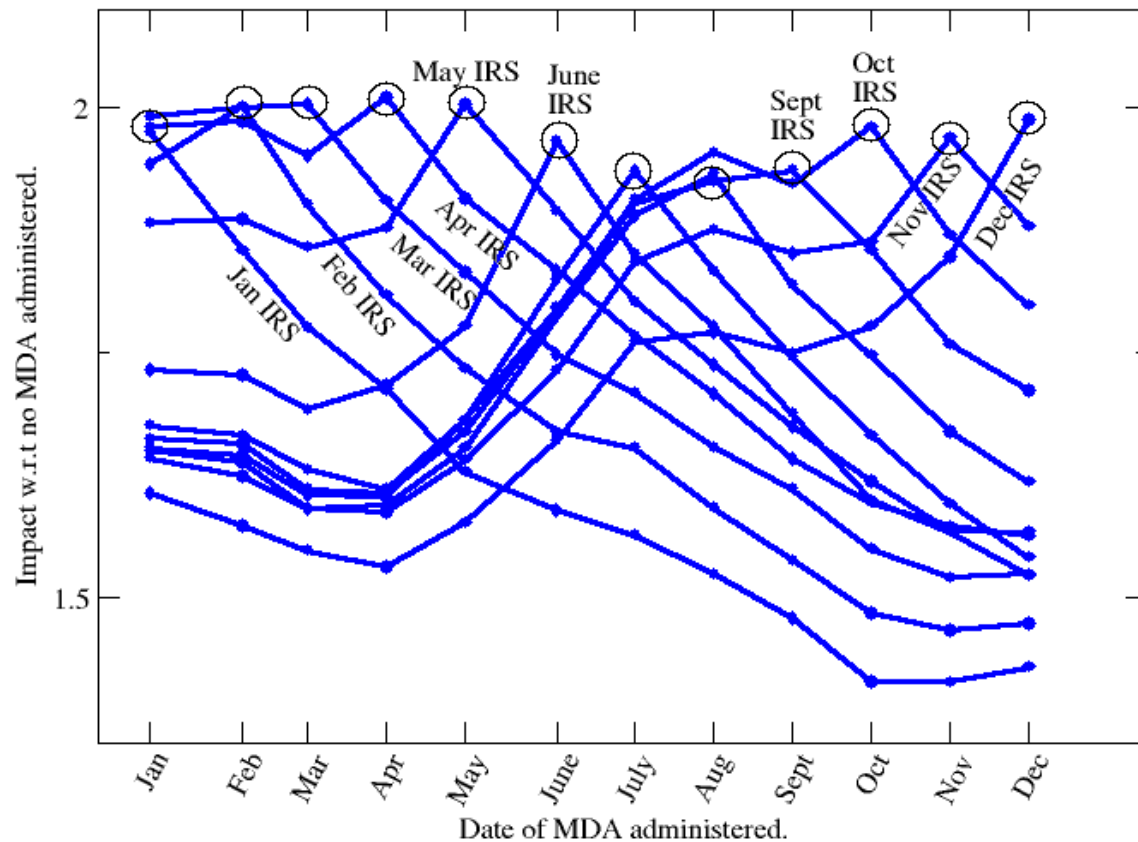
Openmalaria Modelling: synergy or seasonality?

Impact of one IRS and one MDA, applied over 1yr



Openmalaria Modelling: synchronous deployment more powerful than seasonality, at least for this annual EIR (100)

Impact of one IRS and one MDA, applied over 1yr



Katakwi Rotary Malaria Project: IRS + MDA (Uganda)



PROJECT SUMMARY

Description and study site



Objectives

Katakwi District Sequence of malaria control interventions in 3 subcounties (Phase 1)

- Kapujan: (IRS + MDA, 4 rounds)
- Toroma: (IRS, 4 rounds)
- Magoro (std of care)
- LLINs in all three subcounties April 2017

Primary objective:

- **Phase I:** To evaluate the **impact of population based IRS in combination with MDA as compared with no MDA** on clinical and entomological malaria indicators.

PROJECT SUMMARY

Interventions

Phase I (2016-2018): controlled before and after (CBA) pre/post, analyzed with difference in differences

- IRS in Kapujan and Toroma with pirimiphos-methyl, 4 rounds every 8 months.
- MDA for all eligible residents in Kapujan with DHA-P , 4 rounds every 8 months.

Limitations:

- one cluster per arm
- non-randomized

Evaluation Methods & Sample Size

1) Cross sectional community surveys:

200 households (~800 individuals) in each sub county assessed at baseline and then every 6 months for the first two years.

2) Entomology surveys:

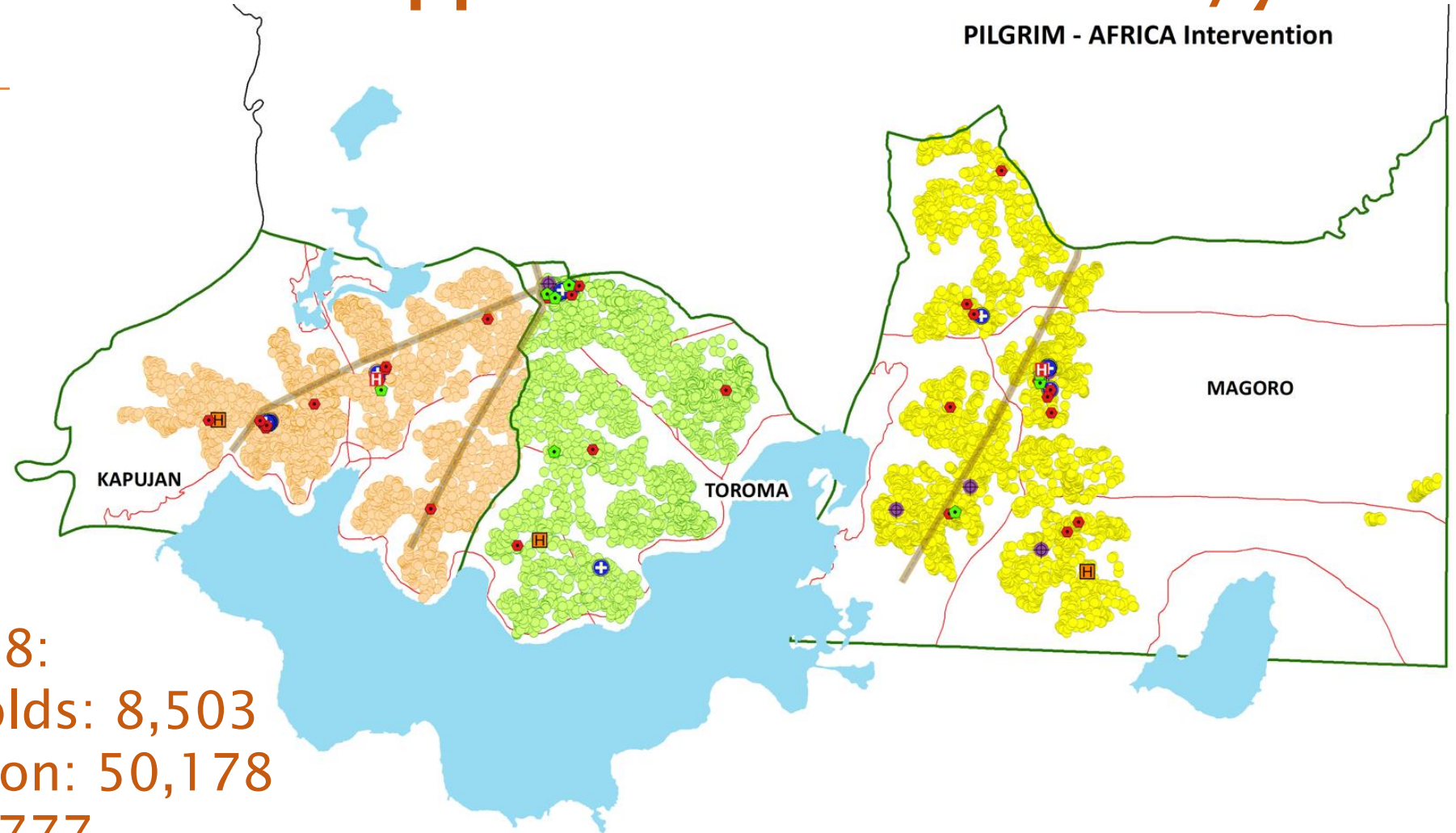
Mosquitoes from 30 households per arm per month using CDC light traps

3) Health facility surveillance

3 adjacent arms: mapped & enumerated 2x/yr

PILGRIM - AFRICA Intervention

- IRS + MDA
- IRS
- Std of Care
(LLINs)

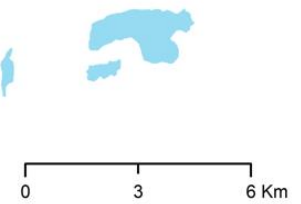


As of March 2018:

- Total households: 8,503
- Total population: 50,178
- MDA arm: 16,777

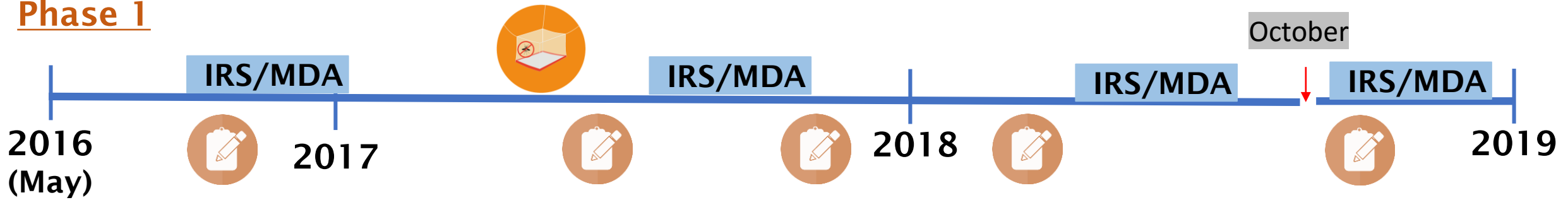


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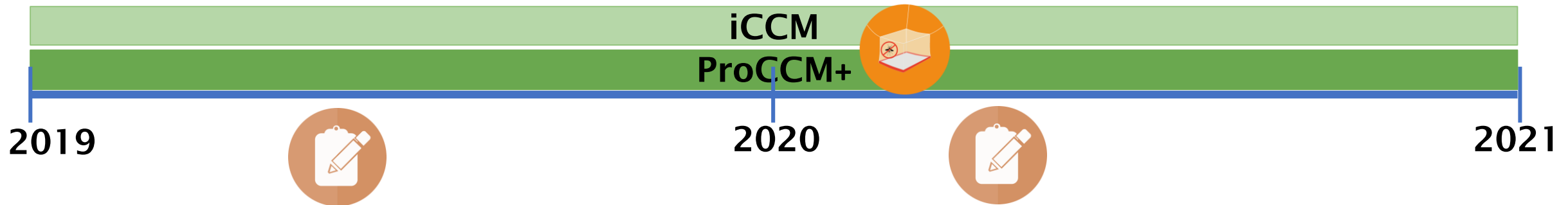


Intervention/Survey Scheduling

Phase 1



Phase 2



KEY



Survey (larger icon represents expanded survey)



LLIN Distribution

MDA Coverage

Round	Treated/Enumerated	1 st Dose	T/E	2 nd Dose	T/E	3 rd Dose
Round 1	13,353/16,577	81%	-	-	-	-
Round 2	12,712/16,620	77%	12,469/16,620	75.02%	12,465/16,620	75%
Round 3	12,366/16,596	74%	12,344/16,596	74.38%	12,343/16,596	74%

- Coverage → coverage of entire enumerated population, not eligible measured by digital check/barcode scan (R 2 and 3) and paper forms (R 1)
- Compliance measured through VHT follow-up of MDA Day 1 (R 2 & 3)

IRS Coverage

Round	Structures Sprayed/Found
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Round 1	97% Arm B 99% Arm A
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Round 2	97% Arm B 99% Arm A
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Round 3	97% Arm B 99% Arm A
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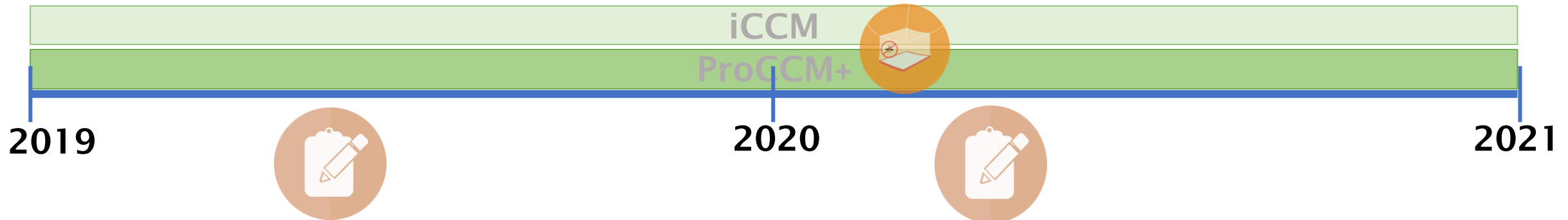
- Coverage is usual program metric, backed by household enumeration/structure numbering
- Coverage and acceptability unusually high for Uganda

Intervention/Survey Scheduling

Phase 1



Phase 2



KEY

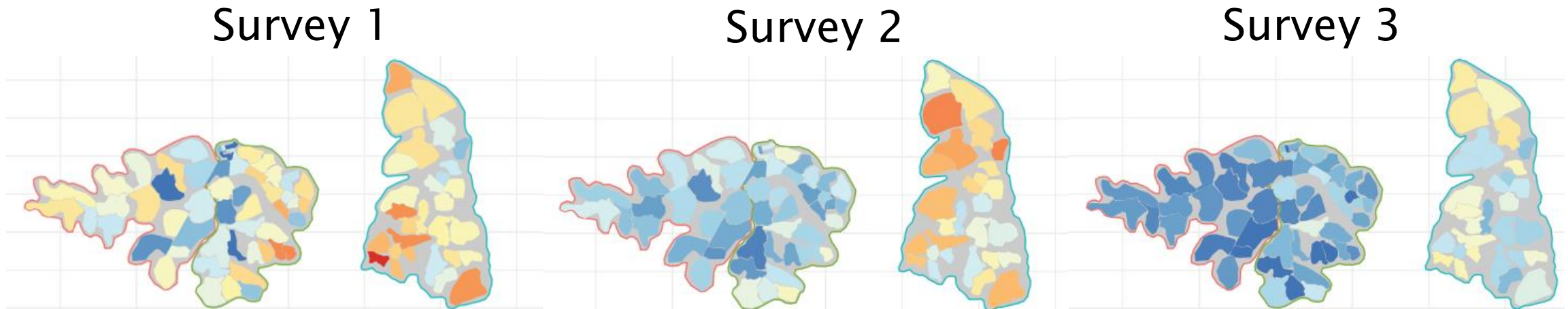


Survey (larger icon represents expanded survey)

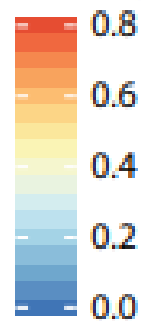


LLIN Distribution

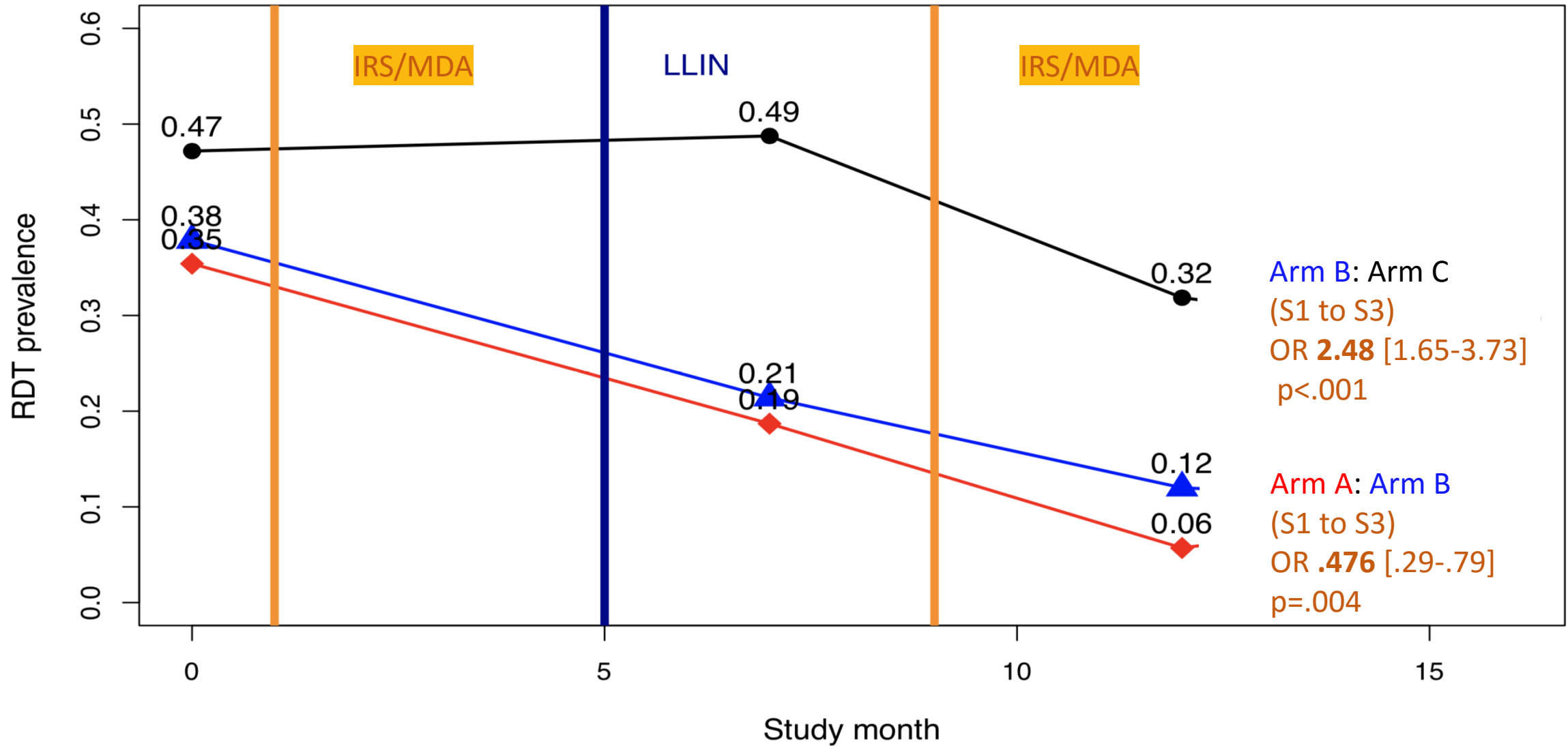
RDT prevalence by village for Surveys 1, 2, 3: differential impact at 3 months



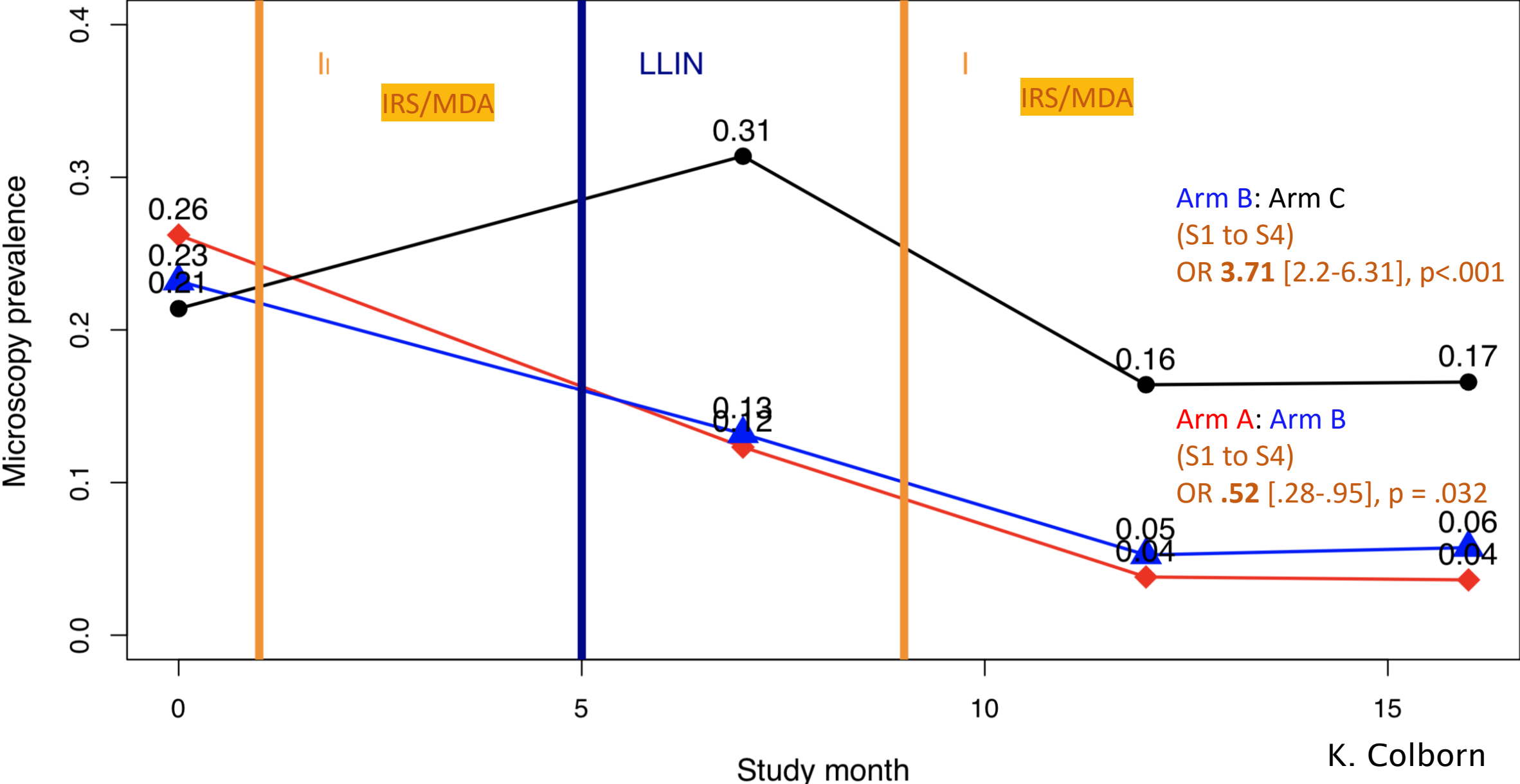
PfPR by RDT



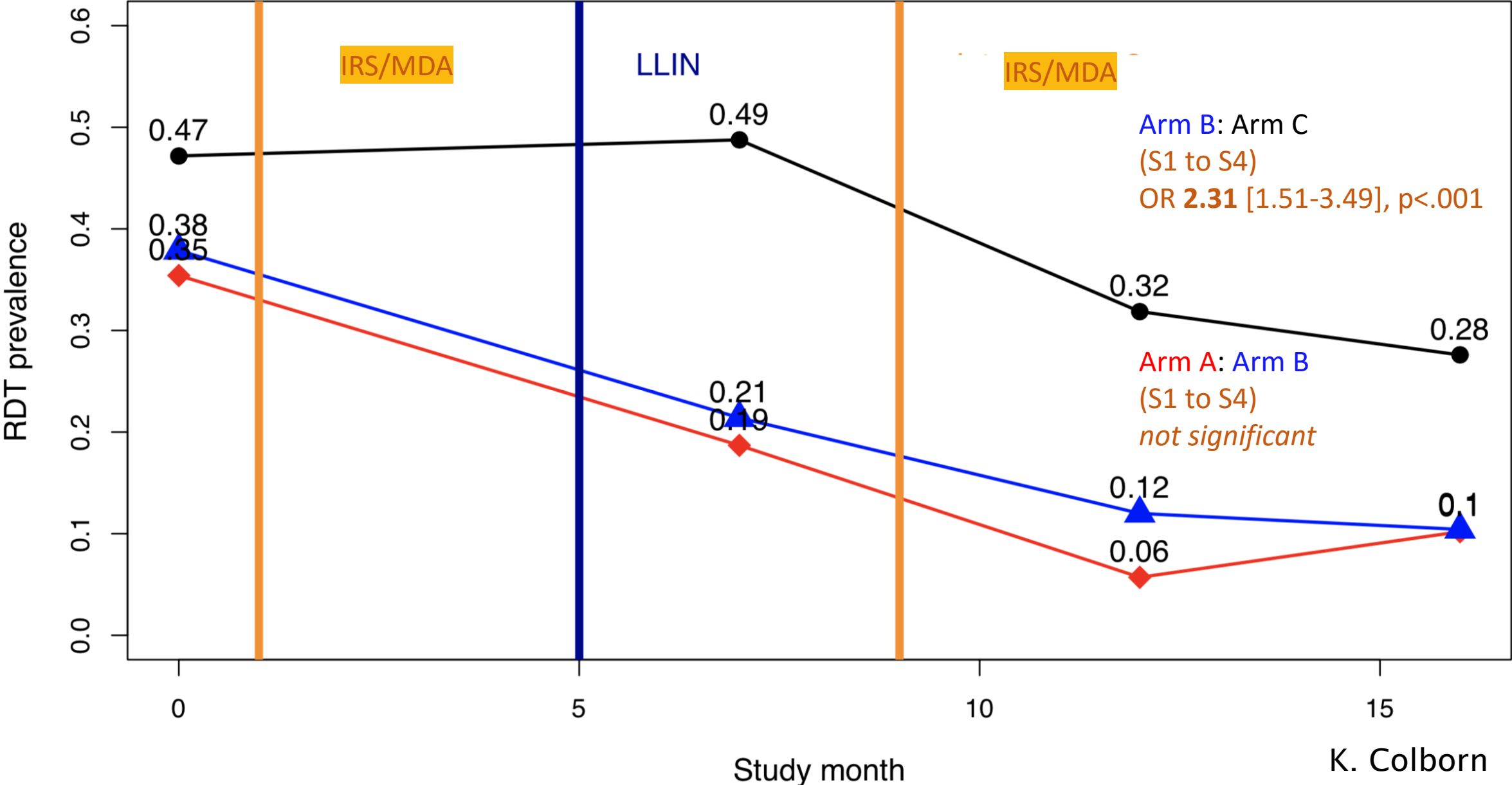
Overall RDT prevalence: 3 months post IRS + MDA



Overall microscopy prevalence: 7 months post IRS + MDA



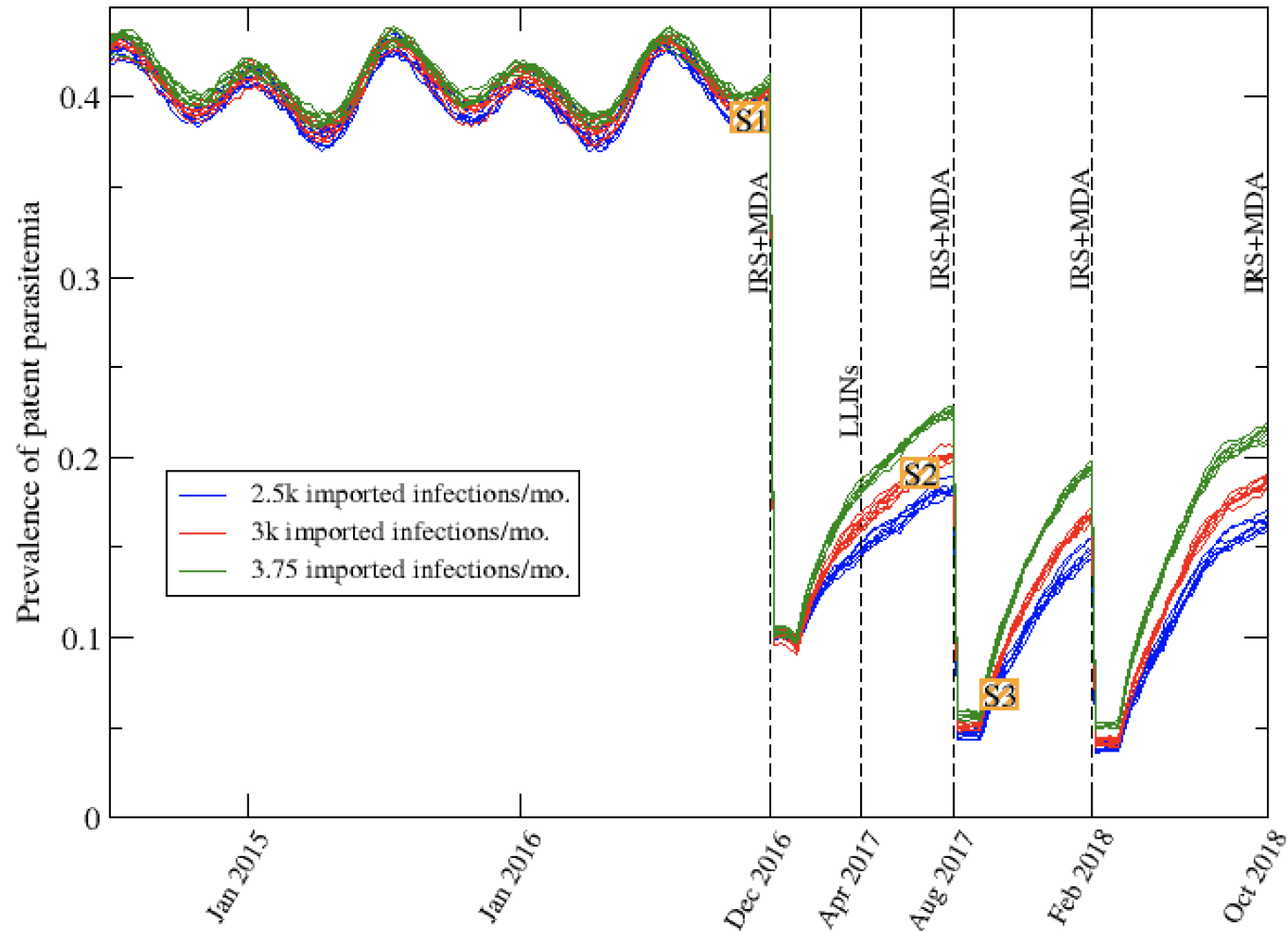
Overall RDT prevalence: 7 months post IRS + MDA



What about mobility?

Openmalaria modelling:

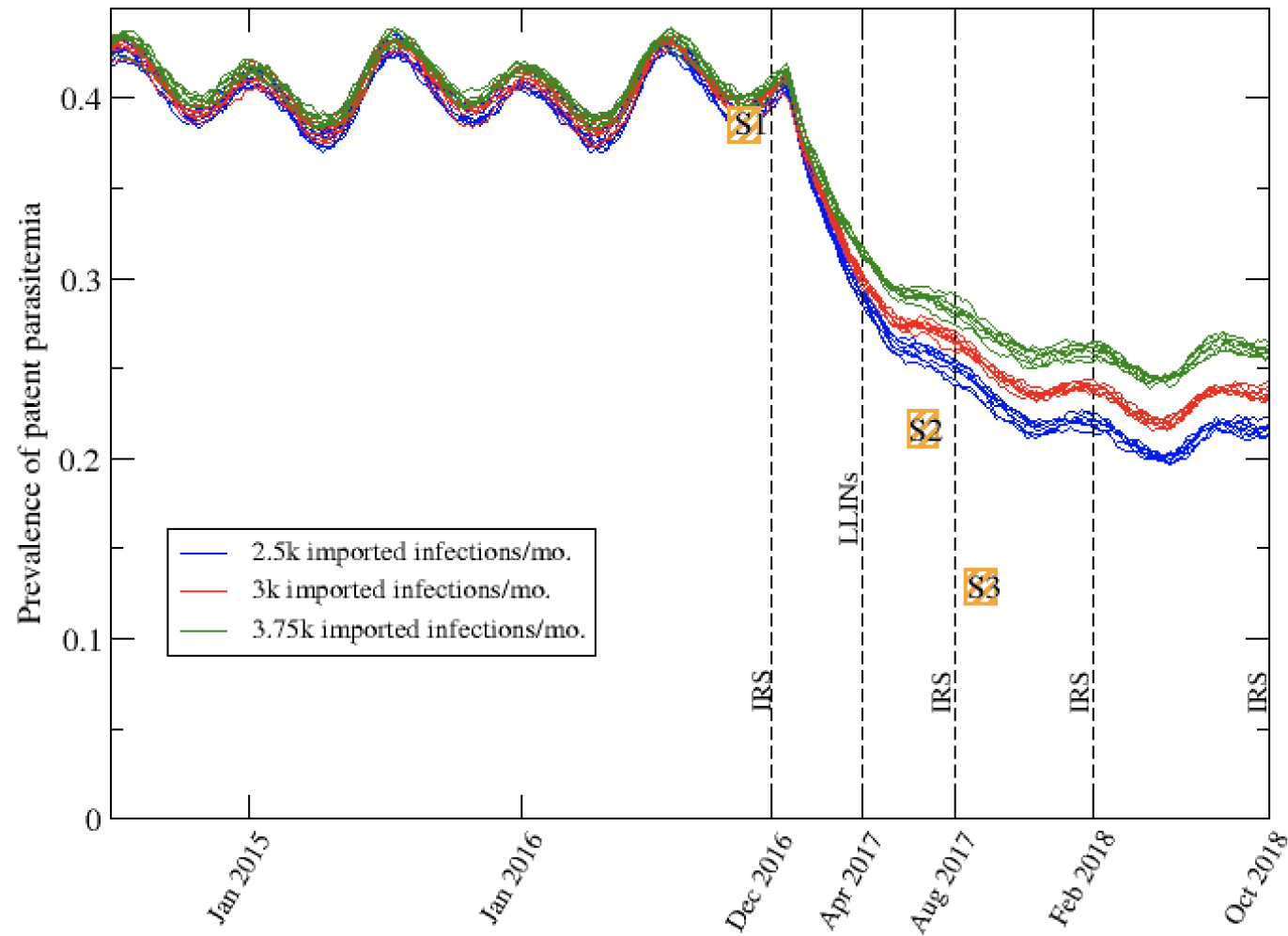
MDA + IRS, with imported infections, realistic EIR



Imported infections
appear to
help....but

R. Elliott

Openmalaria modelling: IRS only, with imported infections, realistic EIR



Imported infections degrade MDA impact, but mainly by degrading IRS. Not the whole answer!

R. Elliott

Summary



- **Two models predict strong timing-dependent synergy**



- **Preliminary results show protection at 3 months, possibly also at 7 months– not as dramatic as predicted**



- **Mobility might “explain” lackluster MDA, but not while IRS is so effective**



THANK YOU Study Team & Partners



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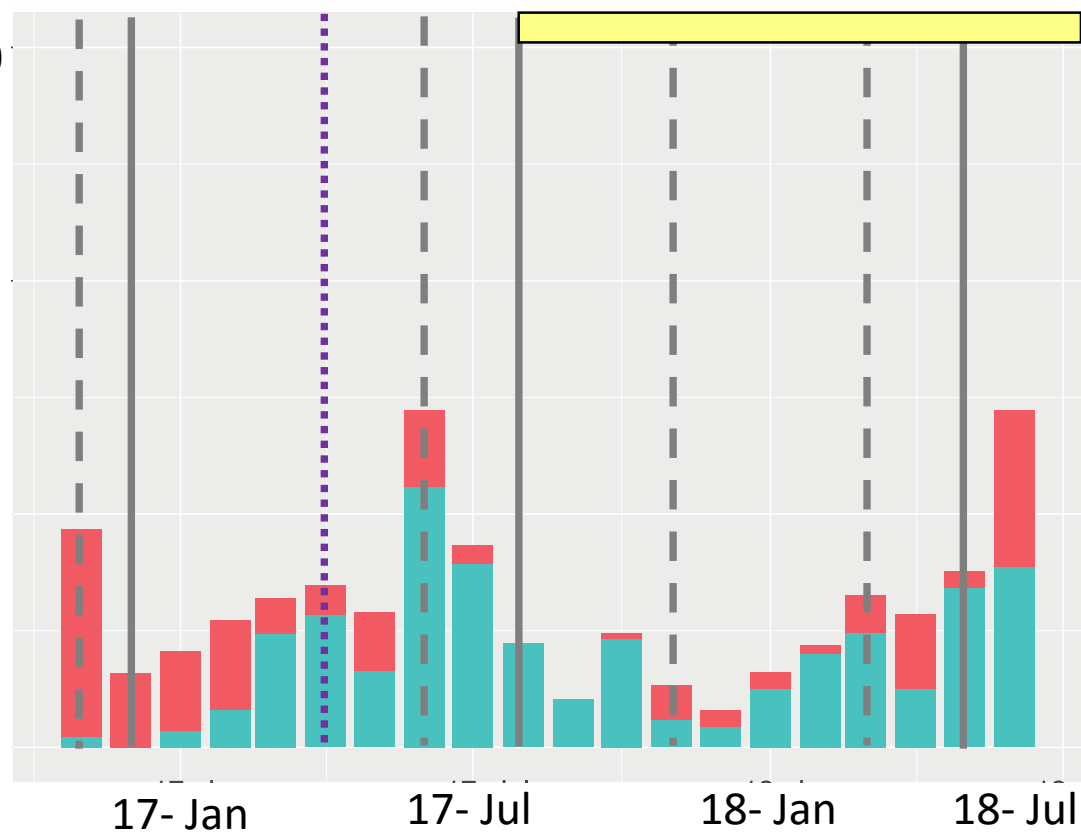


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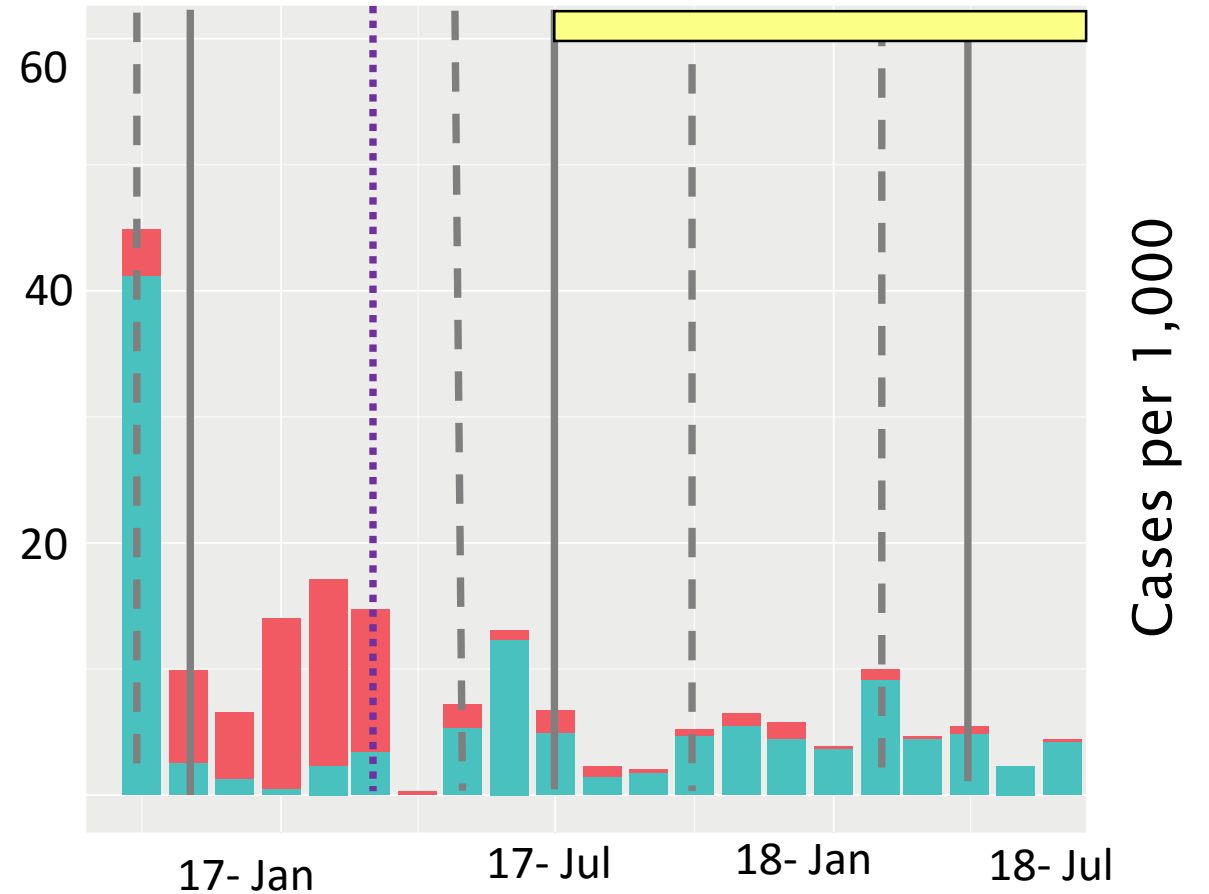


Confirmed malaria cases under 10: by health center

Arm B: IRS only



Arm A: IRS + MDA



Cases per 1,000

Cases per 1,000

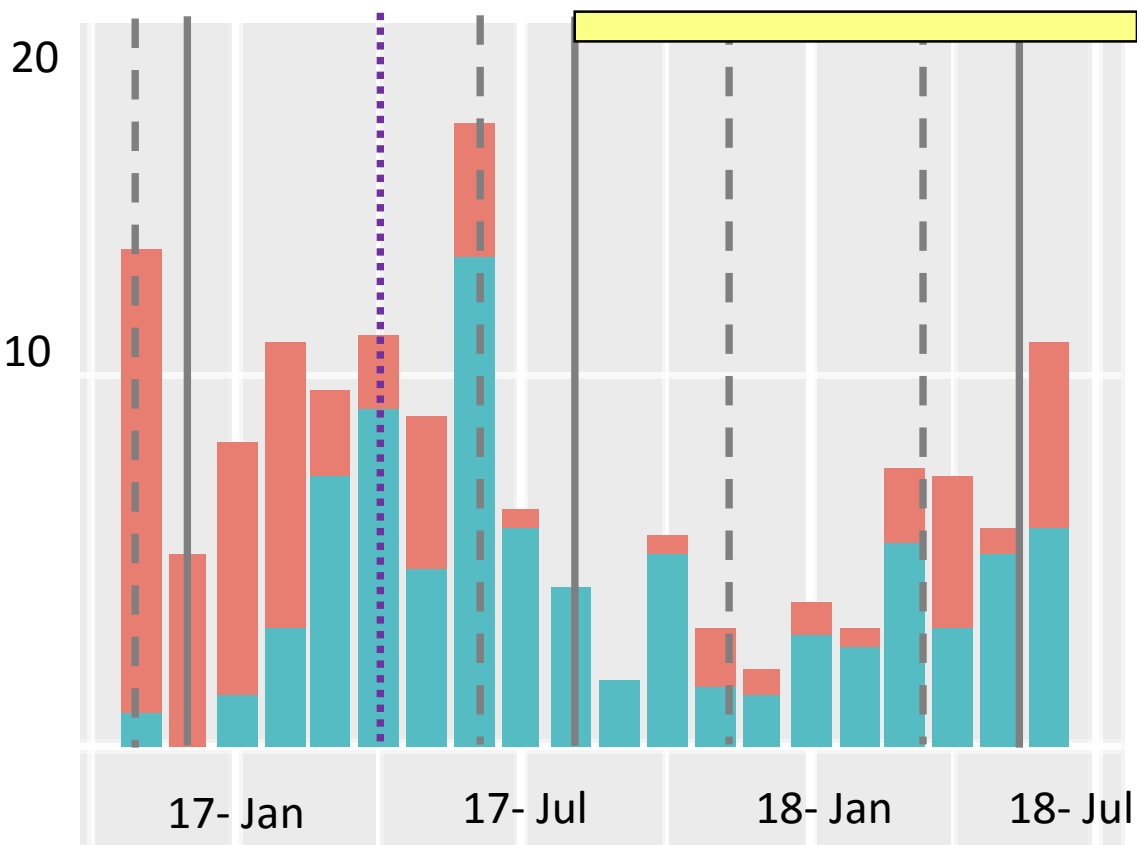
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Surveys
LLINs
Interventions

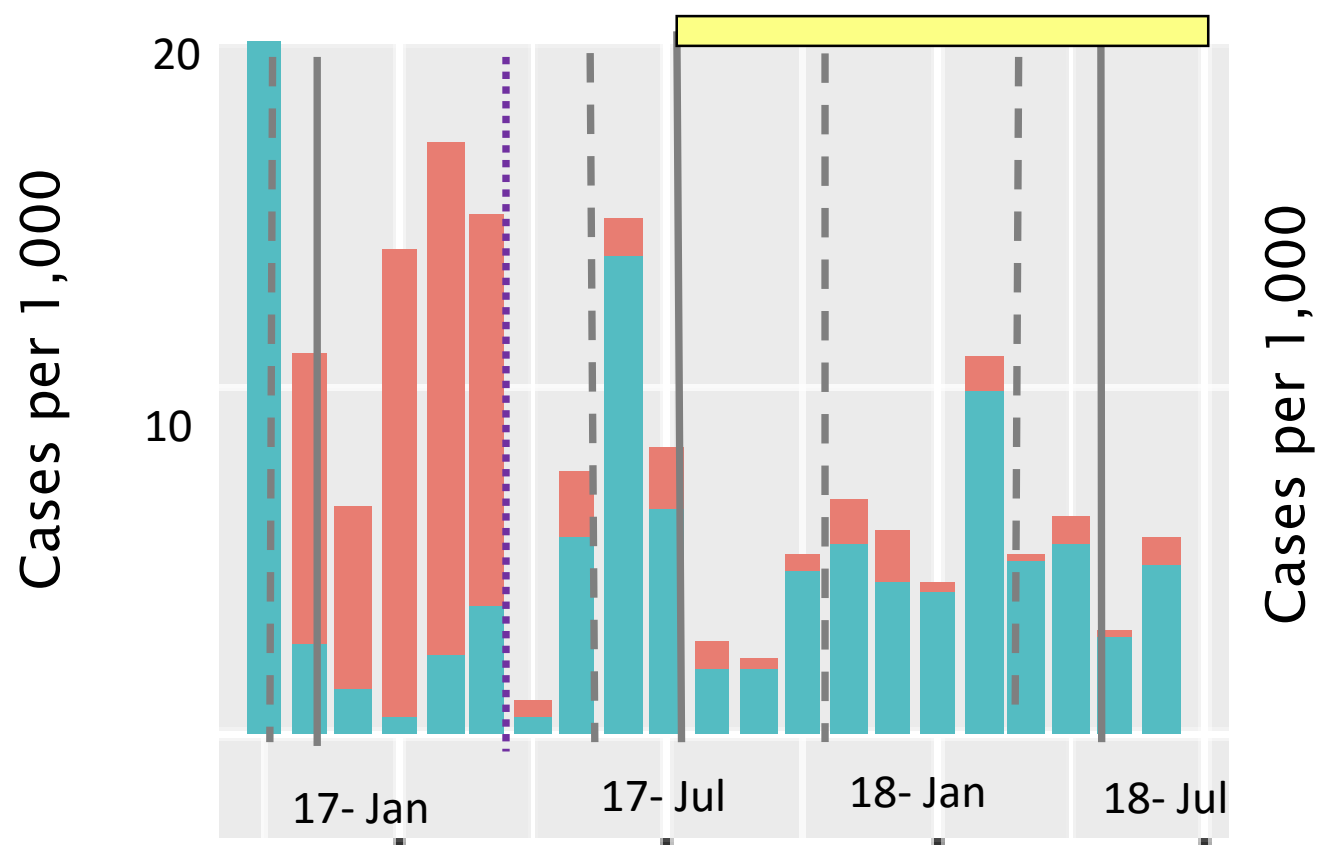
Microscopy
RDT

Confirmed malaria cases under 10: by county of residence

Arm B: IRS only



Arm A: IRS + MDA

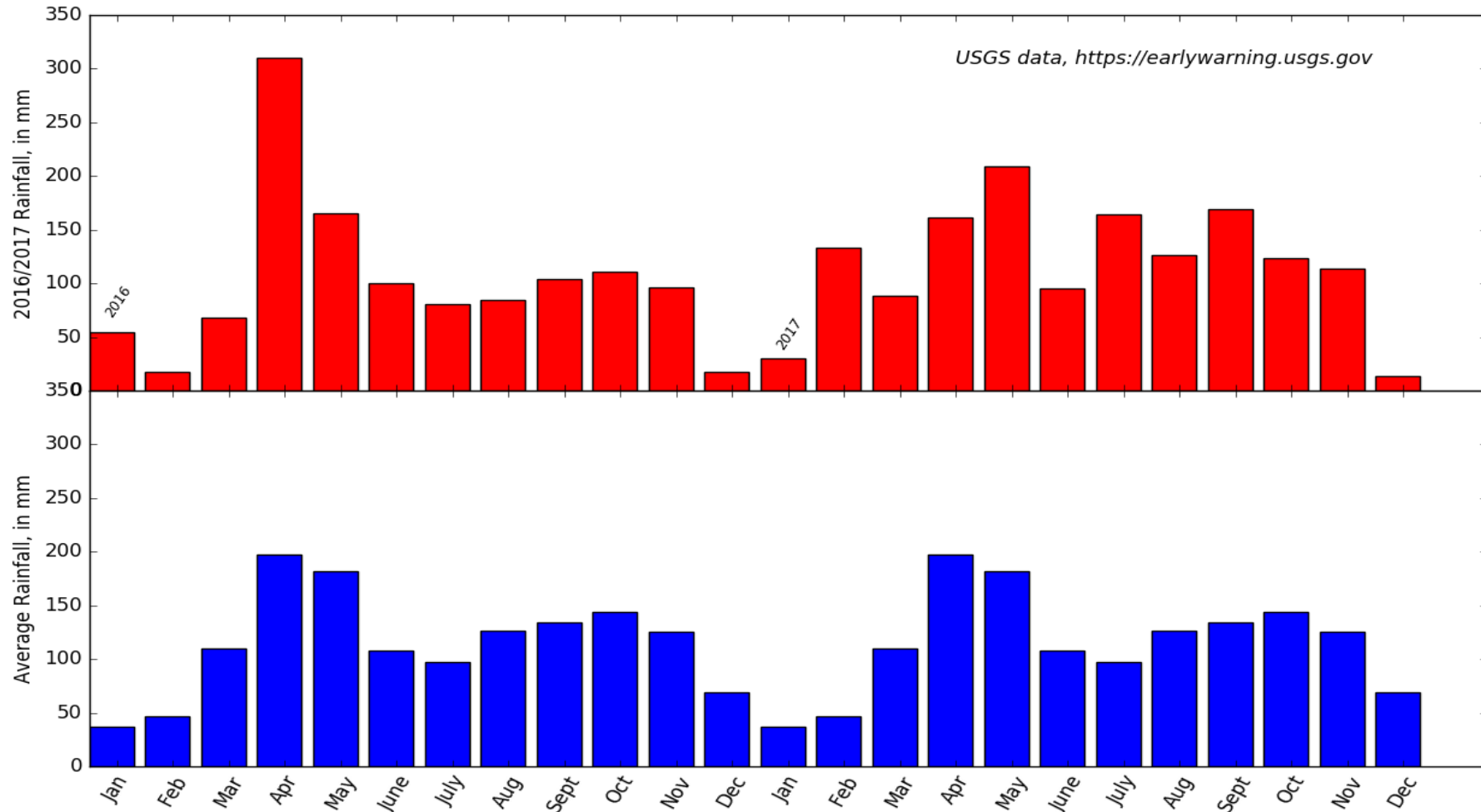


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Surveys
 LLINs
 Interventions

Microscopy
RDT

Eastern Uganda Rainfall 2016/2017



CDC Light Trap Monitoring

