

# Transmission dynamics of SARS-CoV-2 in a strictly-Orthodox Jewish community in the UK

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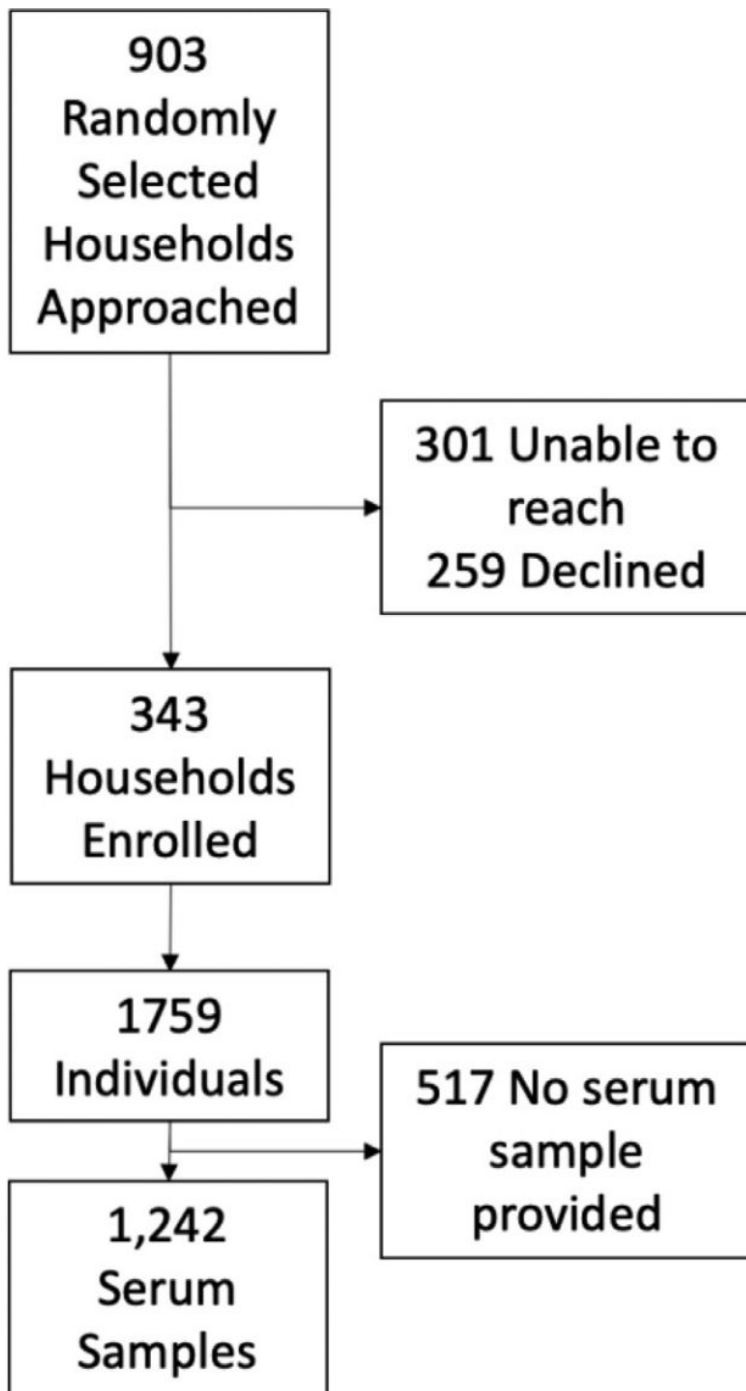
SARS-CoV-2 seroprevalence in a strictly-Orthodox Jewish community  
in the UK: A retrospective cohort study

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William Waites<sup>d,e</sup>, Ben Kasstan<sup>f,g</sup>, Tracey Chantler<sup>h</sup>, Sham Lal<sup>a</sup>, Chrissy H. Roberts<sup>a</sup>,  
David Goldblatt<sup>b</sup>, Rosalind M Eggo<sup>d,1</sup>, Michael Marks<sup>a,c,1,\*</sup>

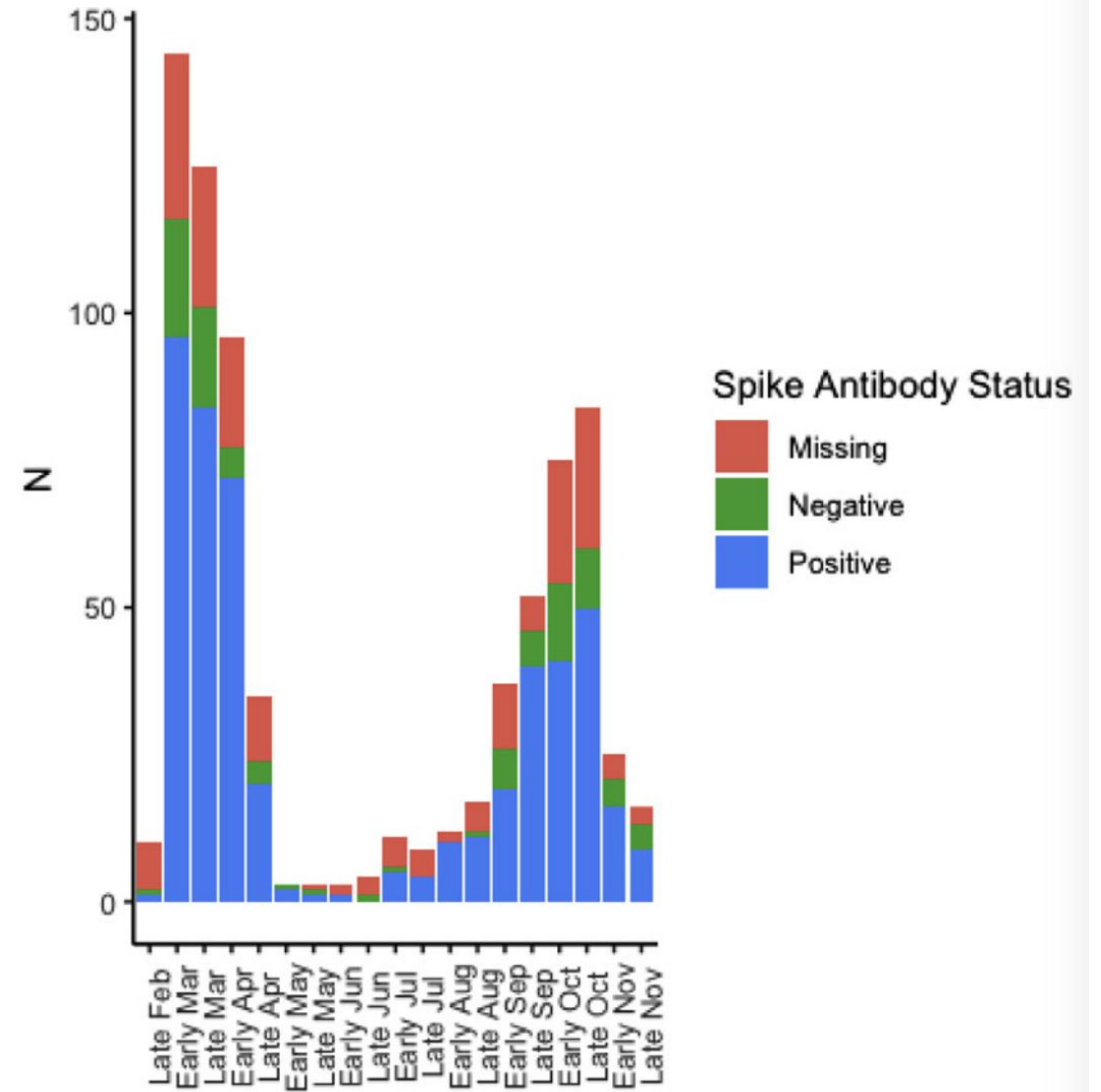
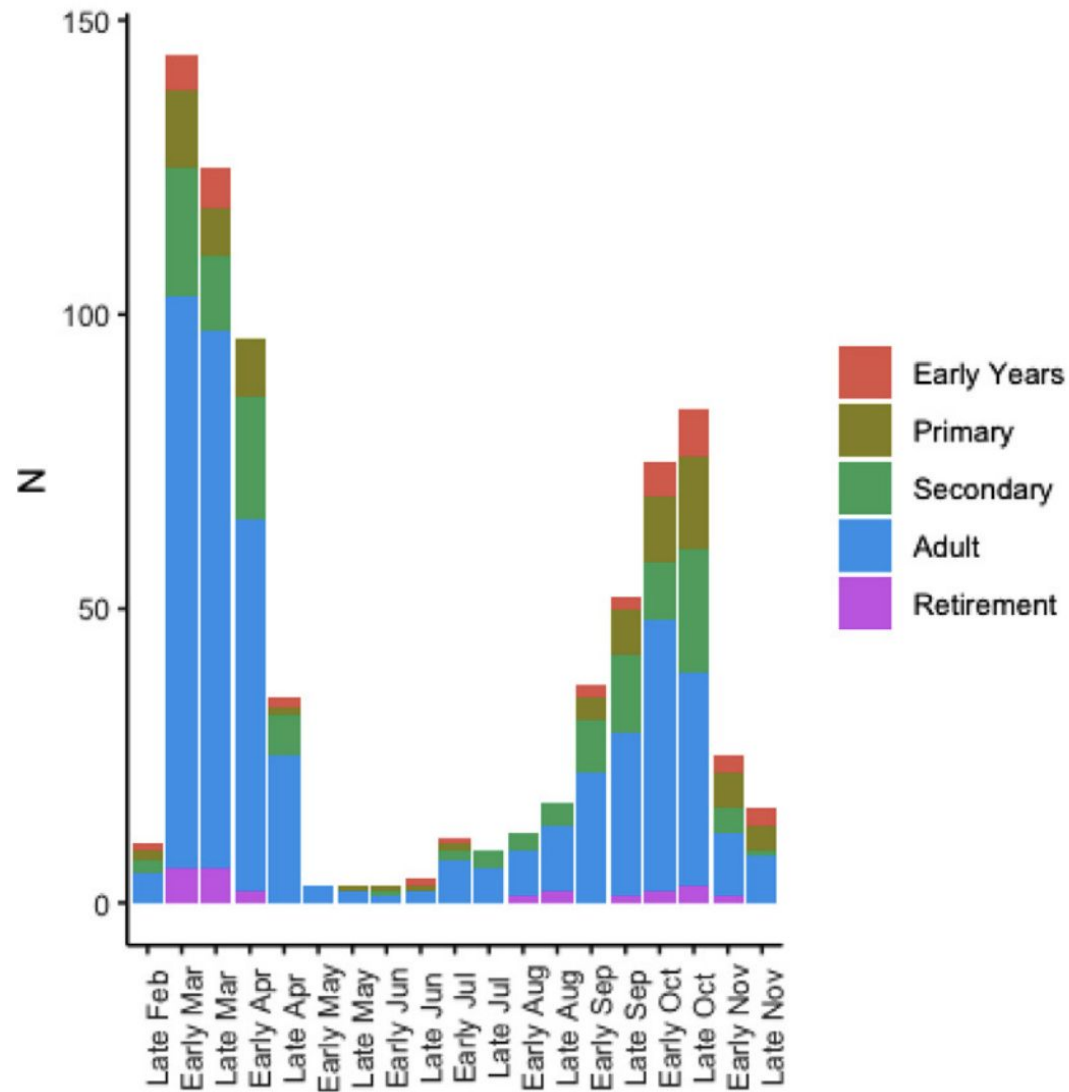
London School of Hygiene & Tropical Medicine Ethics Committee (*Ref* 22532)

# Survey

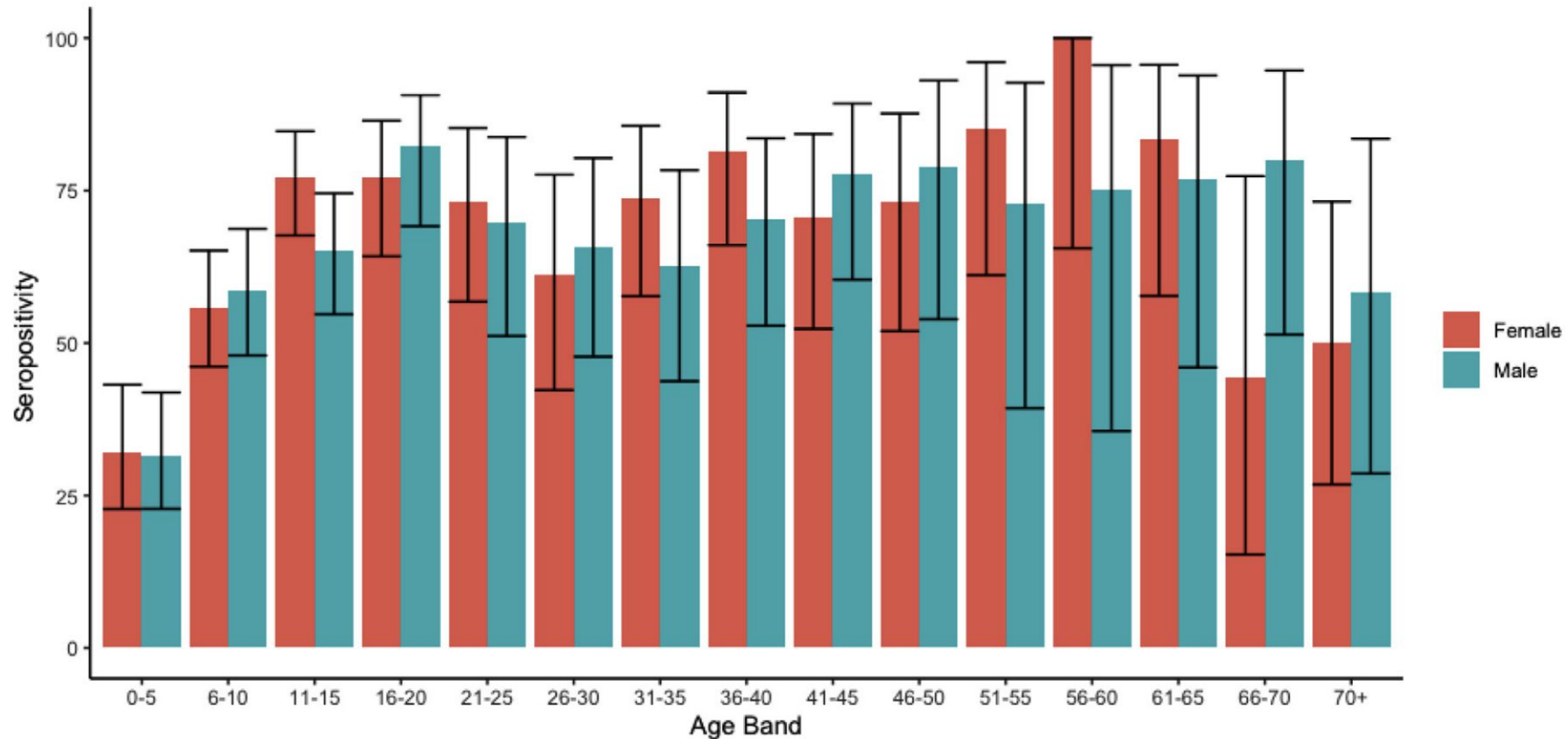
Population approx. 20,000  
High number of children  
Late Oct – early Dec (pre-alpha)



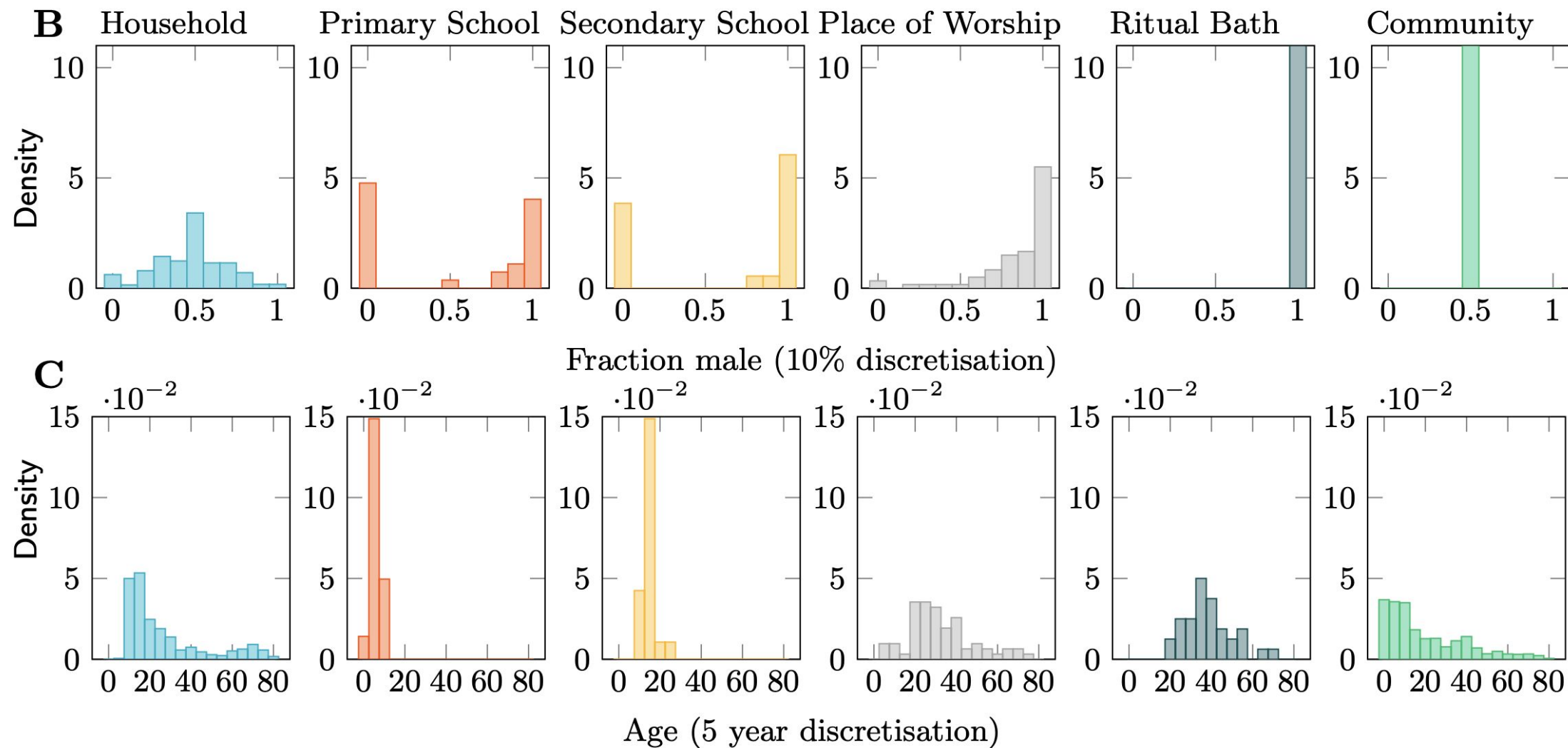
# Self-reported symptoms



# Age-specific seropositivity



# People and places



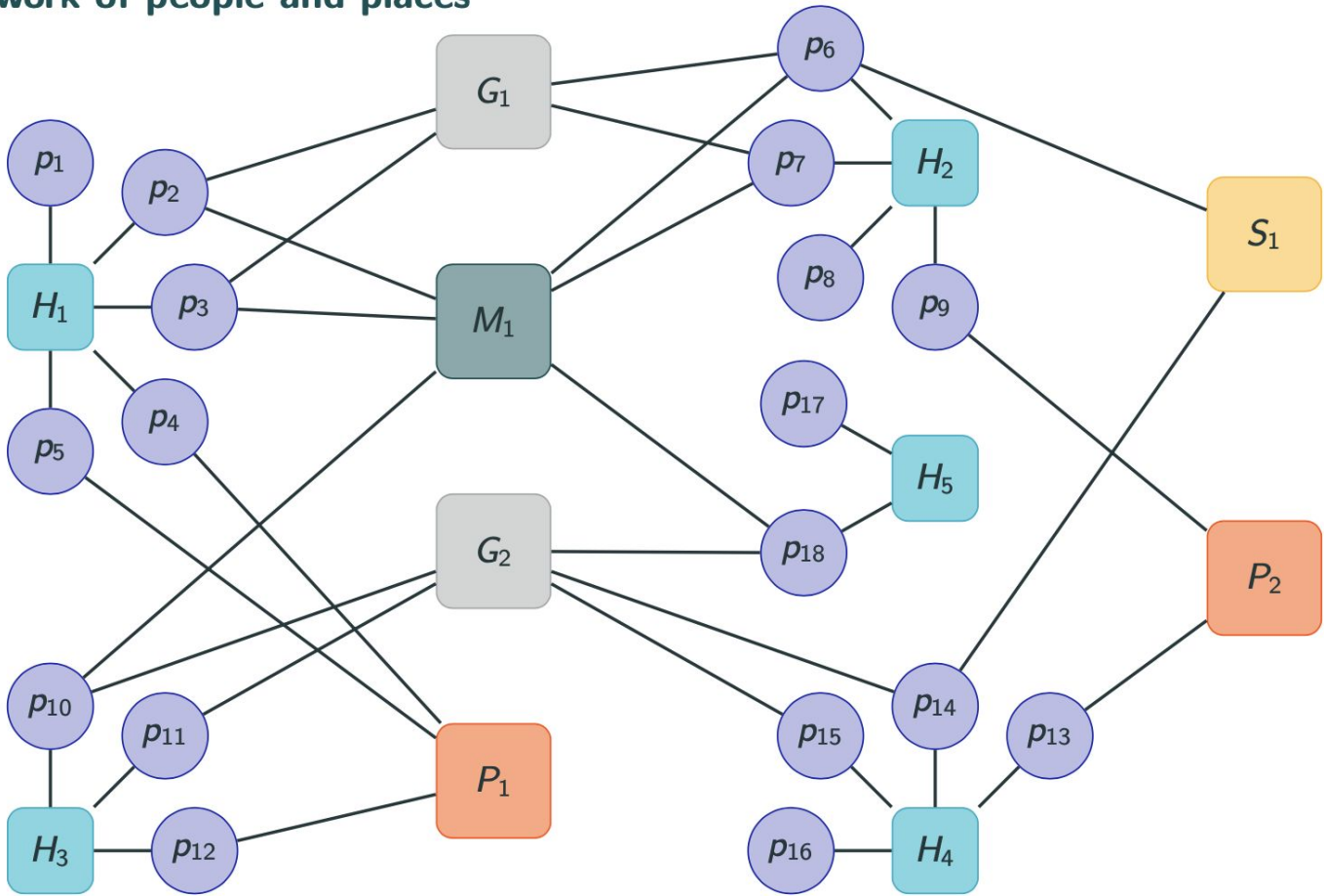
# Characteristics of the network

Setting	Total edges / individuals	Mean degree	Median degree	95th percentile degree	Max degree
Household	1942	5.2	5	10	14
Primary school	686	22.9	16.5	73.3	103
Secondary school	155	7.8	6.5	21.0	22
Place of worship	768	11.1	5	37.6	84
Ritual bath	392	11.2	4	54	73
Community	1942	N/A	N/A	N/A	N/A
Adult Female	537	N/A	N/A	N/A	N/A

Network of people and places



centre for  
mathematical  
modelling of  
infectious  
diseases



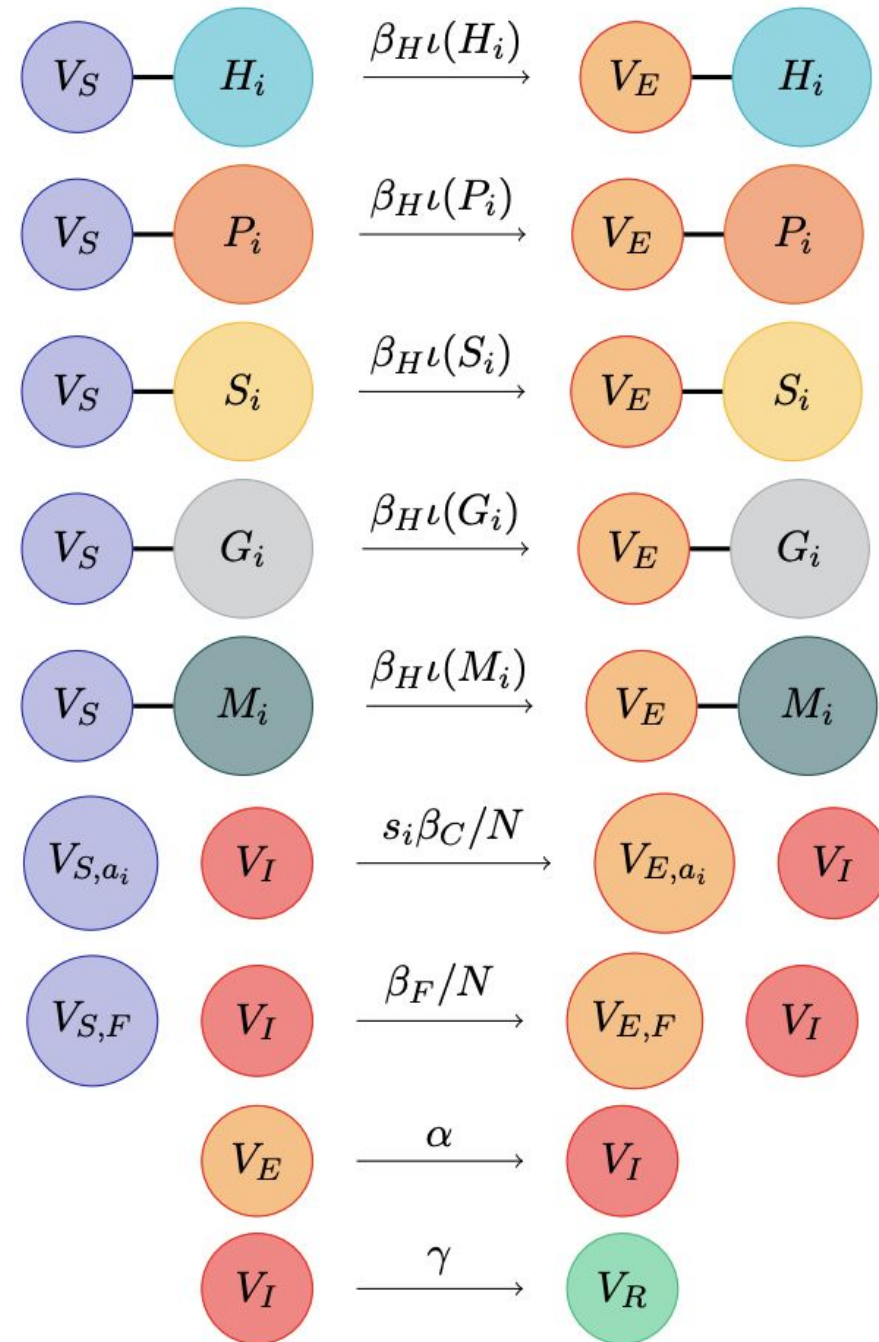
**Legend**

$p$	Susceptible	$p$	Exposed	$p$	Infectious
$p$	Removed	$H$	Household	$P$	Primary School
$S$	Secondary School	$G$	Place of Worship	$M$	Ritual Bath
	Edge		Embedding		Selected Embedding

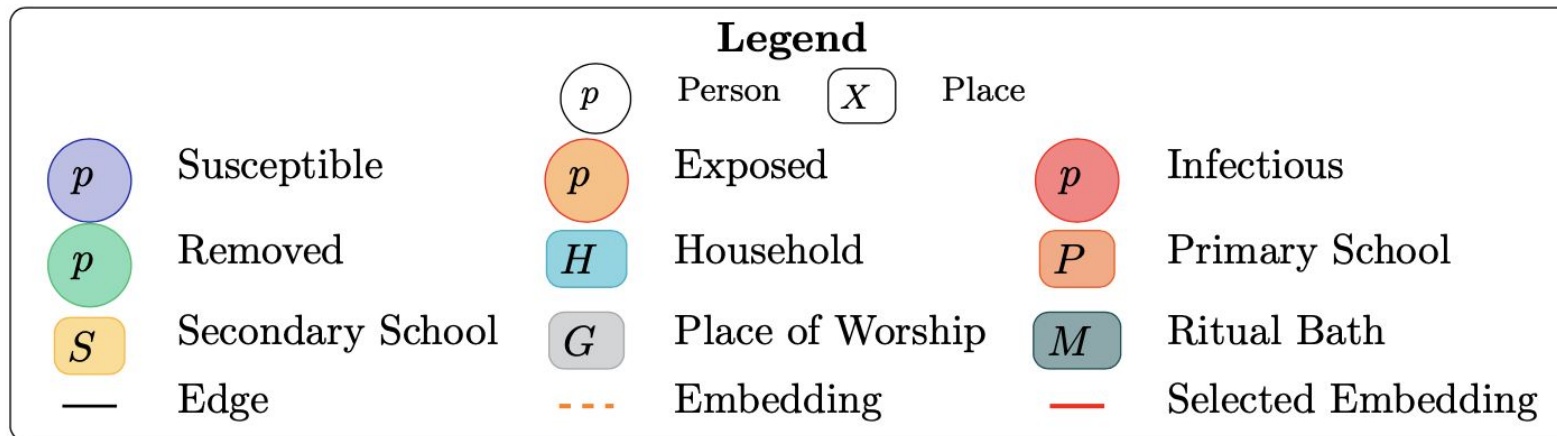
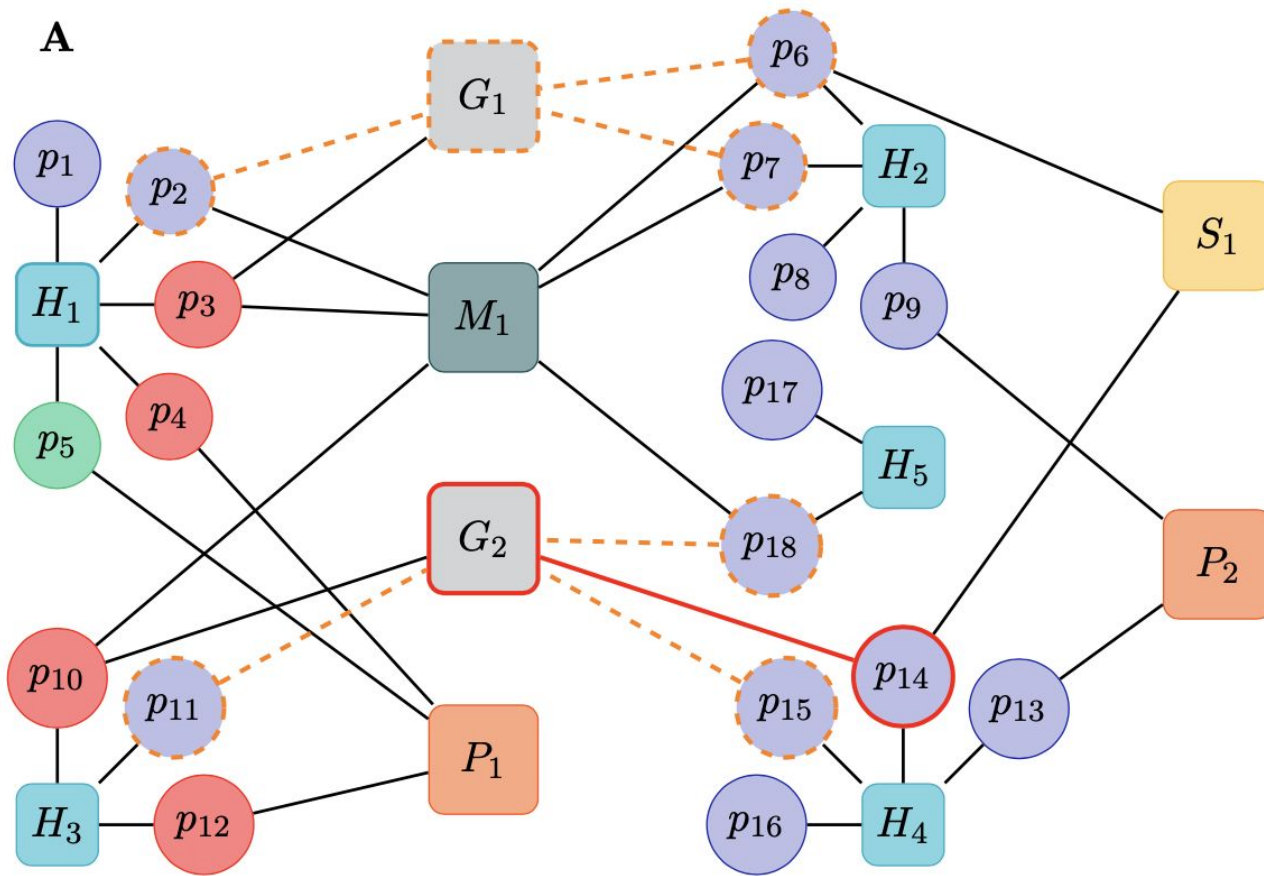


# Rule-based implementation of transmission

Separate community factor for  
women  
Different susceptibility of children



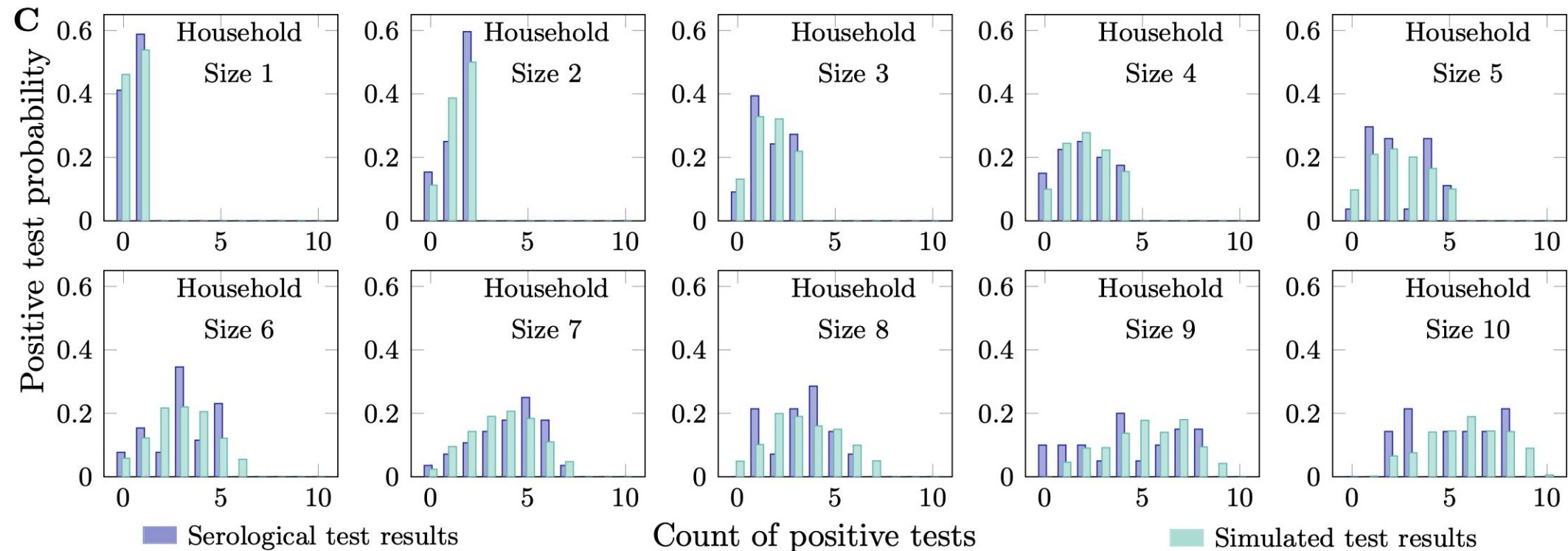




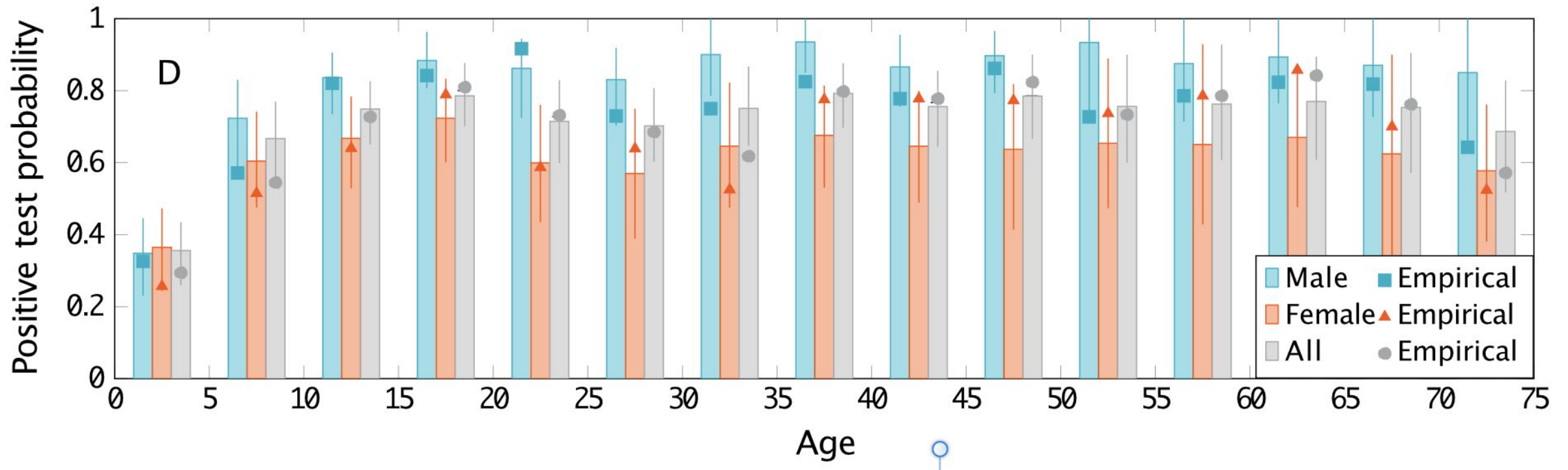
The orange dotted, and red solid edges represent embeddings of a transmission rule (Eq. 6) capturing the situation immediately before a transmission event that will result in the individual  $p_{14}$  becoming infected.

# Fit to households

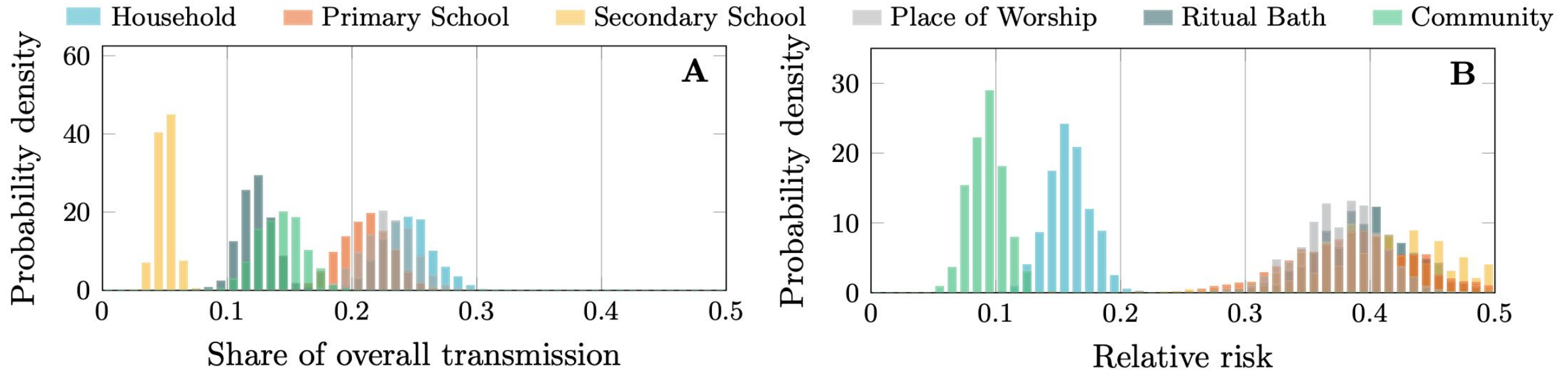
Infer the betas  
Fit to household data  
ABC-SMC



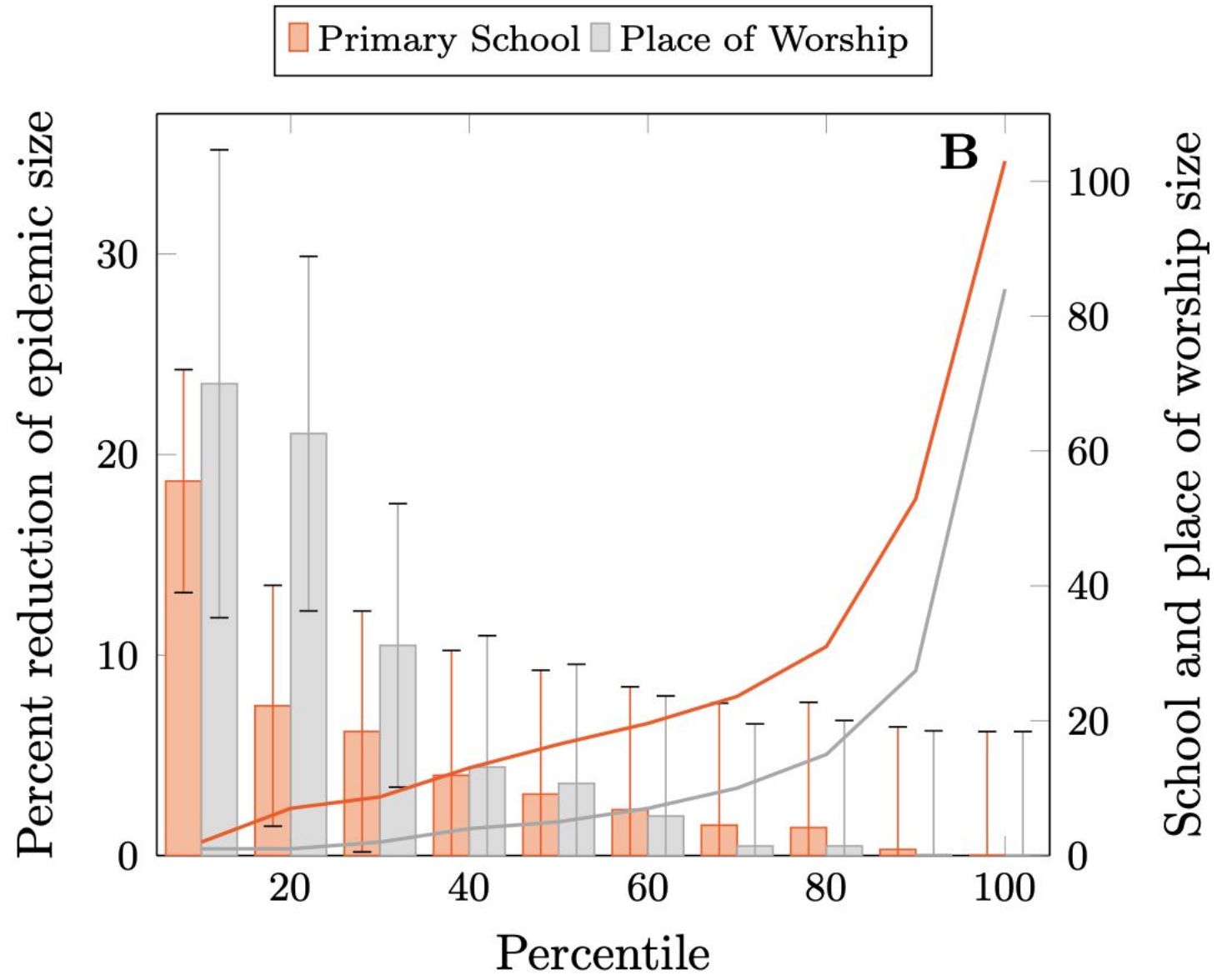
# Age distribution (not explicitly fitted)



# Contribution of each place to transmission



Could place-based interventions have decreased epidemic size?



# Conclusions

- Highest share of transmission within households
- Followed by places of worship and primary schools
  - Underreporting of secondary school attendance
- Limiting size of gatherings (in schools or other settings) could have had an effect on total size
  - But multiple routes of infection possible for each person
- Interventions and other activities were ongoing in the community but we have very little insight into those



*“In my view, it is true that gathering in a small space is inappropriate, but it is possible to pray in groups, each one very small – about 15 people altogether. The groups should begin with first light and then another group, and each one should have a designated time to come and pray there.”*

– Letter from Rabbi Akiva Eiger, Posen, 1831

# Links

William's code: <https://git.sr.ht/~wwaites/orthodox-rewriting>

Gaskell et al: doi: 10.1016/j.lanepe.2021.100127 Cohort study

Waites et al: <https://doi.org/10.1093/cid/ciaa450> Modelling

Kasstan et al: DOI: [10.1016/j.vaccine.2022.02.056](https://doi.org/10.1016/j.vaccine.2022.02.056) Vaccine anthropology

Kasstan et al: doi: [10.1016/j.socscimed.2022.115237](https://doi.org/10.1016/j.socscimed.2022.115237) Sociological insight