MODELING THE IMPACT OF RACIAL AND ETHNIC DISPARITIES ON COVID-19 EPIDEMIC DYNAMICS

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BACKGROUND

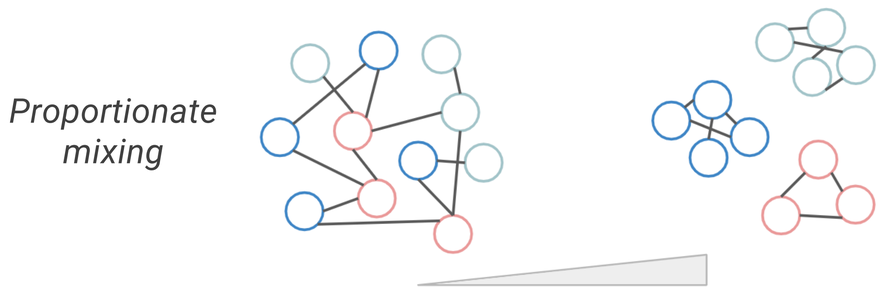
Substantial racial and ethnic disparities in the burden of SARS-CoV-2 have been characterized across the US [1-3], but it is unclear how these heterogeneities in risk are expected to change over time and what implications they have on overall epidemic dynamics.

AIMS

We explored how accounting for heterogeneity in SARS-CoV-2 spread across racial and ethnic groups affected overall and within-group estimates of herd immunity thresholds, epidemic sizes, and longitudinal trends in risk.

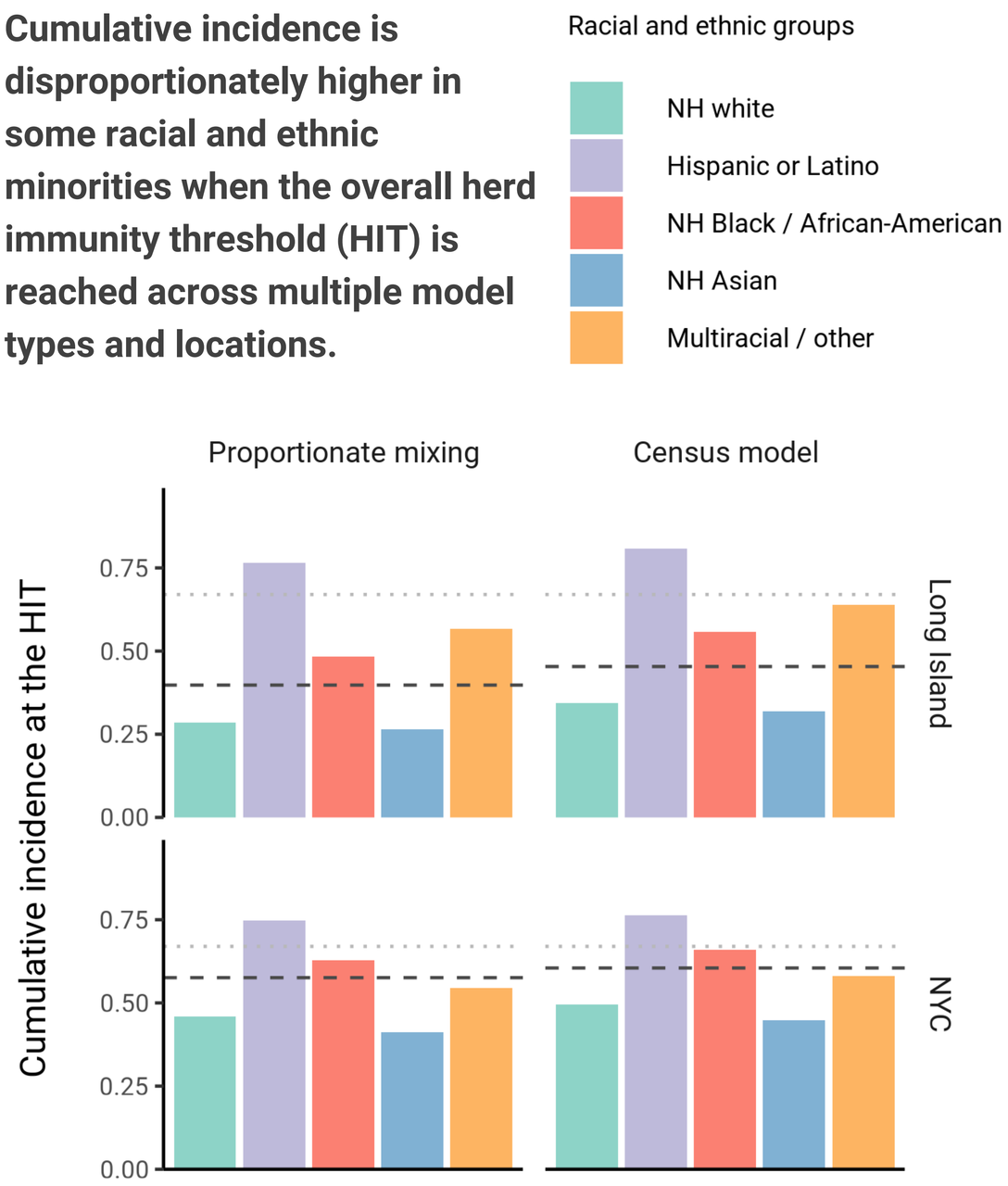
METHODS

We fit compartmental SEIR transmission models structured by five racial and ethnic groups (**non-Hispanic whites, Hispanics or Latinos, non-Hispanic Blacks, non-Hispanic Asians, and multiracial or other individuals**) to seroprevalence data from New York City (NYC) and Long Island [4]. The degree of assortativity (i.e., the degree of preferential within-group mixing) was a key parameter that we varied and fit using census data *(census model)*.



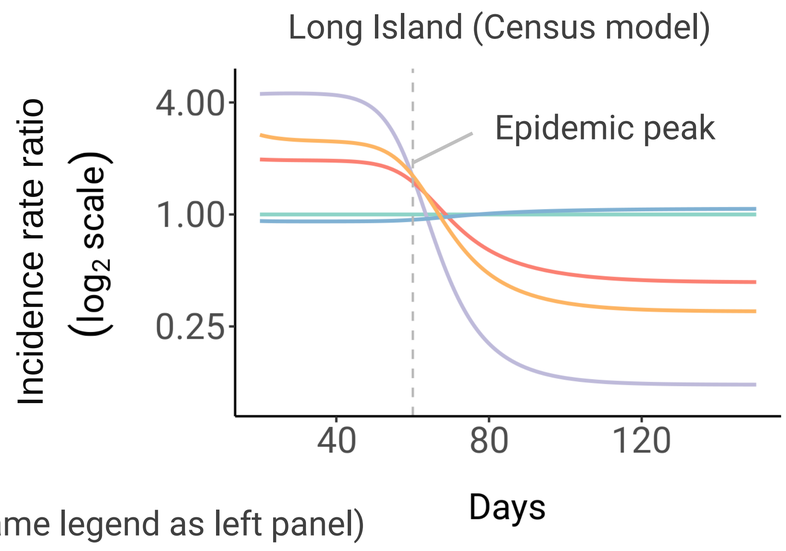
RESULTS

Cumulative incidence is disproportionately higher in some racial and ethnic minorities when the overall herd immunity threshold (HIT) is reached across multiple model types and locations.



The HIT for the overall population is indicated with the black dashed line, and the HIT for a homogeneous model with the same R_0 value of 3 is indicated with the gray dashed line.

Trends in incidence rates relative to non-Hispanic whites reverse after the epidemic has peaked because a majority of individuals from high-risk groups have already been infected.



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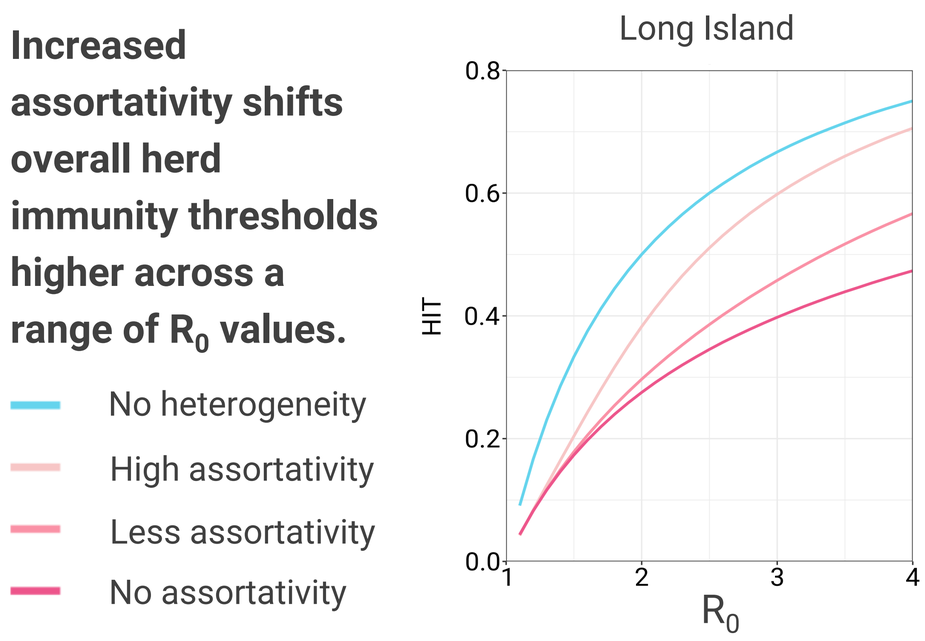
Increased assortativity shifts overall herd immunity thresholds higher across a range of R_0 values.



CONCLUSIONS

- Projecting transmission of SARS-CoV-2 forward indicated that the overall herd immunity threshold was reached only after cumulative incidence had increased disproportionately in minority groups, highlighting the **fundamentally inequitable outcome of achieving herd immunity through infection**.
- These results underscore the importance of developing **socially informed COVID-19 transmission models** and are a step towards using these models to design interventions for reducing disparities in health.

References: [1] Chamie et al., *CID* 2020. [2] Bassett et al., *PLOS Medicine* 2020. [3] Hanage et al., *European Journal of Epidemiology* 2020. [4] Rosenberg et al., *Annals of Epidemiology* 2020.

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