Supplementary material for 'Using simulated infectious disease outbreaks to guide the design of individually randomized vaccine trials'

Figure S1. Top 100 sites with highest Zika virus transmission probability in the Americas identified by the Global Epidemic and Mobility model in 2017. Larger circles and darker colors represent greater population size and average site-level incidence of infection, respectively, across all simulated outbreaks in one year.

Figure S2. Relationships between site prioritization ranking metrics. Each site is plotted, and the color of the dots corresponds to the log site population size. Higher ranks indicate greater 1) median site-level incidence of infection, 2) average site-level incidence, and 3) probability of exceeding 1% site-level incidence across all simulated outbreaks in one year (2017).

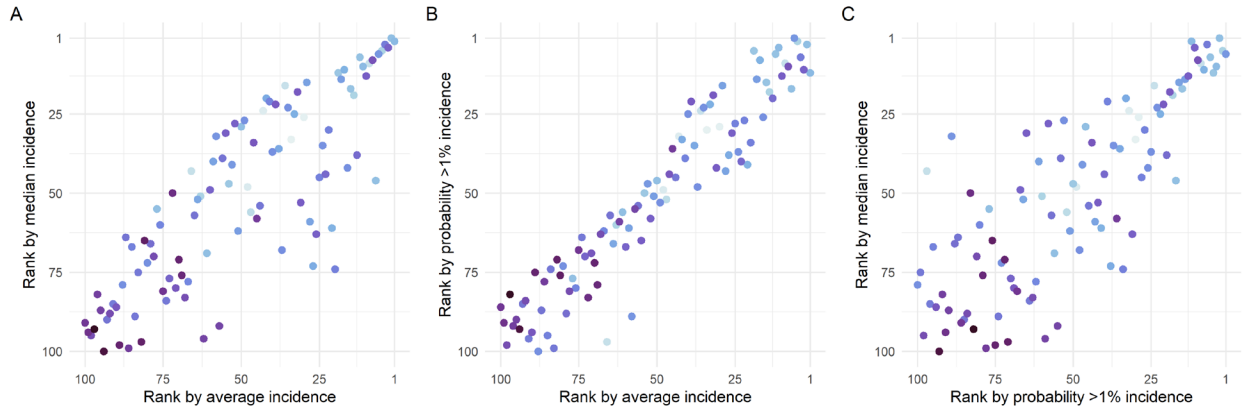

Figure S3. Top 100 sites with highest probability of Zika virus transmission in the Americas in 2017 identified by the Global Epidemic and Mobility model ranked by average site-level incidence of infection across all simulated outbreaks.

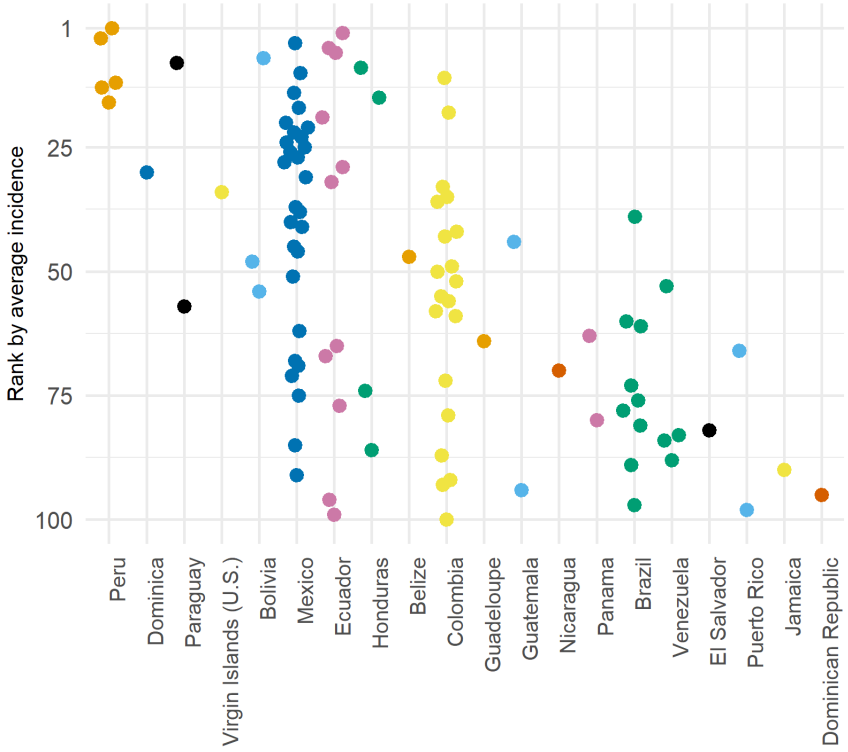

Table S1. Top 100 sites in the Americas with the highest projected Zika virus transmission probability and infection rates in 2017 from the Global Epidemic and Mobility model[a]

Site	State	Country
Belmopan	Cayo	Belize
Rurrenabaque	La Paz	Bolivia
Puerto Suarez	Santa Cruz	Bolivia
Yacuiba	Tarija	Bolivia
Alta Floresta	Mato Grosso	Brazil
Belo Horizonte	Minas Gerais	Brazil
Ipatinga	Minas Gerais	Brazil
Sao Joao del Rei	Minas Gerais	Brazil
Varginha	Minas Gerais	Brazil
Resende	Rio de Janeiro	Brazil
Campinas	Sao Paulo	Brazil
Sao Jose Dos Campos	Sao Paulo	Brazil
Sao Paulo	Sao Paulo	Brazil
Apartado	Antioquia	Colombia
Medellin	Antioquia	Colombia
Barranquilla	Atlantico	Colombia
Cartagena	Bolivar	Colombia
Pereira	Caldas	Colombia
Popayan	Cauca	Colombia
Valledupar	Cesar	Colombia
Bahia Solano	Choco	Colombia
Nuqui	Choco	Colombia
Quibdo	Choco	Colombia
Monteria	Cordoba	Colombia
Riohacha	La Guajira	Colombia
Santa Marta	Magdalena	Colombia
Guapi	Nariño	Colombia
Ipiales	Nariño	Colombia
Pasto	Nariño	Colombia
Tumaco	Nariño	Colombia
Mocoa	Putumayo	Colombia
Puerto Asis	Putumayo	Colombia
Corozal (CO)	Sucre	Colombia
Dominica	Saint Paul	Dominica
Santiago	Santiago	Dominican Republic
Macas	Chimborazo	Ecuador
Santa Rosa (EC)	El Oro	Ecuador
Esmeraldas	Esmeraldas	Ecuador
Guayaquil	Guayas	Ecuador
Tulcan	Imbabura	Ecuador
Manta	Manabi	Ecuador
Tena	Napo	Ecuador
Coca	Orellana	Ecuador
Quito	Pichincha	Ecuador
Lago Agrio	Sucumbios	Ecuador
Latacunga	Tungurahua	Ecuador
San Salvador (SV)	San Salvador	El Salvador
Pointe-a-Pitre	Basse-Terre	Guadeloupe
Guatemala City	Guatemala	Guatemala
Flores	Peten	Guatemala
Guanaja	Colon	Honduras
San Pedro Sula	Cortes	Honduras

Puerto Lempira	Gracias a Dios	Honduras
Roatan	Olancho	Honduras
Kingston (JM)	Saint Catherine	Jamaica
La Paz (MX)	Baja California Sur	Mexico
San Jose Cabo	Baja California Sur	Mexico
Tapachula	Chiapas	Mexico
Tuxtla Gutierrez	Chiapas	Mexico
Colima	Colima	Mexico
Guadalajara	Jalisco	Mexico
Manzanillo (MX)	Jalisco	Mexico
Puerto Vallarta	Jalisco	Mexico
Lazaro Cardenas	Michoacan	Mexico
Uruapan	Michoacan	Mexico
Tepic	Nayarit	Mexico
Monterrey	Nuevo Leon	Mexico
Huatulco	Oaxaca	Mexico
Oaxaca	Oaxaca	Mexico
Puerto Escondido	Oaxaca	Mexico
Cancun	Quintana Roo	Mexico
Chetumal	Quintana Roo	Mexico
Culiacan	Sinaloa	Mexico
Los Mochis	Sinaloa	Mexico
Mazatlan	Sinaloa	Mexico
Ciudad Obregon	Sonora	Mexico
Hermosillo	Sonora	Mexico
Villahermosa	Tabasco	Mexico
Ciudad Victoria	Tamaulipas	Mexico
Jalapa	Veracruz	Mexico
Minatitlan	Veracruz	Mexico
Tampico	Veracruz	Mexico
Veracruz	Veracruz	Mexico
Managua	Managua	Nicaragua
Bocas del Toro	Bocas del Toro	Panama
David	Chiriqui	Panama
Ciudad del Este	Alto Parana	Paraguay
Asuncion	Central	Paraguay
Piura	Piura	Peru
Talara	Piura	Peru
Tarapoto	San Martin	Peru
Tumbes	Tumbes	Peru
Pucallpa	Ucayali	Peru
Vieques	Fajardo	Puerto Rico
San Juan (PR)	Guaynabo	Puerto Rico
Barinas	Barinas	Venezuela
El Vigia	Merida	Venezuela
Merida (VE)	Merida	Venezuela
Valera	Trujillo	Venezuela
St Croix Island	NA	Virgin Islands (U.S.)

[a] The site names listed are the largest urban areas associated with the geographic grids used by the Global Epidemic and Mobility model. For example, Belmopan may include areas outside the urban center.

Table S2. Summary statistics for top ten sites with highest Zika virus transmission probability in 2017 ranked by an equal weight, combined score of the other ranking methods (average site-level incidence of infection, median site-level incidence, probability of exceeding 1% site-level incidence)

Site	State	Country	Average site-level incidence	Median site-level incidence	Probability of >1% of site-level incidence
Lago Agrio	Sucumbios	Ecuador	0.094	0.097	0.903
Coca	Orellana	Ecuador	0.063	0.060	0.905
Esmeraldas	Esmeraldas	Ecuador	0.060	0.059	0.943
Los Mochis	Sinaloa	Mexico	0.080	0.071	0.741
Tumbes	Tumbes	Peru	0.130	0.073	0.613
Piura	Piura	Peru	0.093	0.070	0.623
Talara	Piura	Peru	0.038	0.040	0.754
Tumaco	Narino	Colombia	0.039	0.026	0.780
Ciudad del Este	Alto Parana	Paraguay	0.053	0.030	0.667
Puerto Lempira	Gracias a Dios	Honduras	0.048	0.029	0.701

Table S3. Example of the number of participants enrolled from each of five sites for different enrollment strategies (n = 15,000)

Site Rank[a]	Equal across sites	Proportional to average incidence	(Equal + average incidence)/2
1	3000	4242	3621
2	3000	3059	3030
3	3000	3032	3016
4	3000	2606	2803
5	3000	2061	2530

[a] Ranked by average site-level incidence of infection across simulated outbreaks.

File S1. Equations for allocation strategies

1) Equal enrollment: Let N be the total sample size, let m be the number of sites, let n_i be the sample size at site i, then: $n_i = \frac{N}{m}$
2) Proportional to mean incidence: Let r_i be the rank at site i by average site-level incidence and let y_i = mean incidence. Then site i has size: $n_i = N\frac{y_i}{\sum_{j:r_j \leq m} y_j}$
3) Average of equal enrollment and proportional to mean incidence: $n_i = \frac{\frac{N}{m} + \left(N\frac{y_i}{\sum_{j:r_j \leq m} y_j}\right)}{2}$