

## **Supporting Information for**

**Linguistic diversity as a barrier to disease spread**

**Sihan Chen, Antonio Benítez-Burraco**

**E-mail:** sihanc@mit.edu

**This PDF file includes:**

Figs. S1 to S5

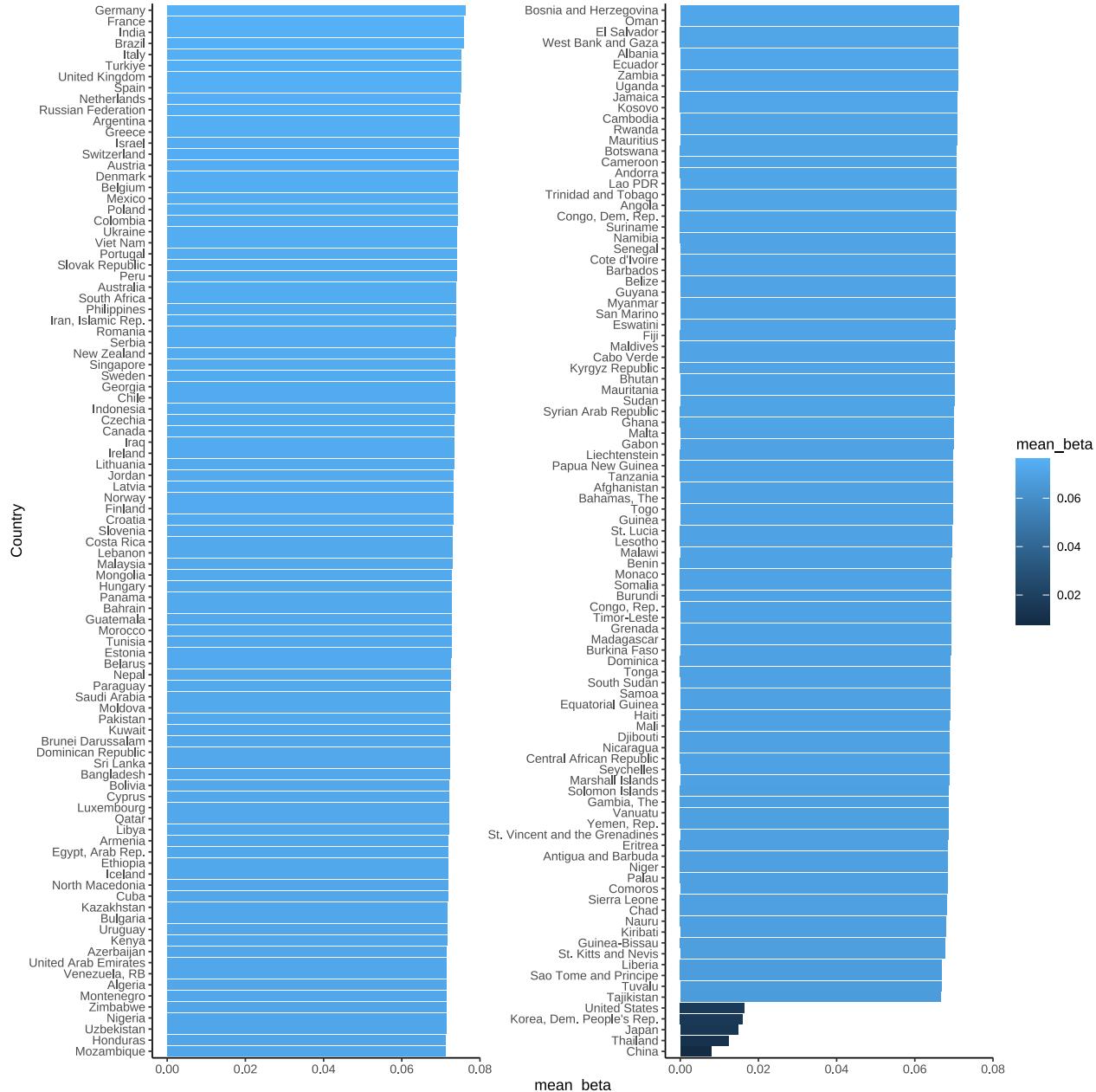
Tables S1 to S3

**Table S1.** Regression results from the global analysis: the effect of  $\Delta\text{LDI}$  and other variables on  $\Delta\beta$ . Significance codes: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

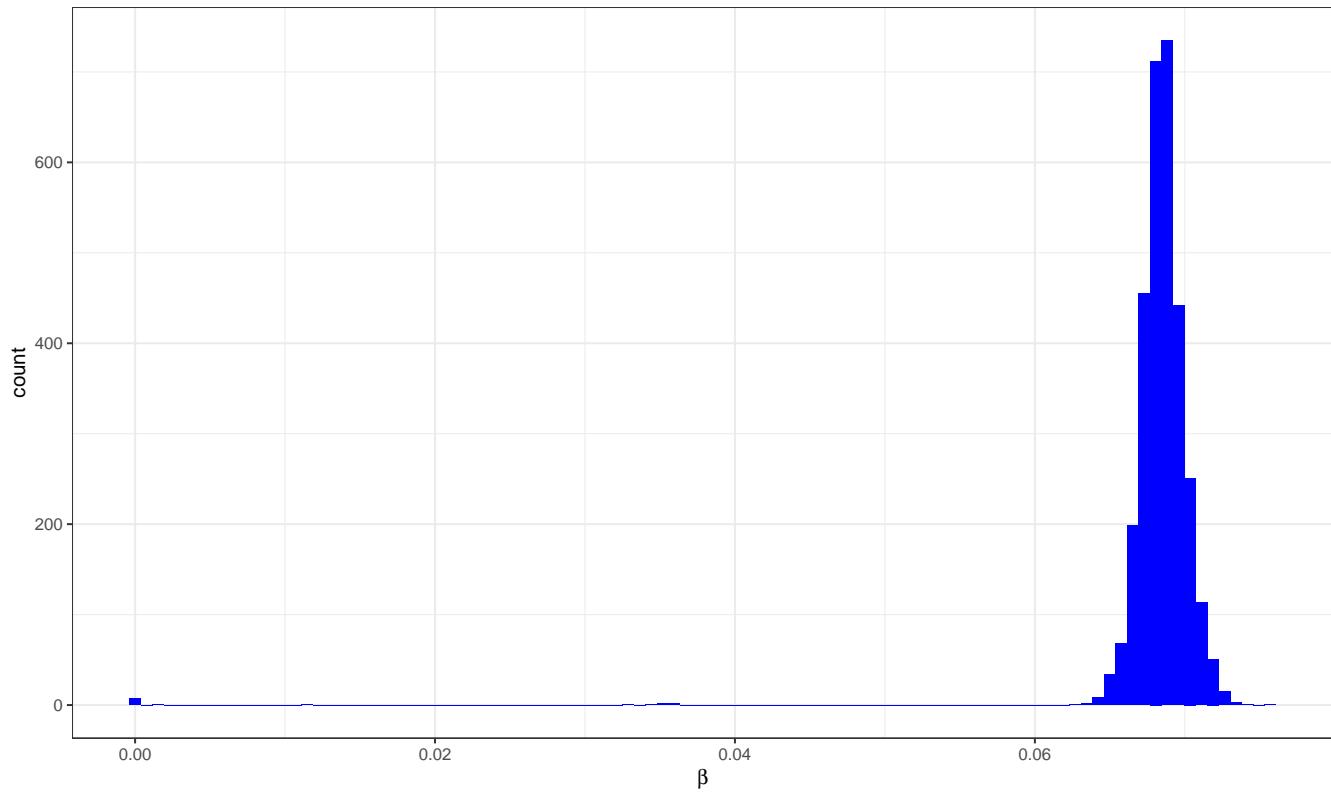
	Estimate	Std. Error	t value	Pr( $\geq  t $ )
(Intercept)	$3.691 \times 10^{-5}$	$4.474 \times 10^{-5}$	0.825	0.410
$\Delta\text{LDI}$	$-2.665 \times 10^{-4}$	$1.155 \times 10^{-4}$	-2.307	0.021*
$\Delta\text{MAP}$	$1.344 \times 10^{-4}$	$2.283 \times 10^{-5}$	5.886	$4.21 \times 10^{-9}\text{***}$
$\Delta\text{MAT}$	$1.814 \times 10^{-4}$	$5.239 \times 10^{-5}$	3.463	0.000539***
$\Delta\text{elev.}$	$1.251 \times 10^{-5}$	$2.631 \times 10^{-5}$	0.475	0.635
$\Delta\text{lat.}$	$1.135 \times 10^{-4}$	$5.796 \times 10^{-5}$	1.958	0.050
$\Delta\text{HDI}$	$1.252 \times 10^{-3}$	$3.300 \times 10^{-5}$	37.947	$< 2 \times 10^{-16}\text{***}$
$\Delta\text{popu.density}$	$-1.671 \times 10^{-4}$	$2.419 \times 10^{-5}$	-6.909	$5.47 \times 10^{-12}\text{***}$
$\Delta\text{road.density}$	$3.401 \times 10^{-4}$	$2.823 \times 10^{-5}$	12.049	$< 2 \times 10^{-16}\text{***}$

**Table S2.** Regression results among U.S. counties: the effect of  $\Delta H$  and other variables on  $\Delta\beta$ . Significance codes: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

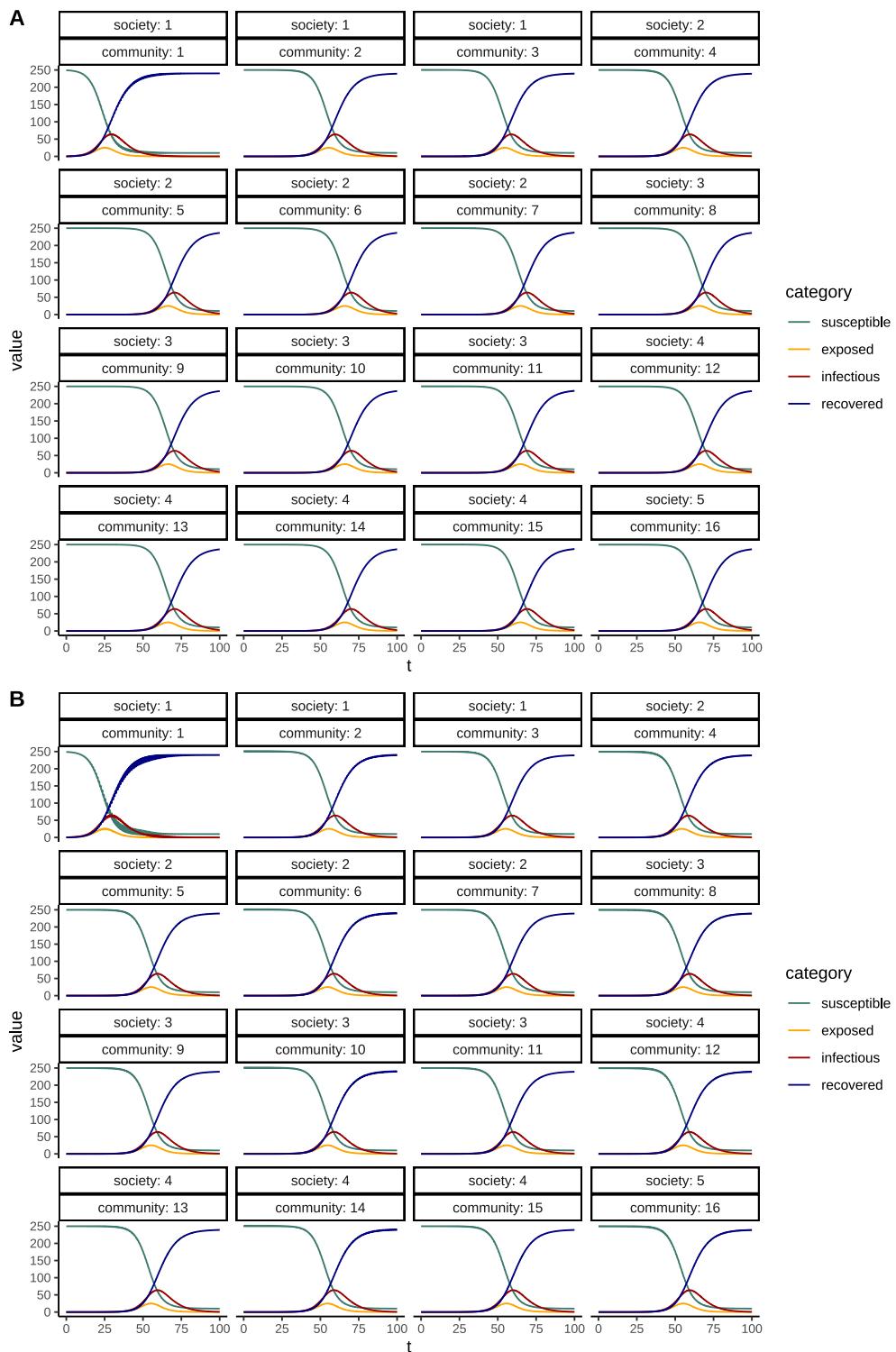
	Estimate	Std. Error	t value	Pr( $\geq  t $ )
(Intercept)	$5.939 \times 10^{-5}$	$9.597 \times 10^{-7}$	61.88	$< 2\text{e-16} \text{***}$
$\Delta H$	$1.416 \times 10^{-3}$	$2.374 \times 10^{-6}$	596.3	$< 2\text{e-16} \text{***}$
$\Delta\text{MAP}$	$5.326 \times 10^{-4}$	$9.989 \times 10^{-6}$	53.318	$< 2\text{e-16} \text{***}$
$\Delta\text{MAT}$	$2.298 \times 10^{-3}$	$8.156 \times 10^{-6}$	281.7	$< 2\text{e-16} \text{***}$
$\Delta\text{lat.}$	$1.540 \times 10^{-3}$	$1.333 \times 10^{-5}$	115.5	$< 2\text{e-16} \text{***}$
$d_e$	$2.160 \times 10^{-4}$	$1.027 \times 10^{-5}$	21.022	$< 2\text{e-16} \text{***}$
$d_i$	$7.290 \times 10^{-5}$	$1.027 \times 10^{-5}$	7.097	$1.27 \times 10^{-12} \text{***}$
$\Delta\text{life.expe}$	$-9.356 \times 10^{-4}$	$4.927 \times 10^{-6}$	-189.9	$< 2 \times 10^{-16}\text{***}$
$\Delta\text{popu.density}$	$-6.398 \times 10^{-3}$	$2.169 \times 10^{-5}$	-295.0	$< 2 \times 10^{-16}\text{***}$
$\Delta\text{road.density}$	$7.732 \times 10^{-3}$	$7.870 \times 10^{-6}$	982.4	$< 2 \times 10^{-16}\text{***}$



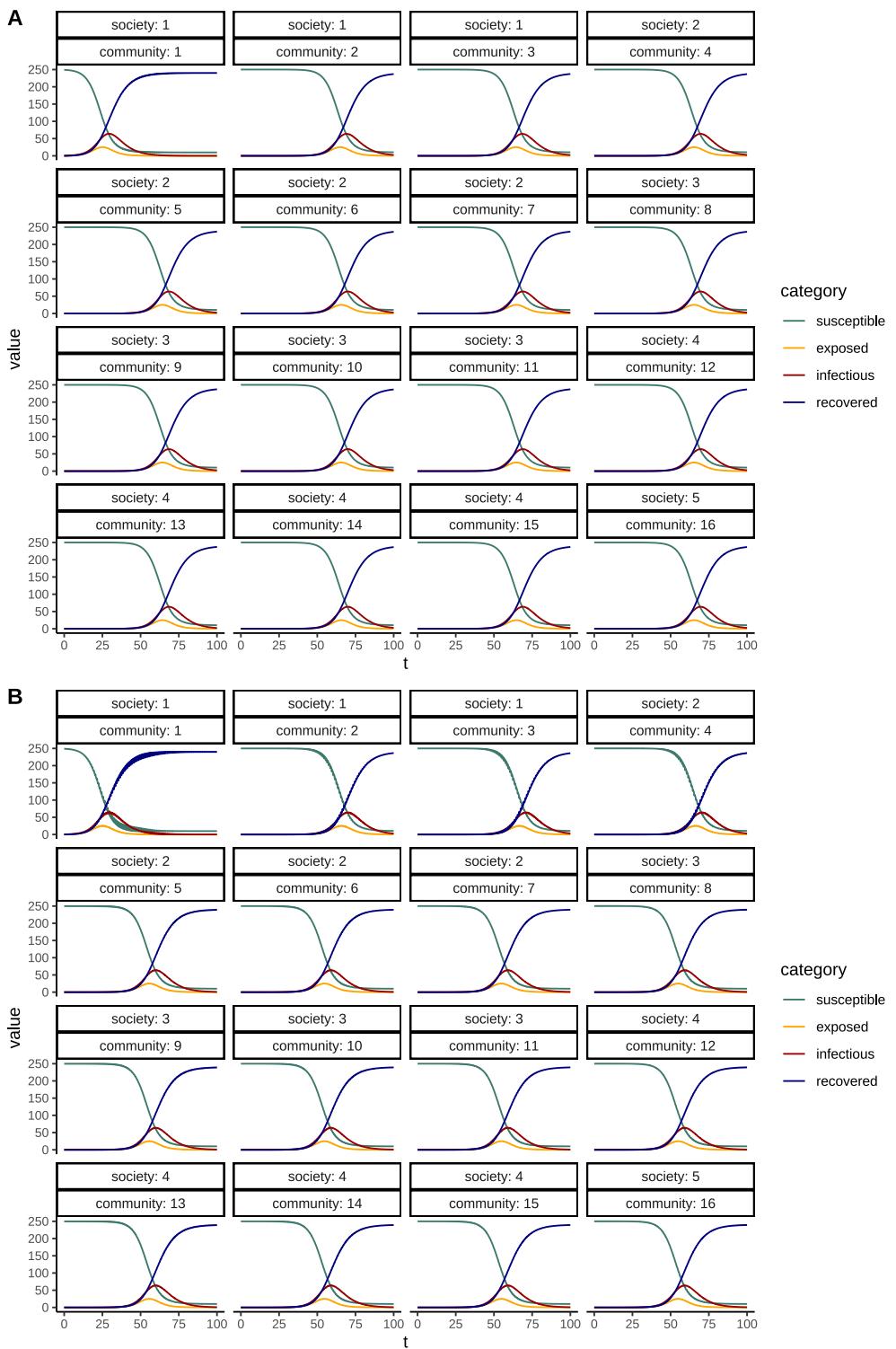
**Fig. S1.** The calculated COVID-19 transmission rate ( $\beta$ ) in each country, according to data provided by Johns Hopkins University.



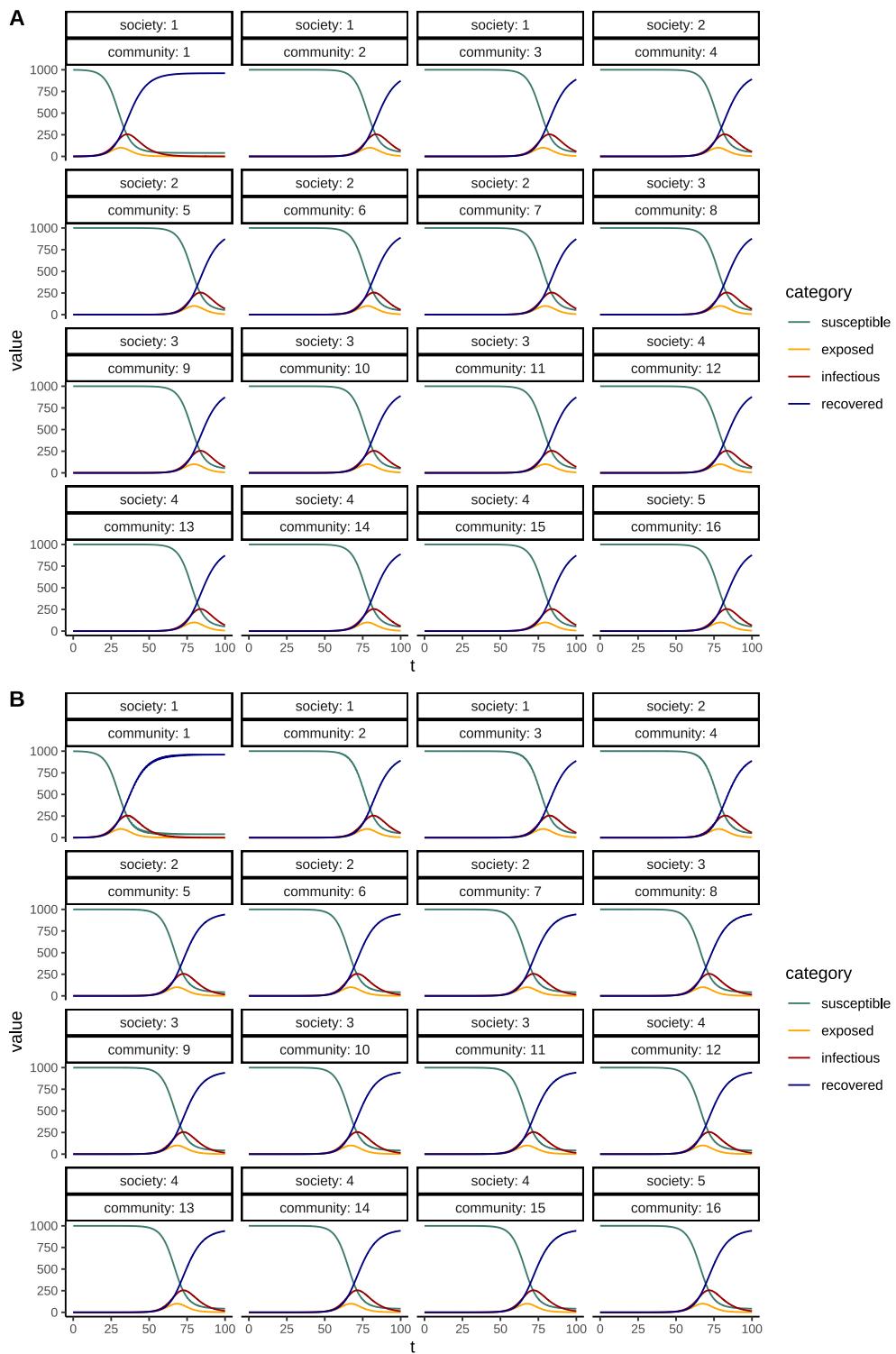
**Fig. S2.** Histogram of COVID-19 transmission rate ( $\beta$ ) in each US county, according to data provided by Johns Hopkins University



**Fig. S3.** The population change of each group (green: susceptible, orange: exposed, red: infectious; blue: recovered) in each community for **(A) Scenario 1** and **(B) Scenario 2** as a function of time (unit: days).



**Fig. S4.** The population change of each group (green: susceptible, orange: exposed, red: infectious; blue: recovered) in each community for (A) Scenario 3 and (B) Scenario 4 as a function of time (unit: days).



**Fig. S5.** The population change of each group (green: susceptible, orange: exposed, red: infectious; blue: recovered) in each community for (A) Scenario 5 and (B) Scenario 6 as a function of time (unit: days).

**Table S3. List of datasets used in the analysis**

Dataset #	Description	Publisher	Link
DS1	COVID-19 daily case data by country between 2020 and 2023	Johns Hopkins University	<a href="#">link</a>
DS2	mean annual temperature and mean annual precipitation data by country, pulled from Geospatial Data v0.2	Global Data Lab	<a href="#">link</a>
DS3	elevation by country	Wikipedia	<a href="#">link</a>
DS4	Subnational HDI v8.1	Global Data Lab	<a href="#">link</a>
DS5	road density by country (km per surface area)	World Bank	<a href="#">link</a>
DS6	population density by country	World Bank	<a href="#">link</a>
DS7	population by country (2022)	World Bank	<a href="#">link</a>
DS8	"Languages spoken at home" data from the 2023 5-year estimates of the American Community Survey (ACS)	U.S. Census Bureau	<a href="#">link</a>
DS9	mean annual temperature by U.S. county (2022)	NOAA	<a href="#">link</a>
DS10	mean annual precipitation by U.S. county (2022)	NOAA	<a href="#">link</a>
DS11	latitude and area of each U.S. county	U.S. Census Bureau	<a href="#">link</a>
DS12	"education attainment" data from ACS 2023 5-year estimates	U.S. Census Bureau	<a href="#">link</a>
DS13	"income in the past 12 months" from ACS 2023 5-year estimates	U.S. Census Bureau	<a href="#">link</a>
DS14	life expectancy by county	CDC	<a href="#">link</a>
DS15	population by county (2023)	U.S. Census Bureau	<a href="#">link</a>
DS16	road length by county, compiled by Erin Davis	U.S. Census Bureau	<a href="#">link</a>
DS17	List of the busiest passenger flight routes	Wikipedia	<a href="#">link</a>