

Model Projections of the Impact of the PopART Intervention in the HPTN 071 (PopART) Study

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ON BEHALF OF THE POPART MODELLING TEAM

IAS 2019



U.S. NATIONAL INSTITUTES OF HEALTH:
National Institute of Allergy and Infectious Diseases
National Institute of Mental Health
National Institute on Drug Abuse

Primary objectives of modelling within HPTN 071 (PopART)

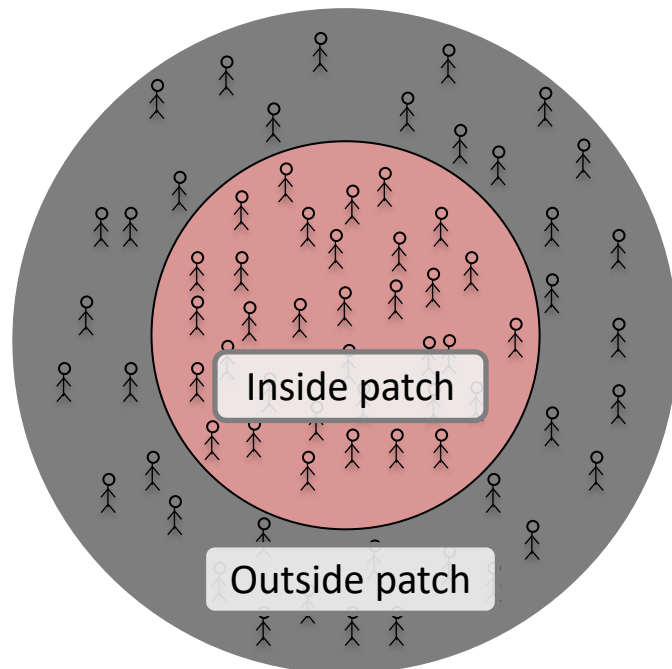
1. To help interpret the results of the trial.
2. To project longer-term impact.
3. To explore likely impact in different settings.
4. To explore the likely impact of alternative intervention packages.

Individual-based model for HIV transmission

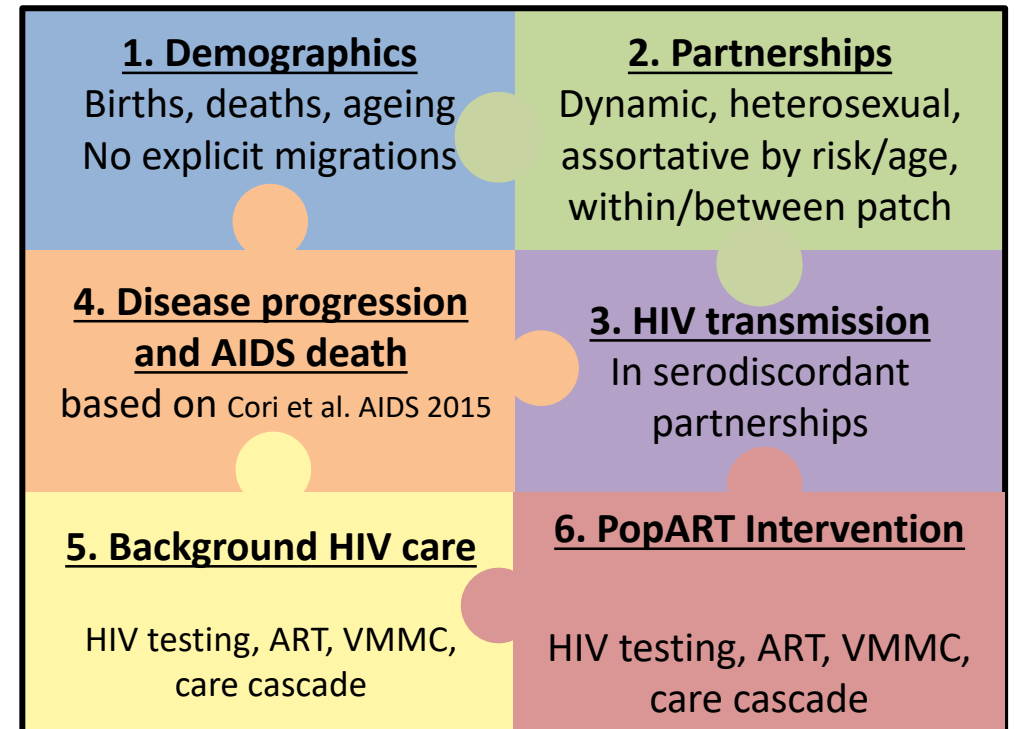
Modelled as two “patches”:

Inside patch = PopART intervention community

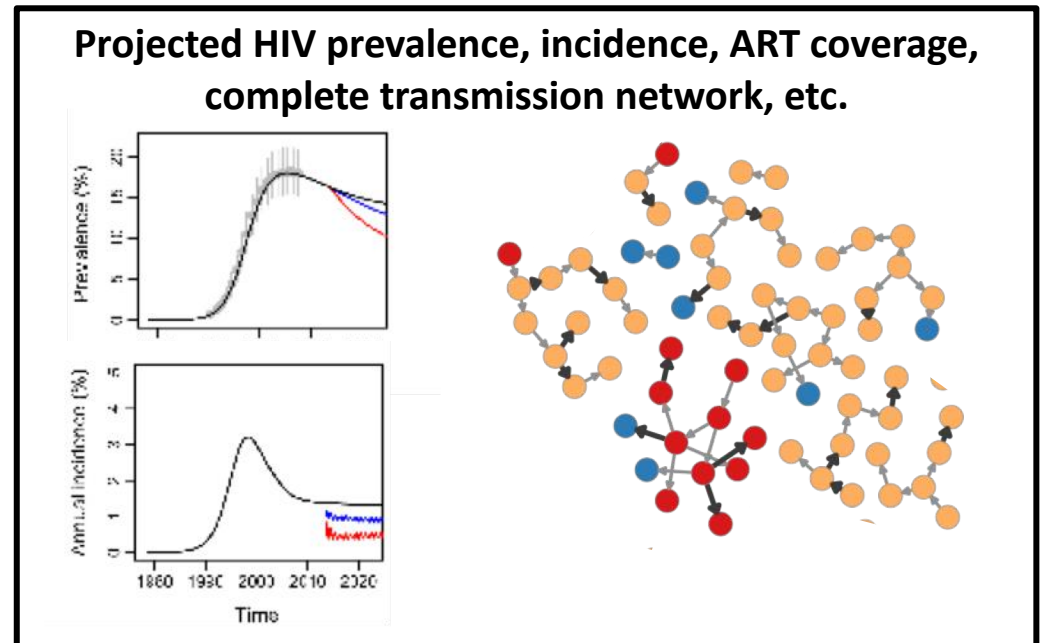
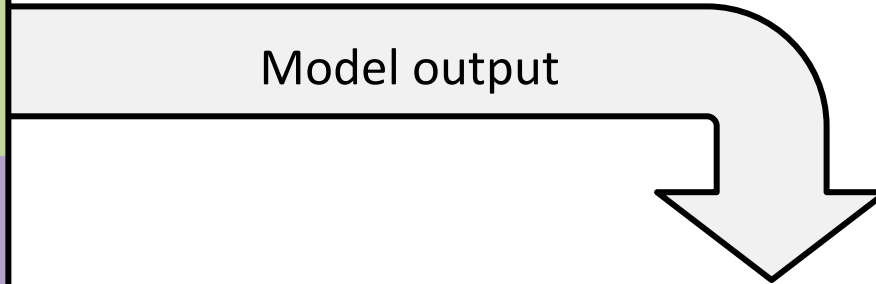
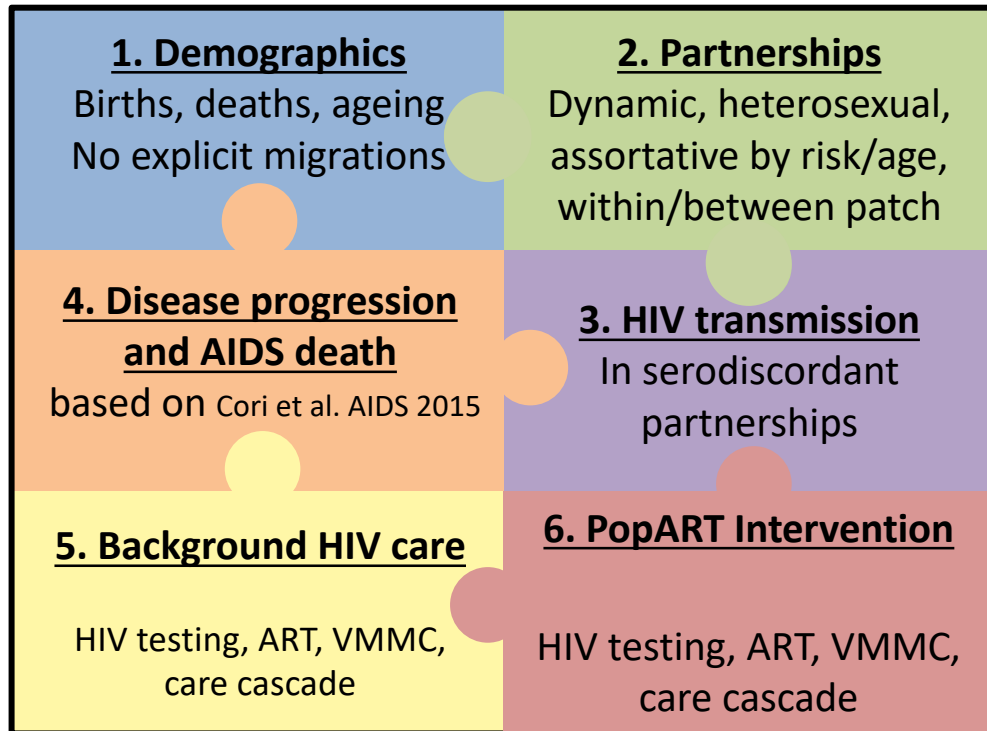
Outside patch = surrounding area



Within each patch:



Individual-based model for HIV transmission



Trial unblinding (Dec 2018): a unique opportunity to test model predictions

Before trial unblinding:

- Modelling team was blinded to all PC data except PC0 but had access to data from CHiPs.
- Each community was calibrated using the following data (stratified by age and sex):
 - CHiPs prevalence (R3 only)
 - Zambia: CHiPs prop. aware & prop. on ART (3 rounds), DHS prev. (3 rounds)
 - South Africa: CHiPs prop. aware & prop. on ART (R3), HSRC prev. (4 rounds).
- Impact calculated as comparison with counterfactual simulations.
- Modelling projections were lodged in a time-stamped repository.

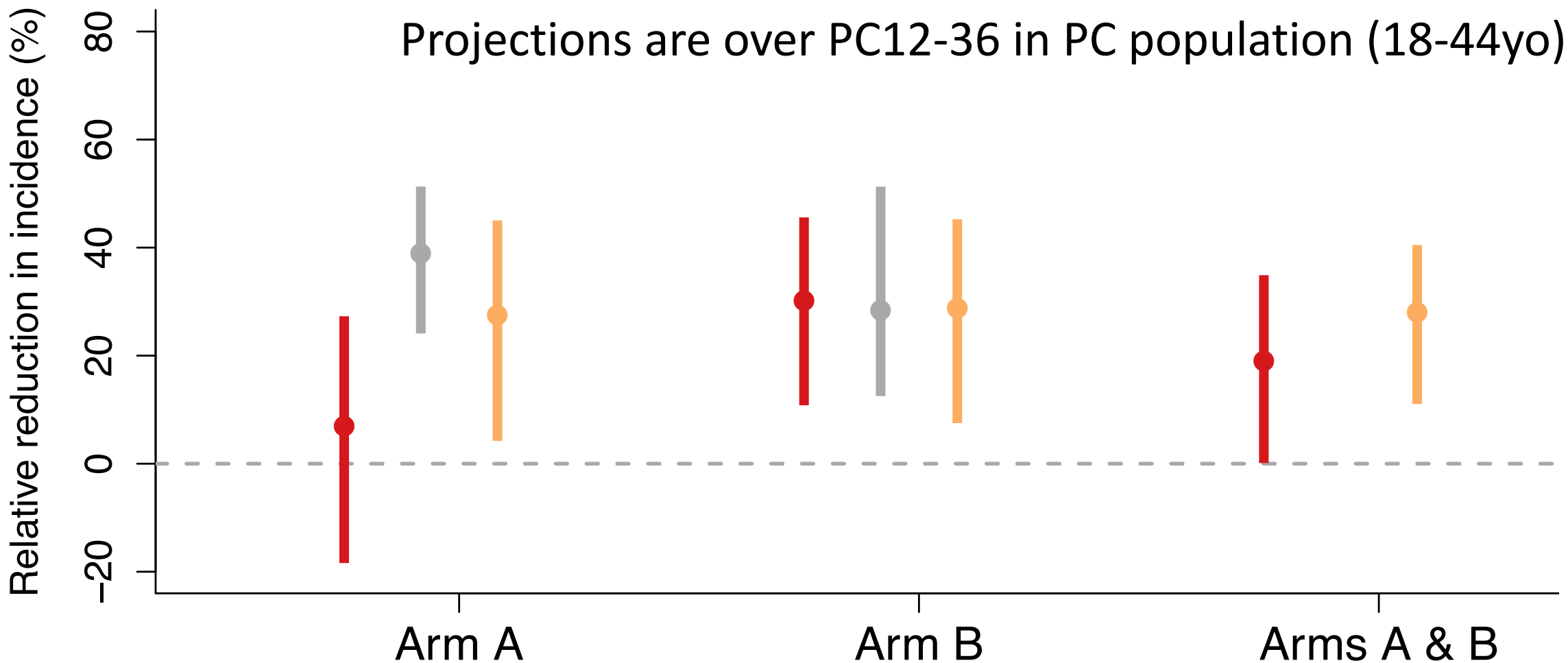
Trial unblinding (Dec 2018): a unique opportunity to test model predictions

After unblinding:

- Model parameters informed from PC data were updated.
 - Those governing sexual partnerships, uptake of VMMC, TMC
- In addition to the data used before unblinding, each community was calibrated using (stratified by age and sex):
 - PC prevalence (4 rounds), viral suppression at PC24.
 - South Africa: PC proportion aware and proportion on ART (4 rounds).
- Impact calculated as comparison with arm C projections.

PROJECTIONS OF TRIAL IMPACT

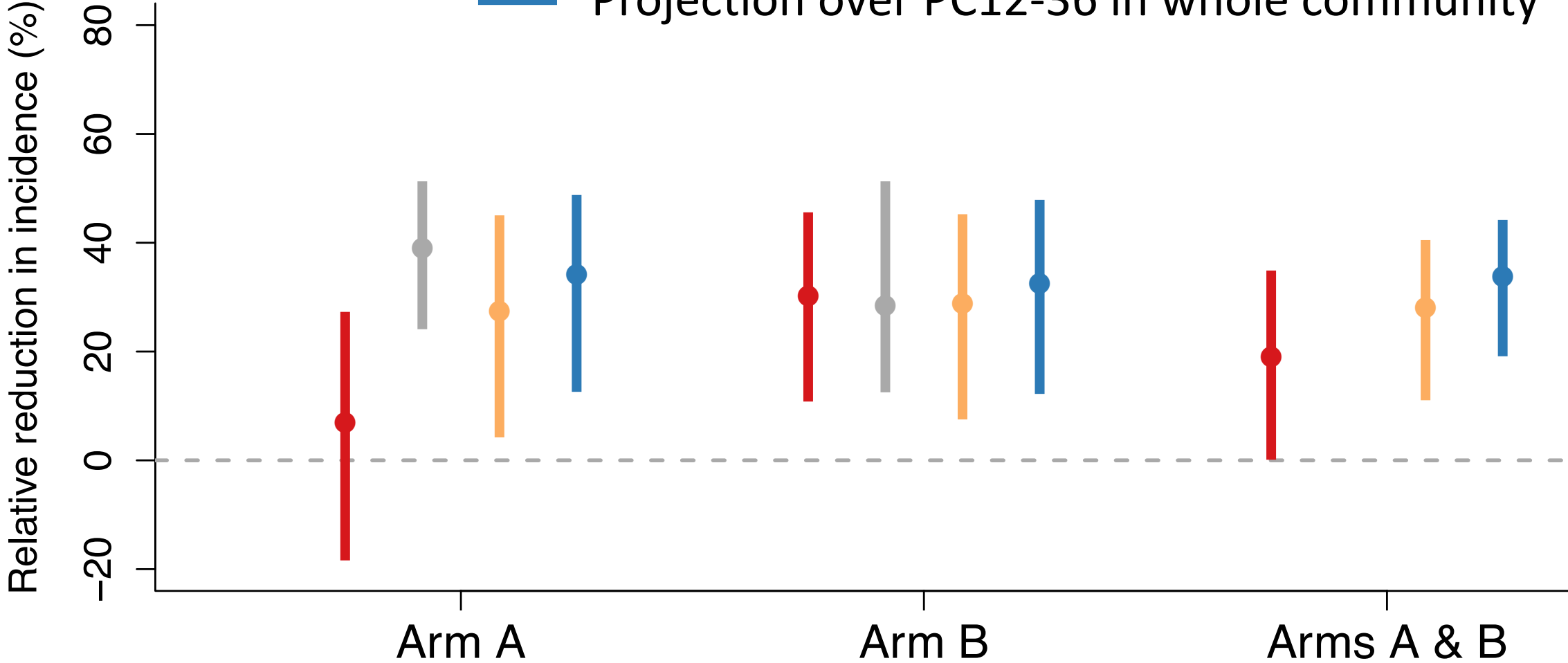
- Observed
- Projection (PC; pre-unblinding)
- Projection (PC; post-unblinding)



PROJECTIONS OF TRIAL IMPACT

- Observed
- Projection (PC; pre-unblinding)
- Projection (PC; post-unblinding)

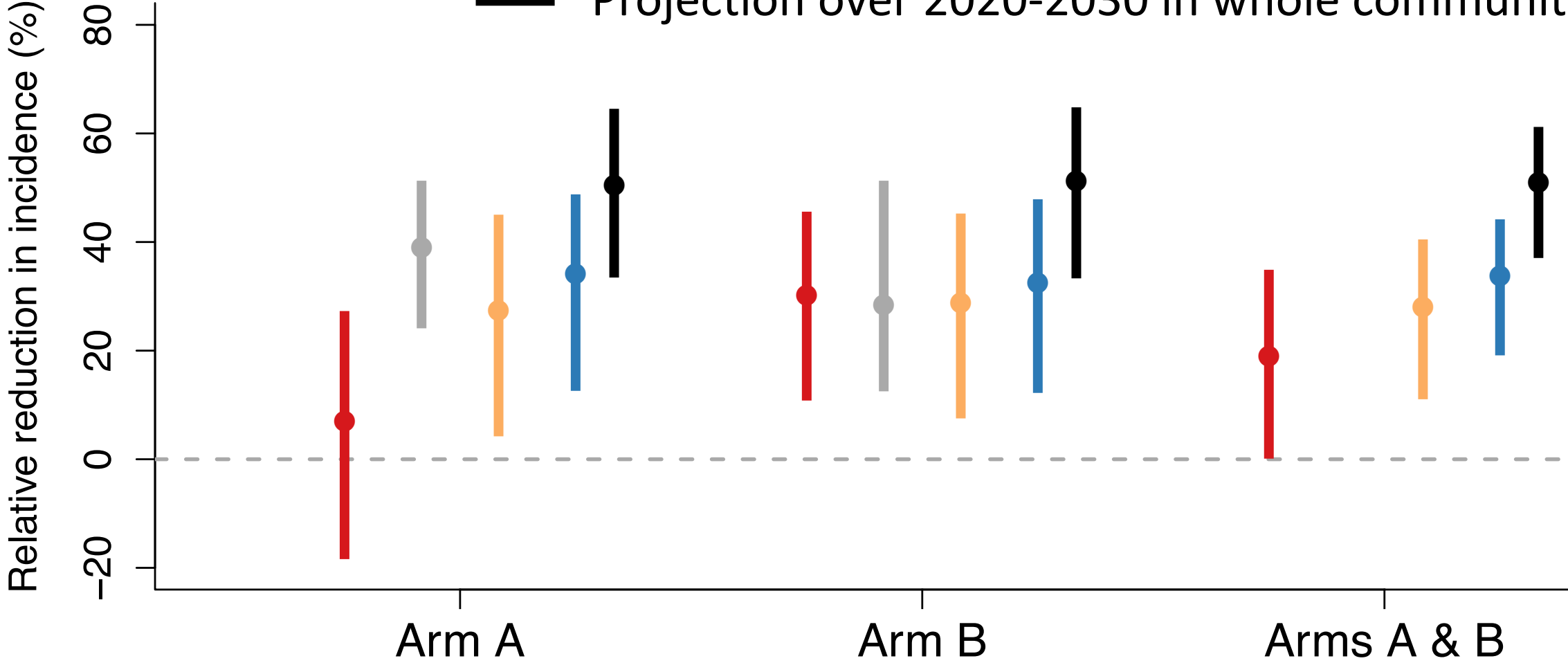
— Projection over PC12-36 in whole community



PROJECTIONS OF TRIAL IMPACT

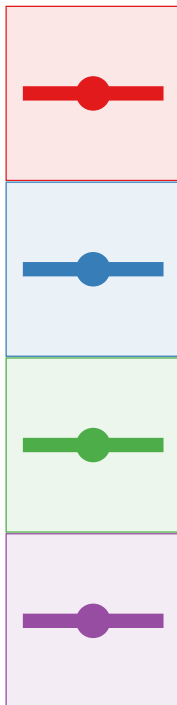
- Observed
- Projection (PC; pre-unblinding)
- Projection (PC; post-unblinding)
- Projection (whole community)

— Projection over 2020-2030 in whole community



What is the projected future impact in different settings?

Four scenarios projected to 2030:



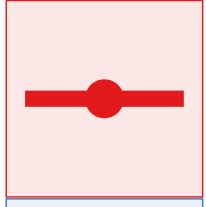
PopART then continuation of CHiPs intervention to 2030

PopART then no CHiPs intervention after trial

CHiPs intervention nationwide

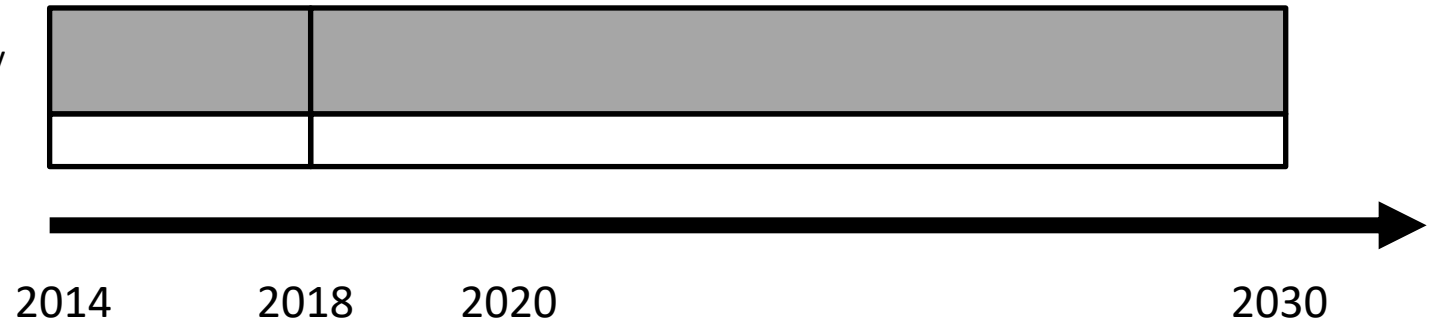
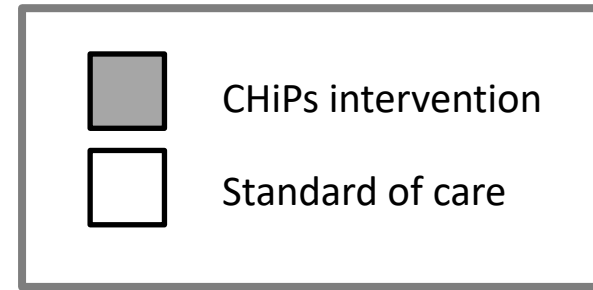
No CHiPs intervention

SCENARIO DESCRIPTION



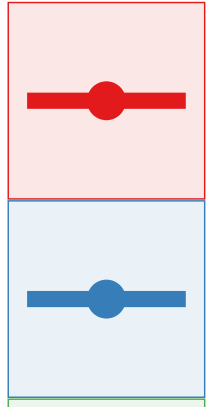
PopART/
CHiPs continued

PopART community
Surrounding area



Note: Impact measured only
in the PopART community.

SCENARIO DESCRIPTION



PopART/
CHiPs continued

PopART/
CHiPs discontinued

PopART community

Surrounding area

PopART community

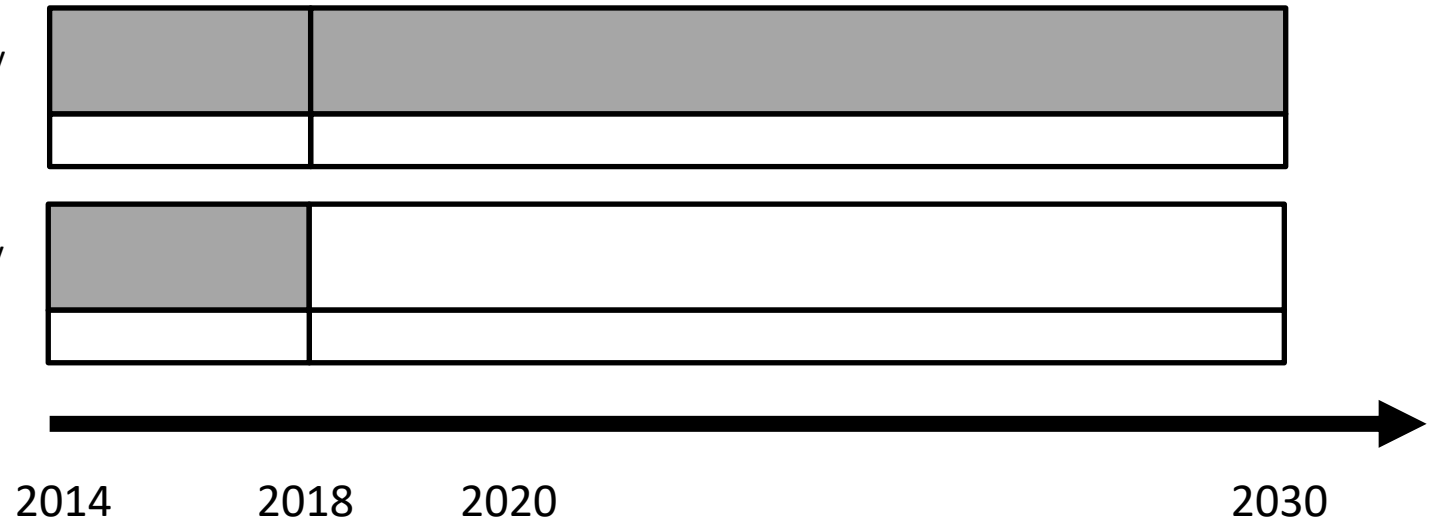
Surrounding area



CHiPs intervention

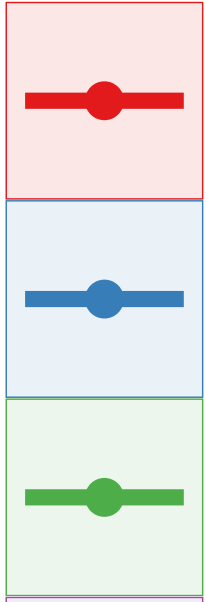
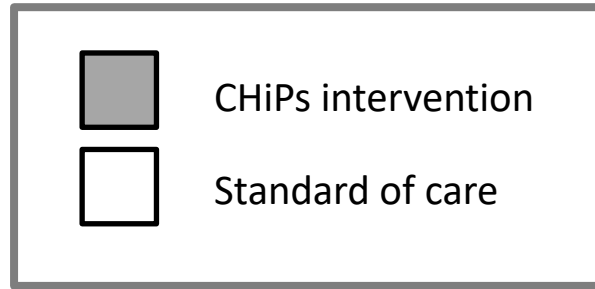


Standard of care



Note: Impact measured only in the PopART community.

SCENARIO DESCRIPTION



PopART/
CHiPs continued

PopART/
CHiPs discontinued

CHiPs/nationwide

PopART community

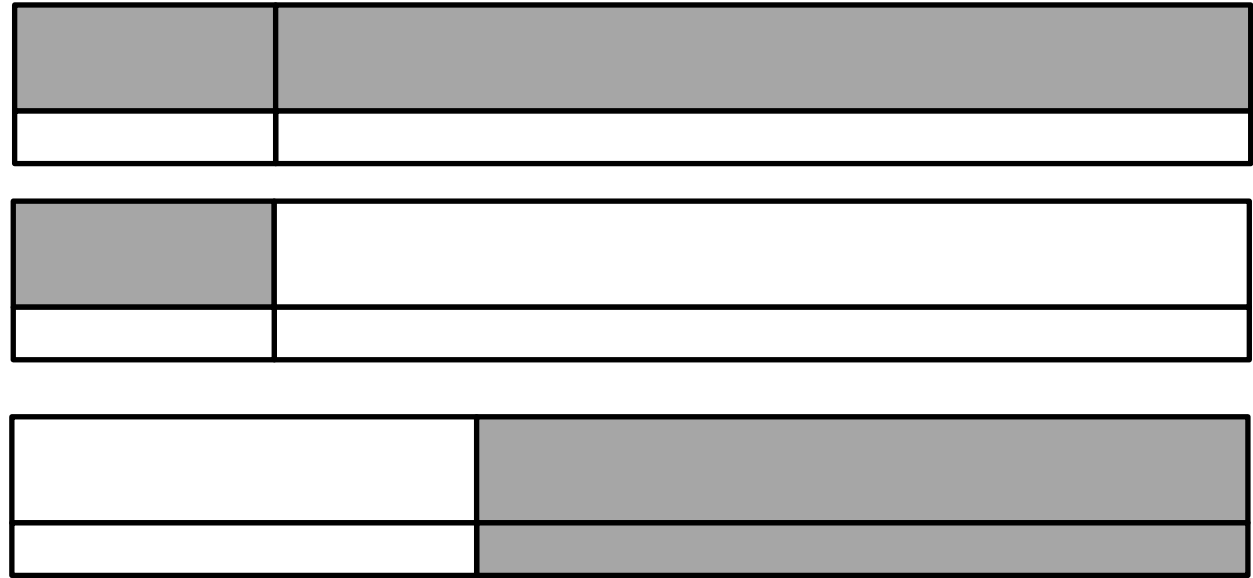
Surrounding area

PopART community

Surrounding area

PopART community

Surrounding area



2014

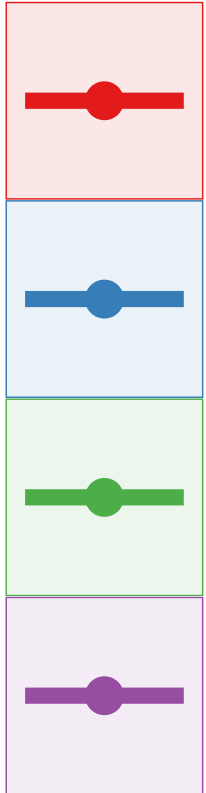
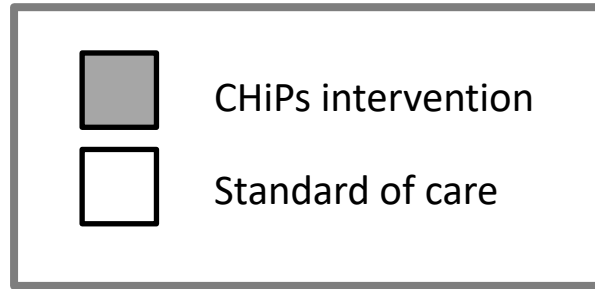
2018

2020

2030

Note: Impact measured only in the PopART community.

SCENARIO DESCRIPTION



PopART/
CHiPs continued

PopART/
CHiPs discontinued

CHiPs/nationwide

No CHiPs

PopART community

Surrounding area

PopART community

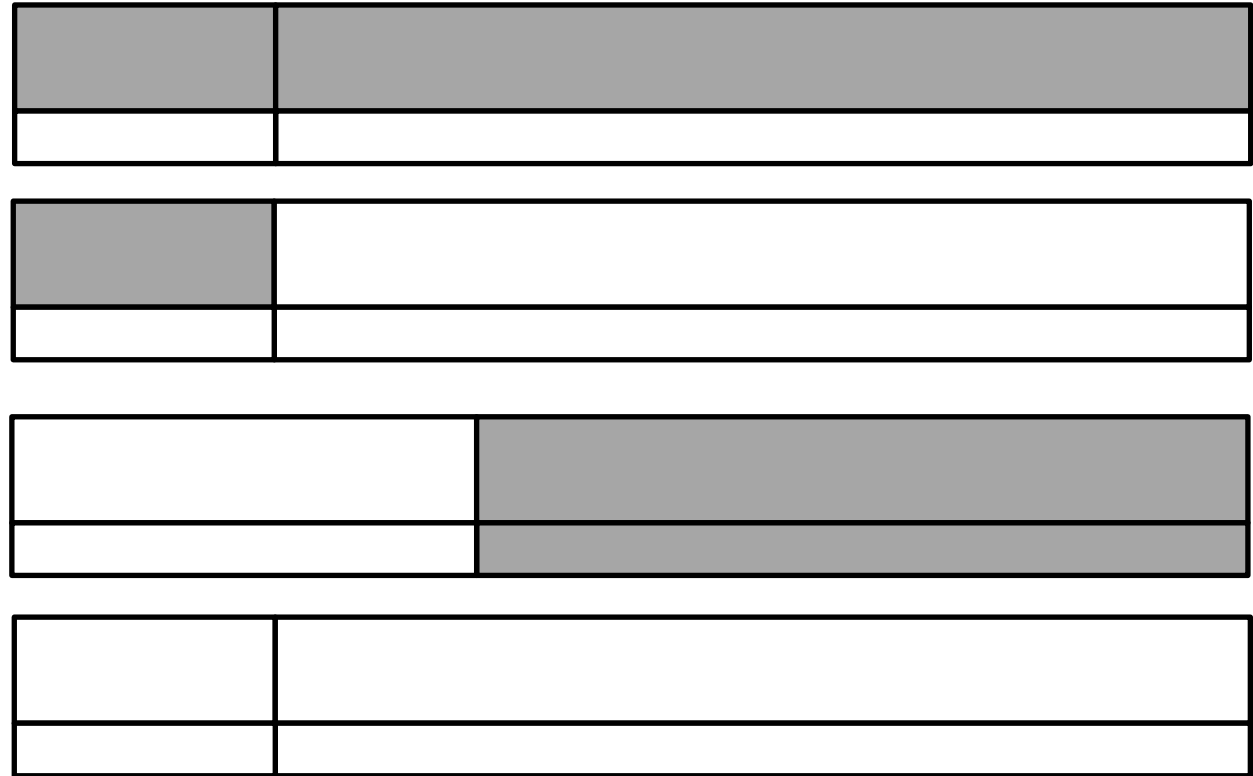
Surrounding area

PopART community

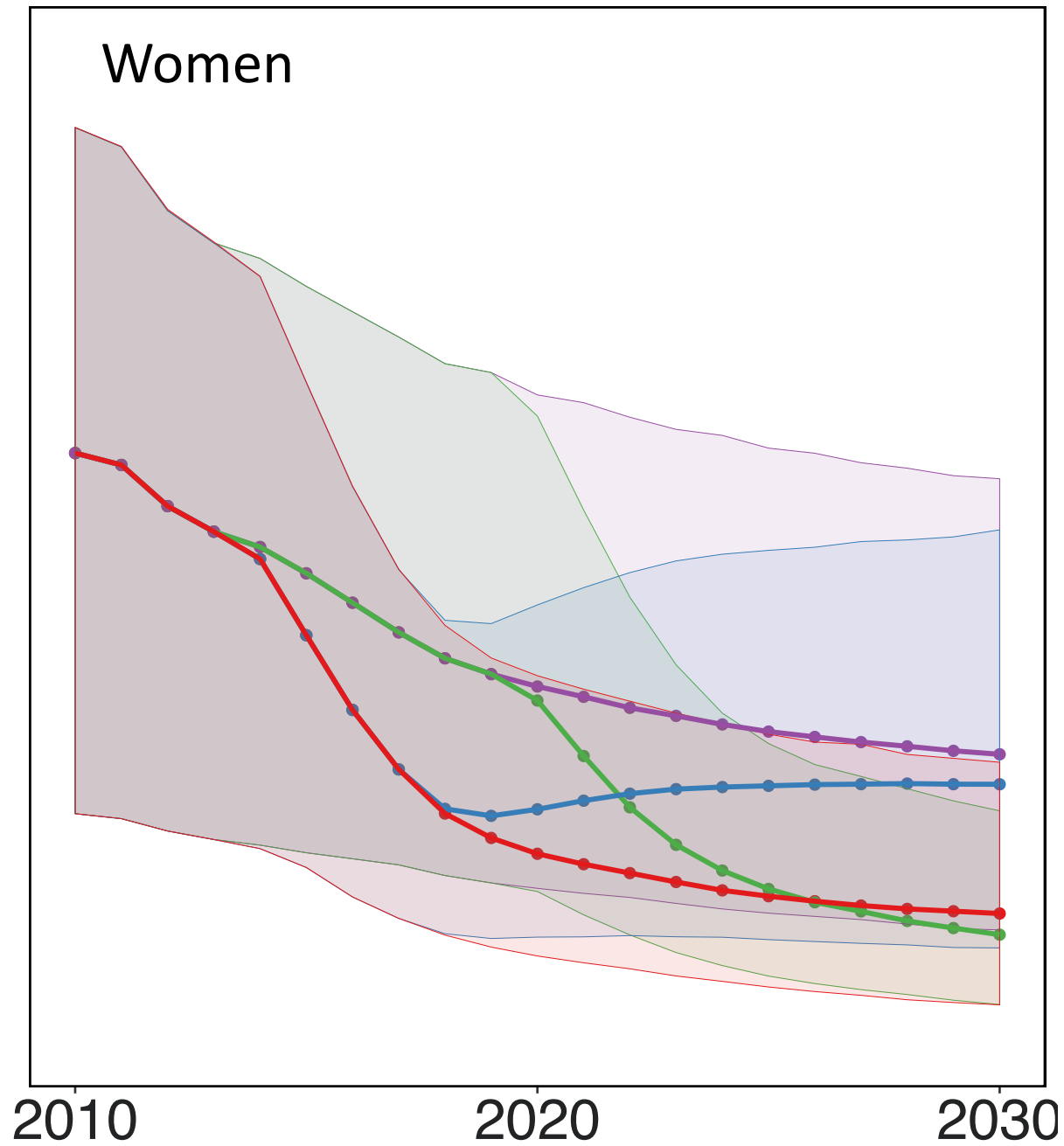
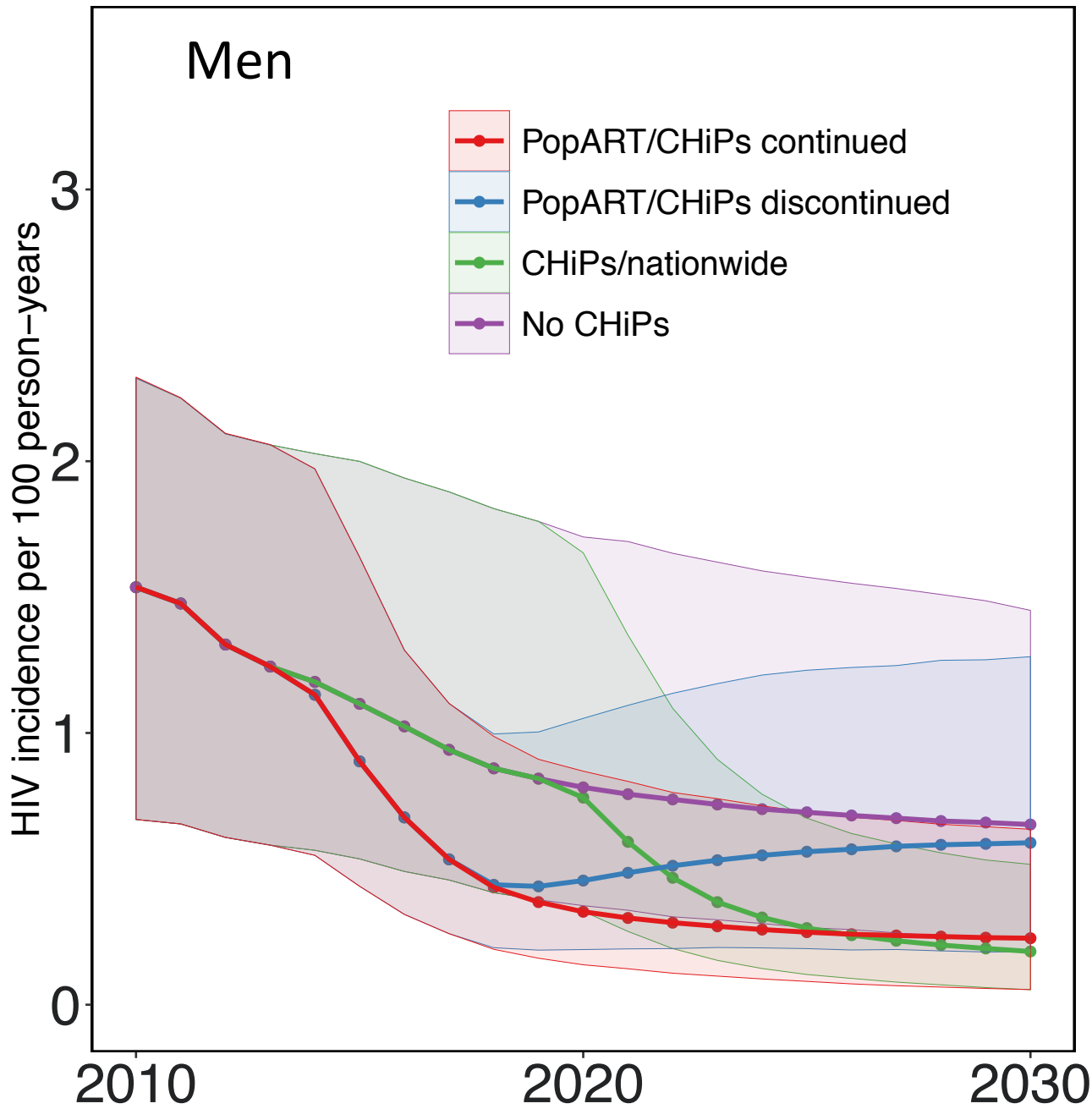
Surrounding area

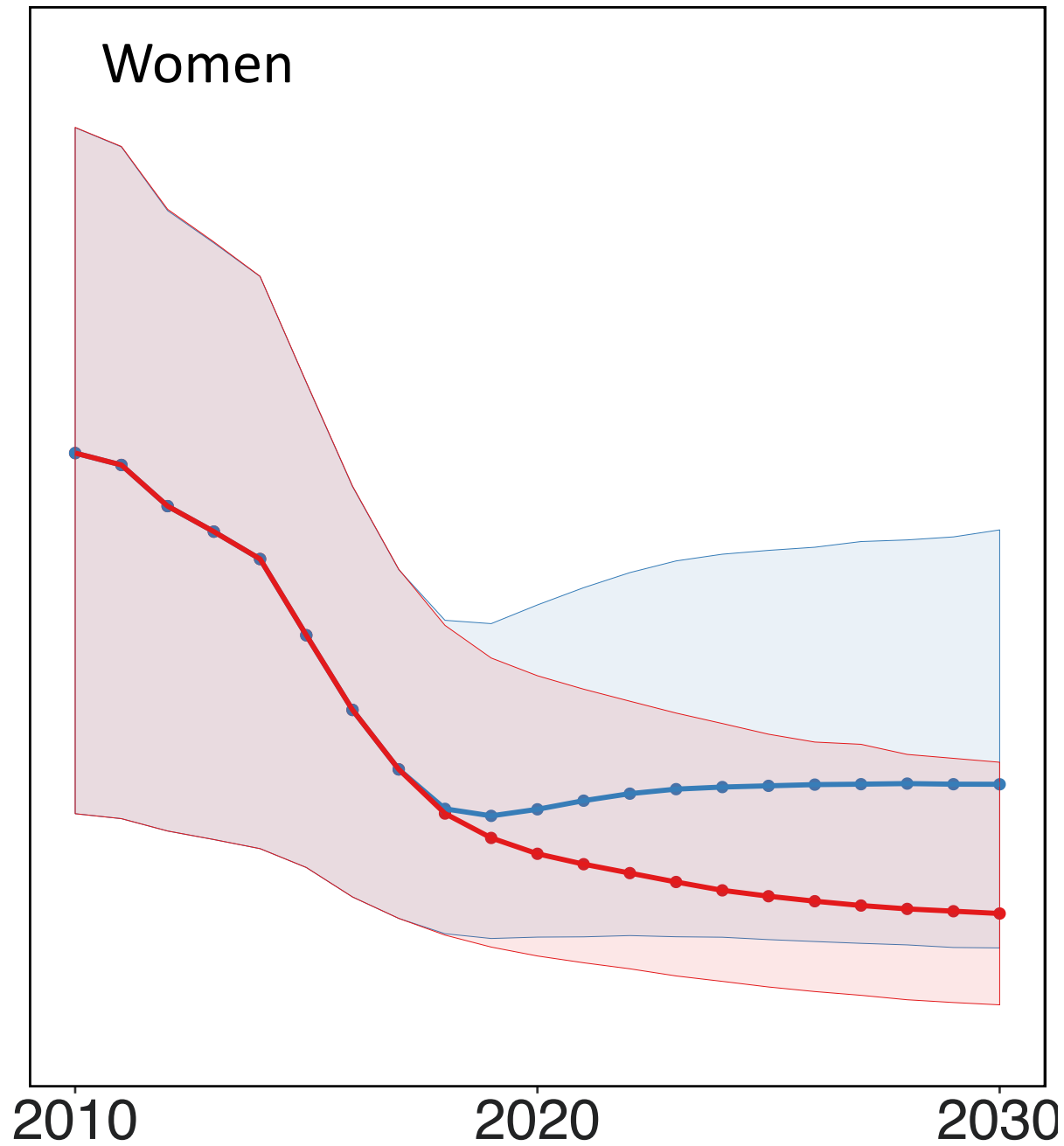
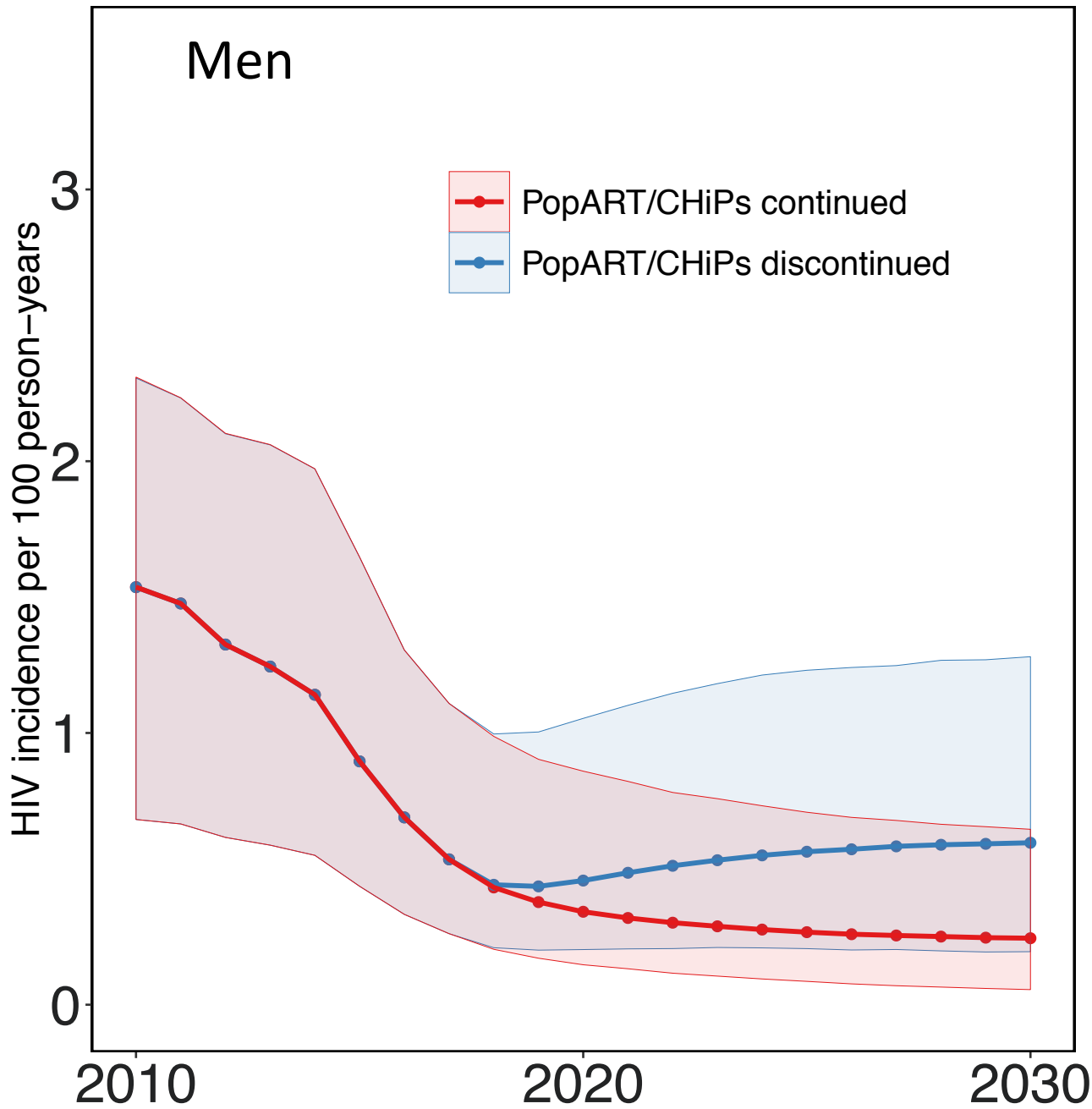
PopART community

Surrounding area



Note: Impact measured only in the PopART community.





Men

Women

- PopART/CHiPs continued
- PopART/CHiPs discontinued
- No CHiPs

Greater incidence reductions when a CHiPs intervention is continued for a longer period of time.

HIV incidence per 100 person-years

3

2

1

0

2010

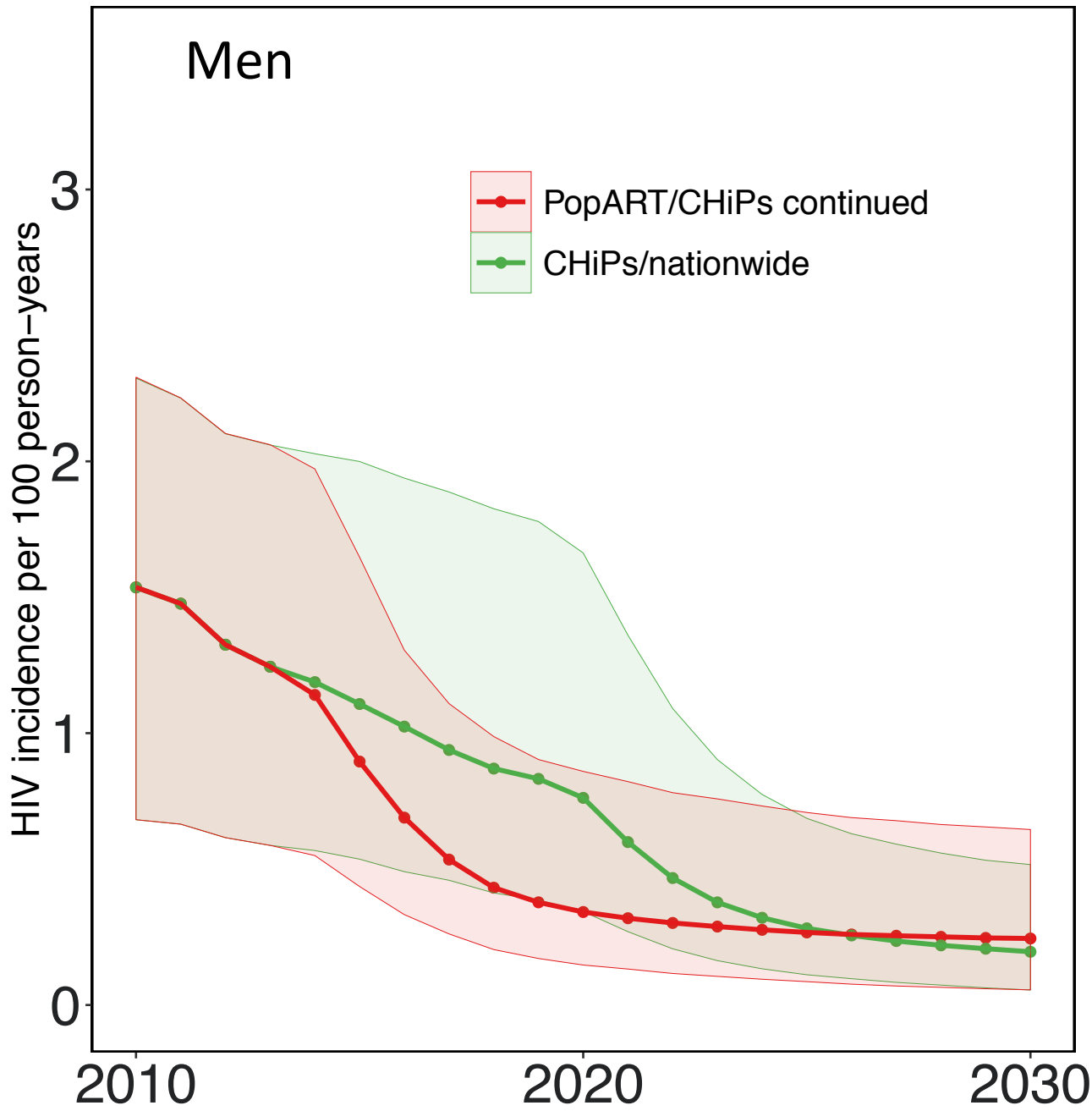
2020

2030

2010

2020

2030



Men

Women

- PopART/CHiPs continued
- CHiPs/nationwide

Greater incidence reductions when a CHiPs intervention is introduced to a wider area.

HIV incidence per 100 person-years

3

2

1

0

2010

2020

2030

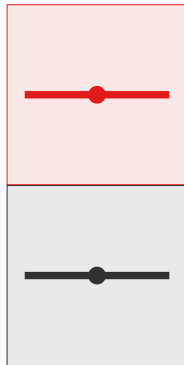
2010

2020

2030

What was the impact of different components of the intervention?

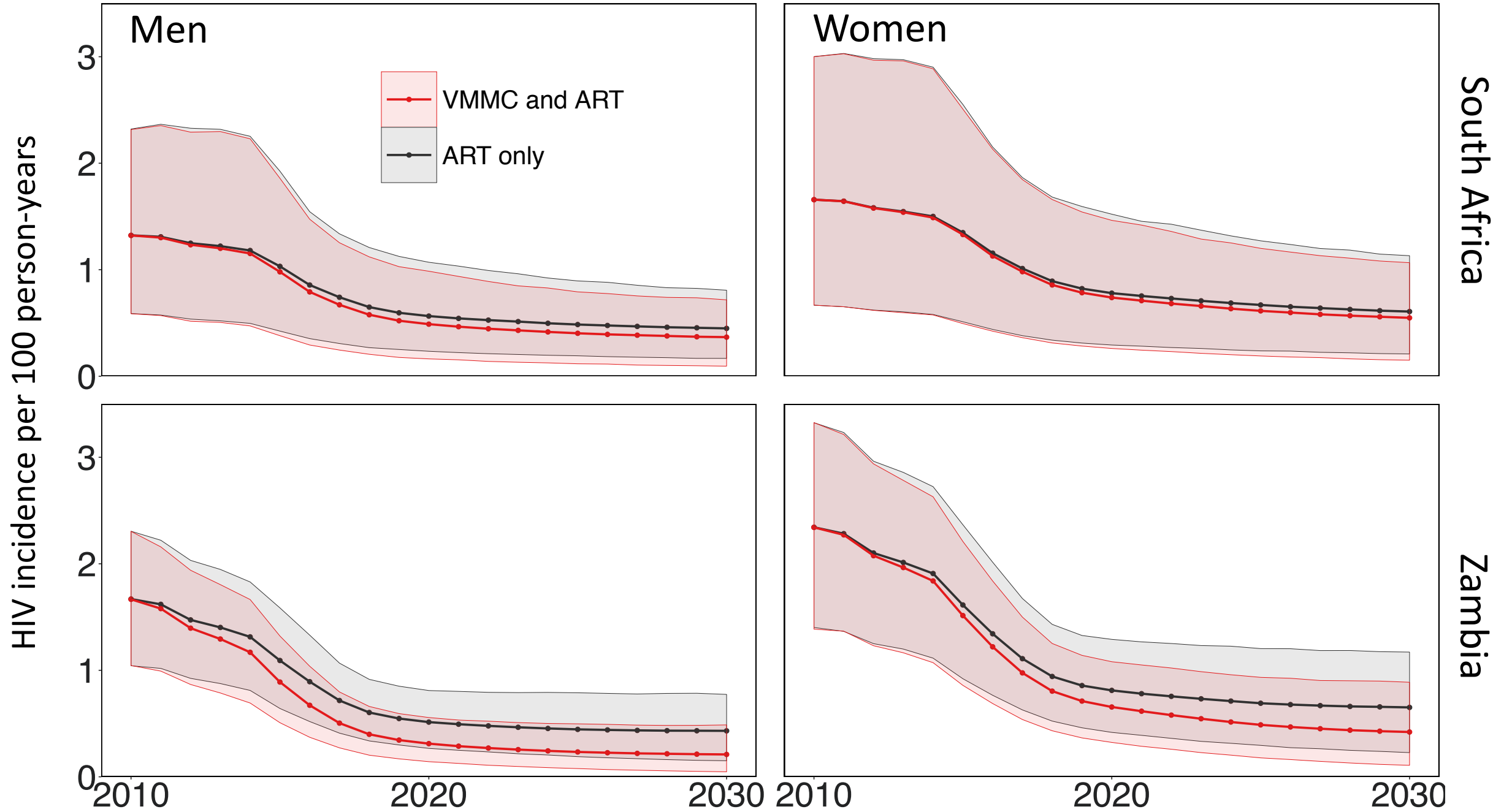
Two scenarios were modelled:



PopART including VMMC and ART (primary scenario)

PopART including ART but no VMMC

Note: Within the model VMMC reduces HIV susceptibility of an HIV- man by 60%.



Summary

- Trial unblinding tested the predictive ability of modelling and validated the model against observed trial impact.
- Reductions in cumulative incidence over 2020-2030 consistently predicted to be >50% for PopART-like interventions compared to standard-of-care.
- Increased impact if PopART-like intervention is introduced to a wider area and continued over a longer period of time.
- Substantial impact of VMMC, conditional on high uptake.

Acknowledgements

PopART modelling team:

- Christophe Fraser
- Anne Cori
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