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Prof. Neil Ferguson & Prof. Dr. Hans Heesterbeek
Editors-in-Chief of *Epidemics*

Re. Submission of a research paper to *Epidemics*

Dear Editors,

We are pleased to submit to you the attached manuscript entitled *Contribution of unmet needs of individuals at high risk may be underestimated in epidemic models without risk turnover: a mechanistic modelling analysis* for publication as a (regular issue) research paper.

Epidemic models of sexually transmitted infections (STI) such as HIV are increasingly used to help guide intervention priorities by quantifying the contribution of high risk groups to overall transmission. However, movement of individuals between risk groups – which we call “turnover” – is not often considered, and it is not clear how estimates of “contribution” would change if turnover was considered. Moreover, methods to implement turnover which incorporate epidemiological data appear to be lacking.

In this paper, we present new methods to design and parameterize systems of turnover among risk groups in epidemic models, based on epidemiological data. We then leverage these methods to examine the influence of turnover on several epidemic model outputs in a representative STI, including the contribution of the highest risk group to overall transmission. We find that this contribution could be underestimated in models without turnover following model fitting, which suggests that models without turnover may underestimate the importance of reaching high risk groups with interventions.

While our study is framed around a representative STI, risk group turnover is applicable to a wide range of epidemic contexts, infections, and hosts. We therefore aimed to reach a broad audience in the readers of *Epidemics*, who we expect will benefit from the proposed framework for parameterizing turnover, and our mechanistic insights as to the influence of turnover on epidemic model outputs.

Researchers who we think would provide excellent review of this work include: James S. Koopman (University of Michigan); Michael Pickles (University of Manitoba); Marie-Claude Boily (Imperial College London); Jeffrey Eaton (Imperial College London); Hein Stigum (Norwegian Institute of Public Health); and Geoff Garnett (Bill and Melinda Gates Foundation).

We look forward to hearing from you about how we can share our contributions with the readers of *Epidemics*.

Sincerely,

Sharmistha Mishra