

THE LANCET Planetary Health

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed.
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Supplement to: Poongavanan J, Lourenço J, Tsui J L-H, et al. Dengue virus importation risks in Africa: a modelling study. *Lancet Planet Health* 2024; **8**: e1043–54.

Supplementary Appendix

Figure S1.....	1
Figure S2.....	2
Figure S3.....	3
Figure S4.....	4
Figure S5.....	4
Figure S6.....	5
Figure S7.....	6
Figure S8.....	9
Table S1.....	10

Figure S1

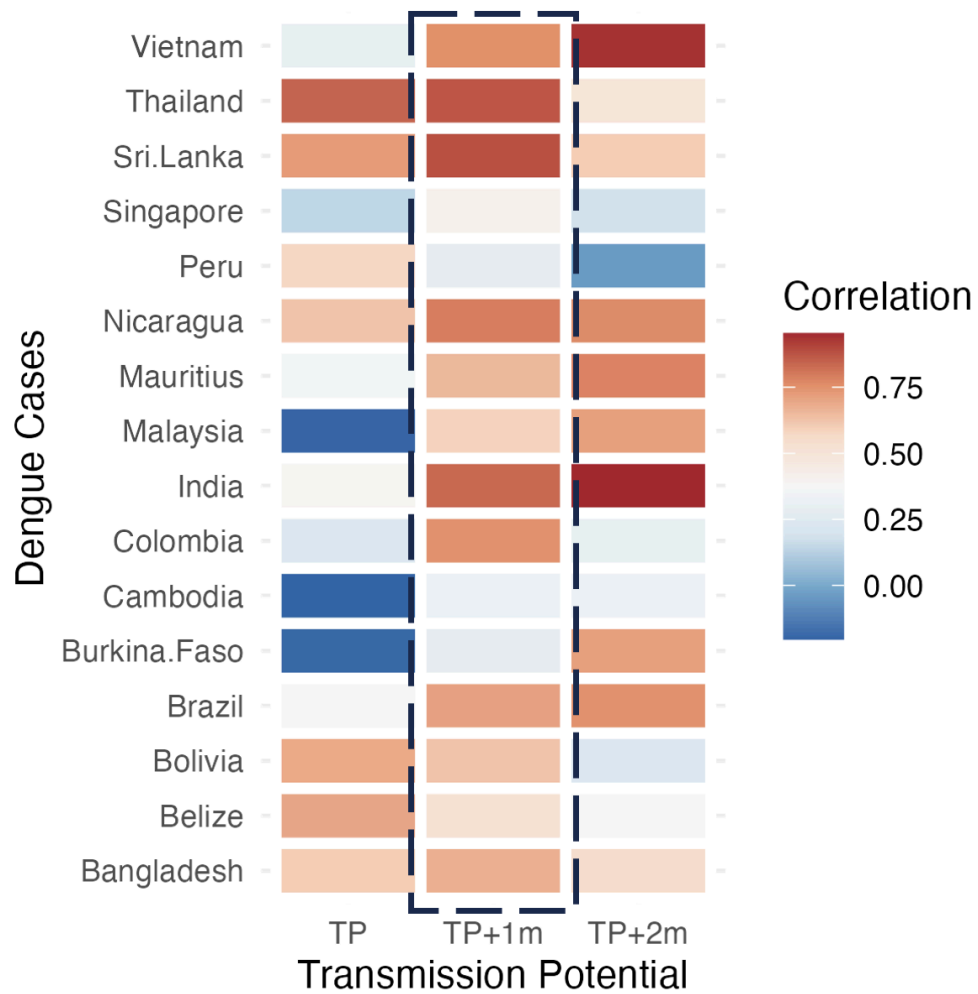


Figure S1: Temporal correlation between monthly dengue cases from different origin countries to Transmission potential without and with 1 and 2 months lag (p-values ranging from 0.001 to 0.65).

Figure S2

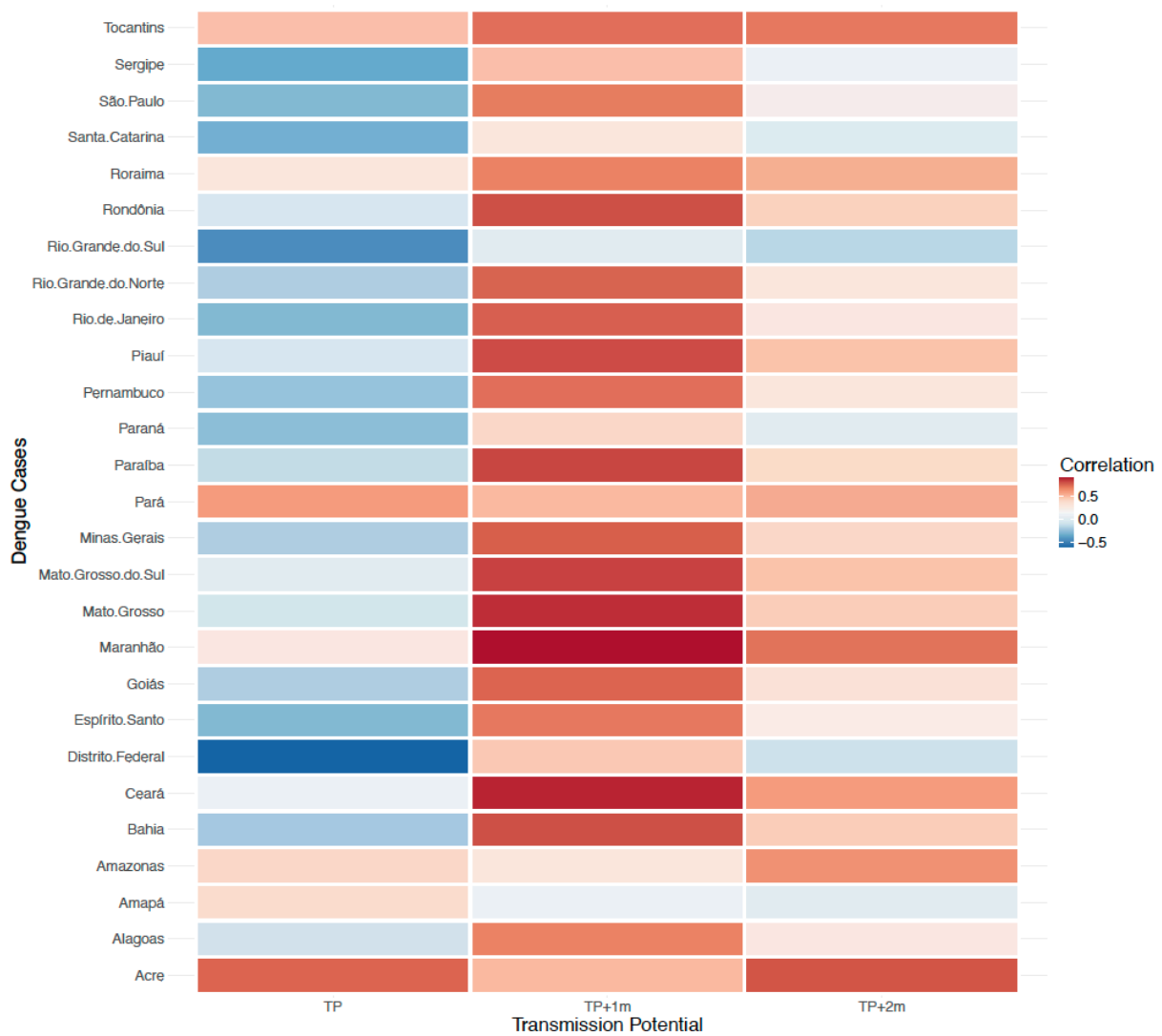


Figure S2: Temporal correlation between monthly dengue cases from different states in Brazil to Transmission suitability without and with 1 and 2 months lag. The p-values for the correlations ranged from 0.0000103 to 0.671.

Figure S3

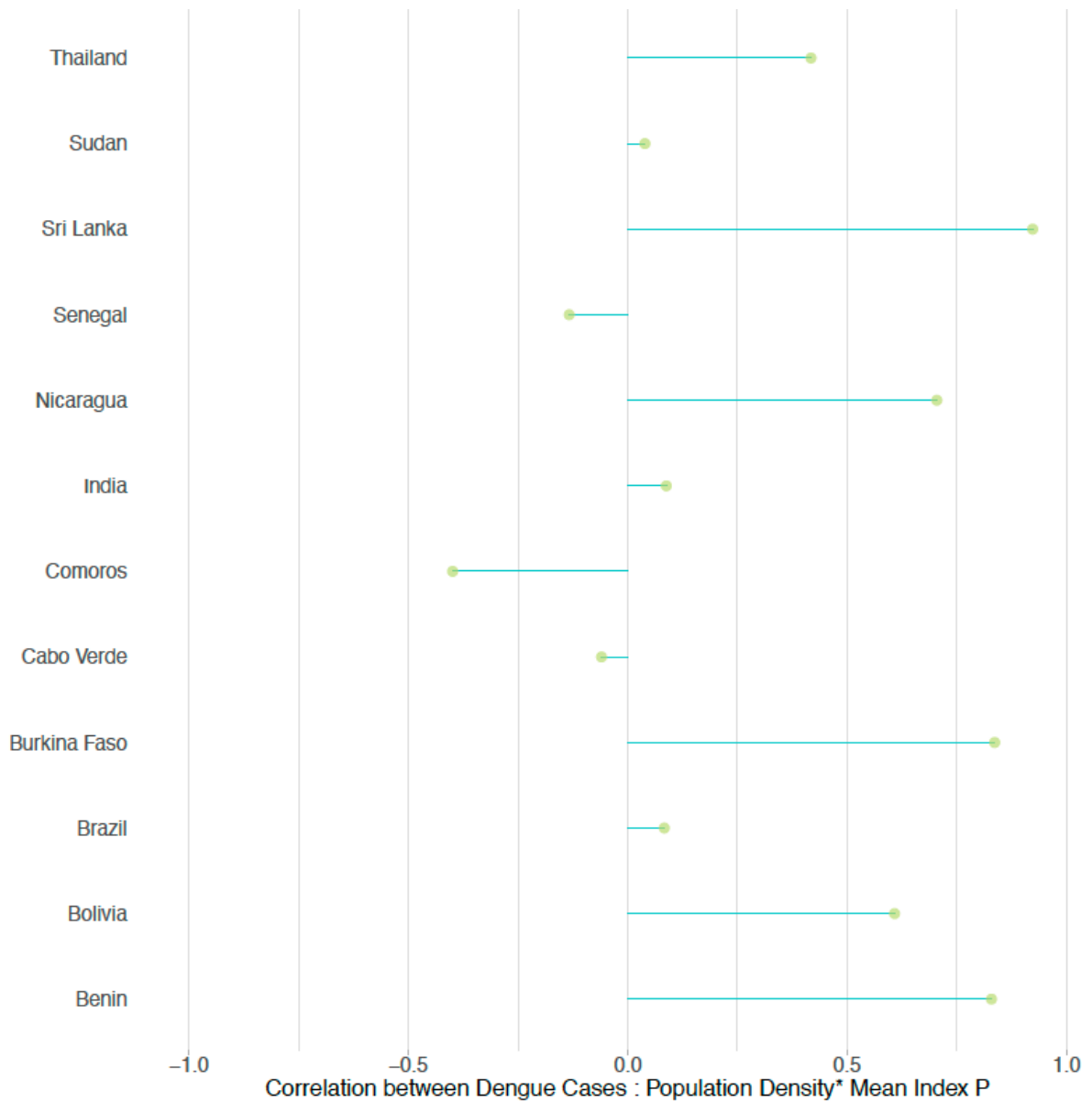


Figure S3: Correlation between Dengue Cases and Population Density multiplied by Mean Index P: This plot illustrates the relationship between the number of dengue cases and the interaction of population density with the mean transmission potential (index P).

Figure S4

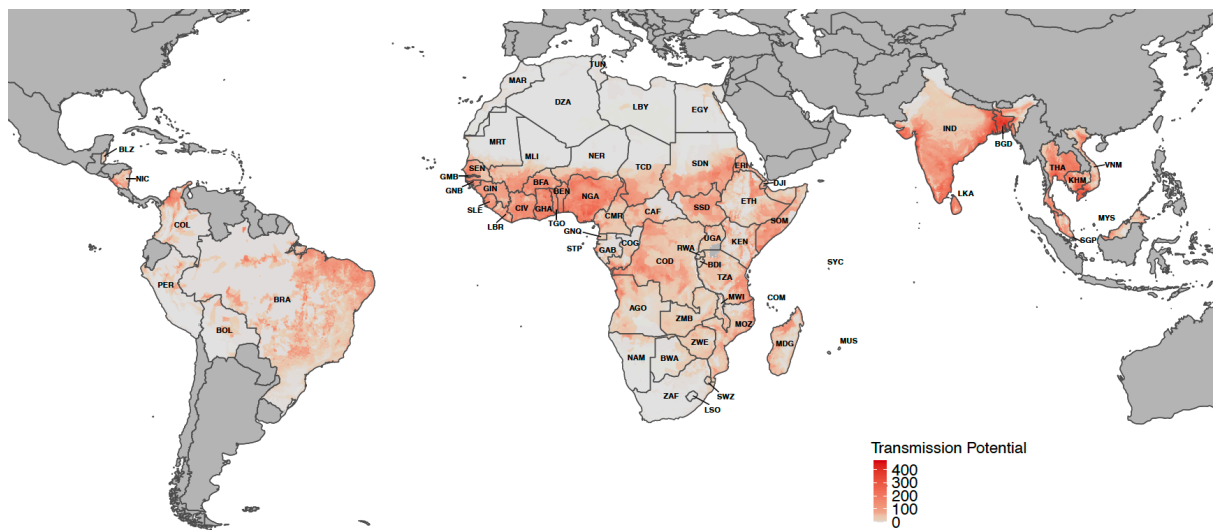


Figure S4: The figure shows the composite index of transmission suitability multiplied by Population Density (t_i), used in this study. Here we only show for the 14 countries of high incidence and the African continent, i.e., only for the origin and destination countries used in this study.

Figure S5

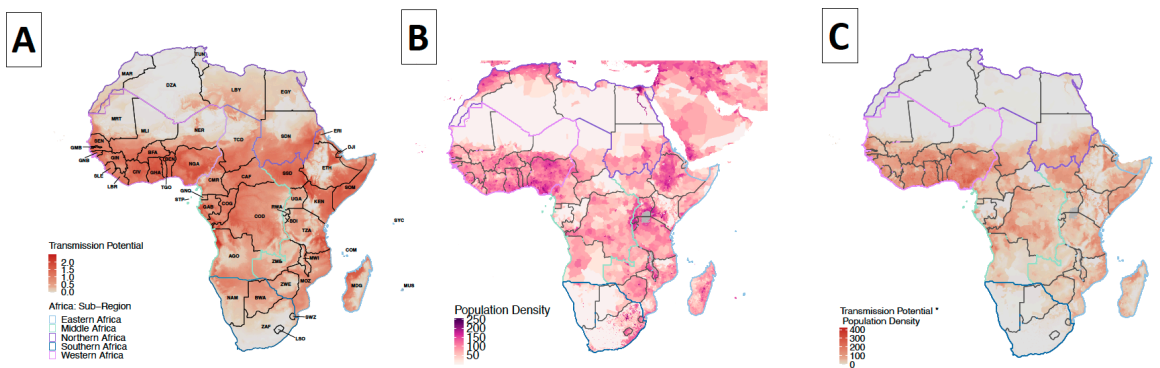


Figure S5: A) The map background uniformly represents the transmission suitability of dengue (mean index P) across Africa, with the continent divided into five distinct regions. B) The population density across Africa and C) Transmission suitability multiplied by population density for Africa. We also divide the African continent into 5 regions: Eastern (light blue) , Middle (Green), Northern (Purple), Southern (dark blue) and Western Africa (pink) which are outlined on the map.

Figure S6

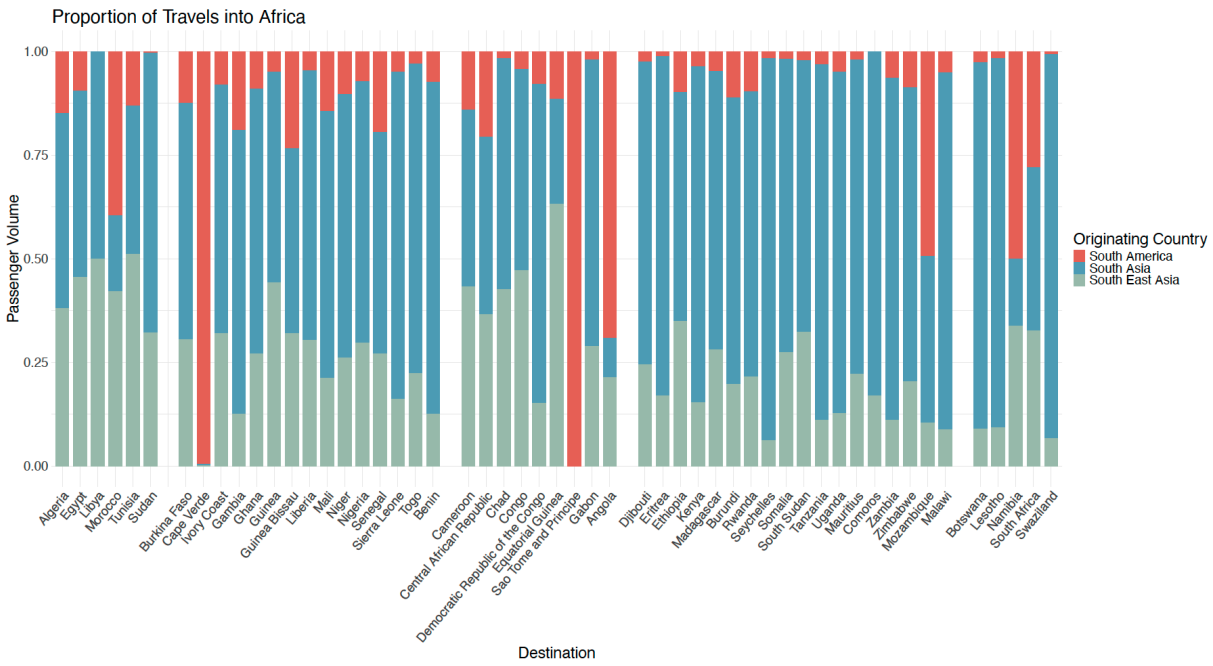
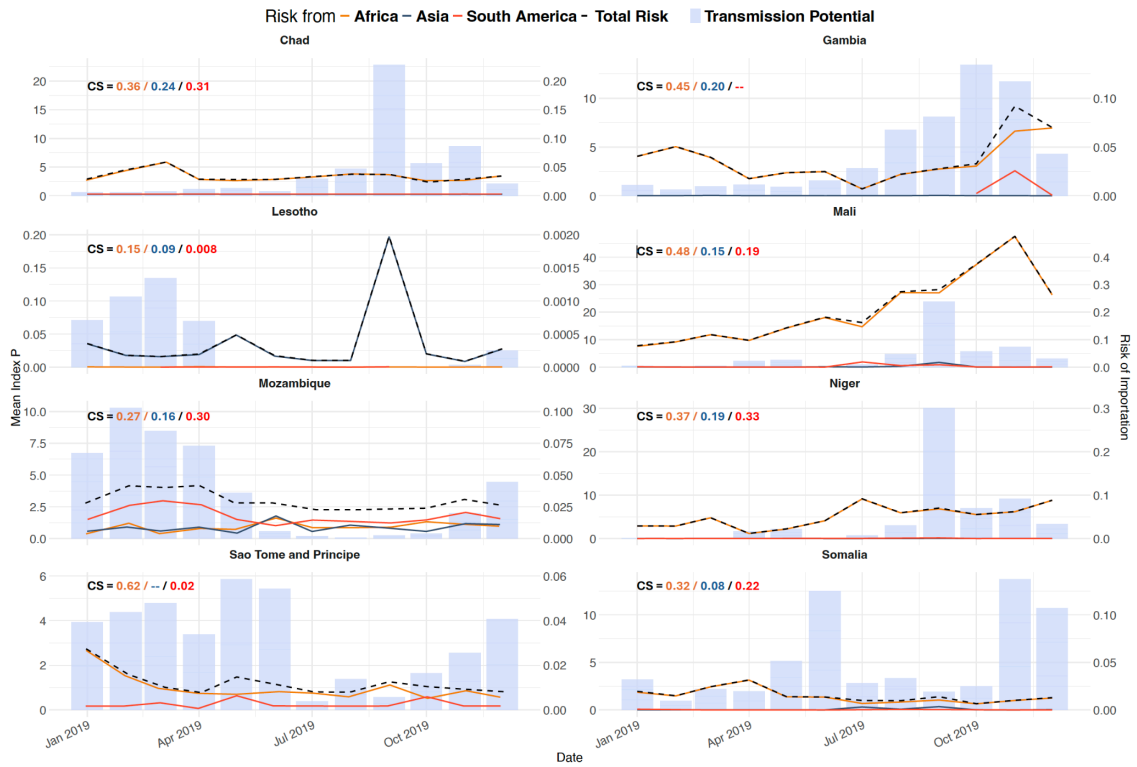


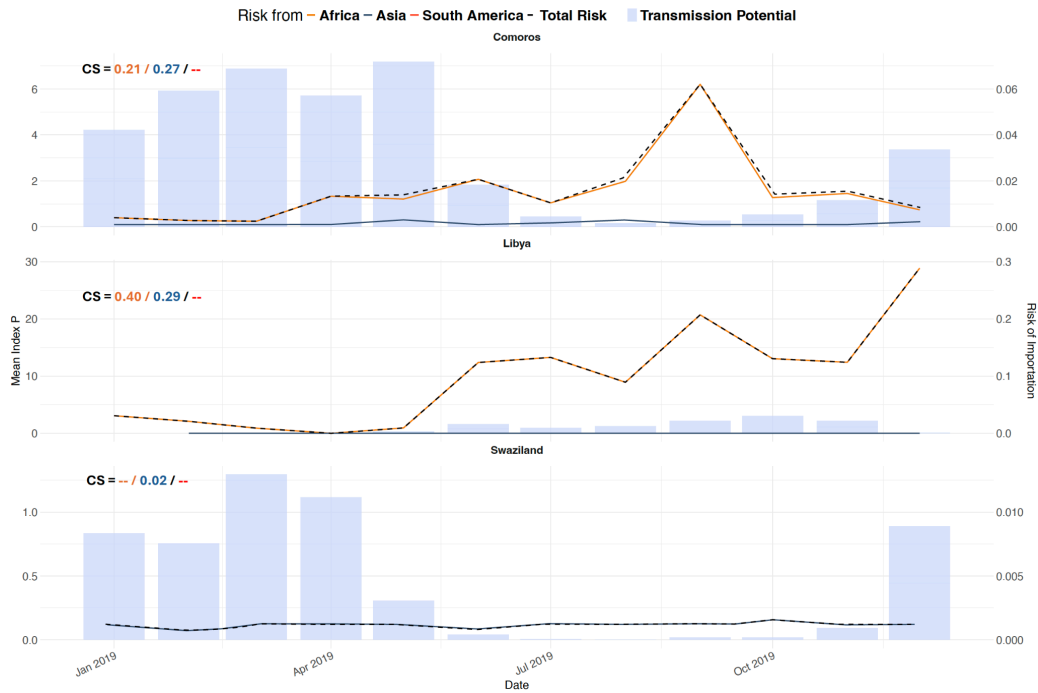
Figure S6: This figure depicts the proportion of travel volumes from Asia, Southeast Asia, and South America to African countries over the course of one year.

Figure S7

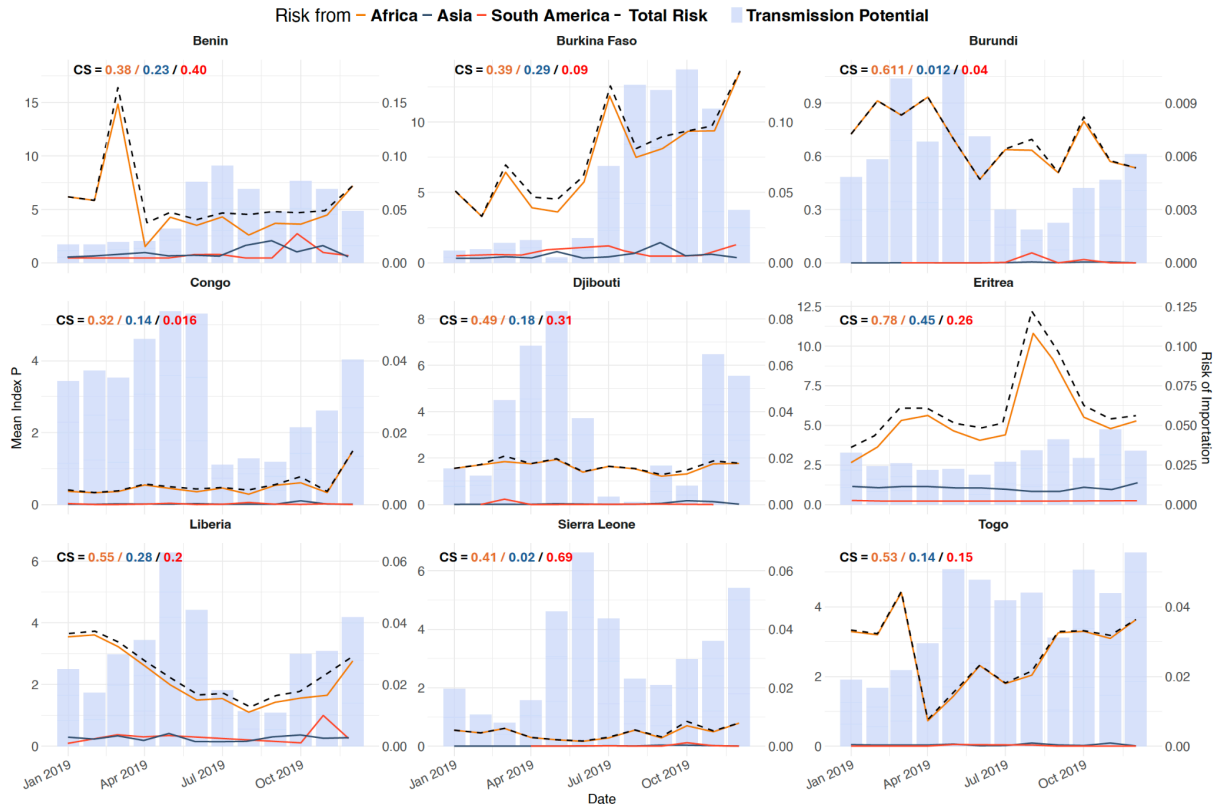
A



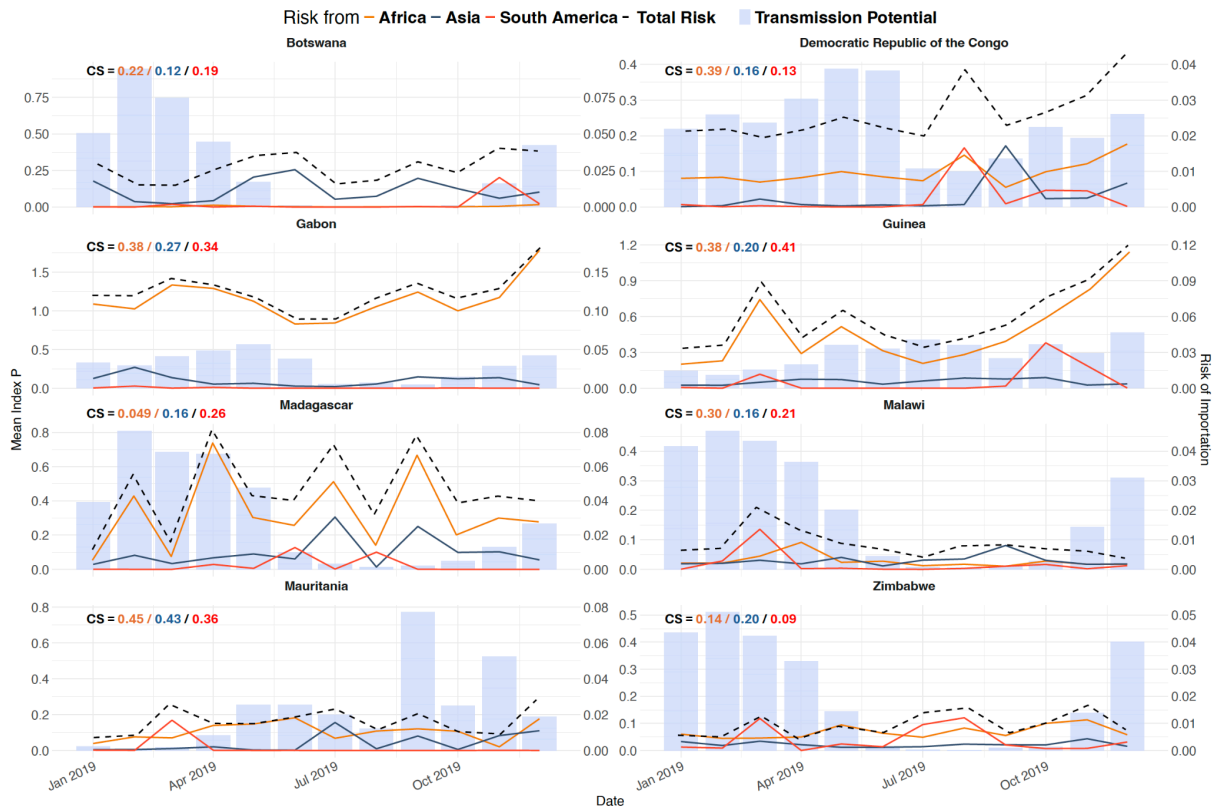
B



C



D



E

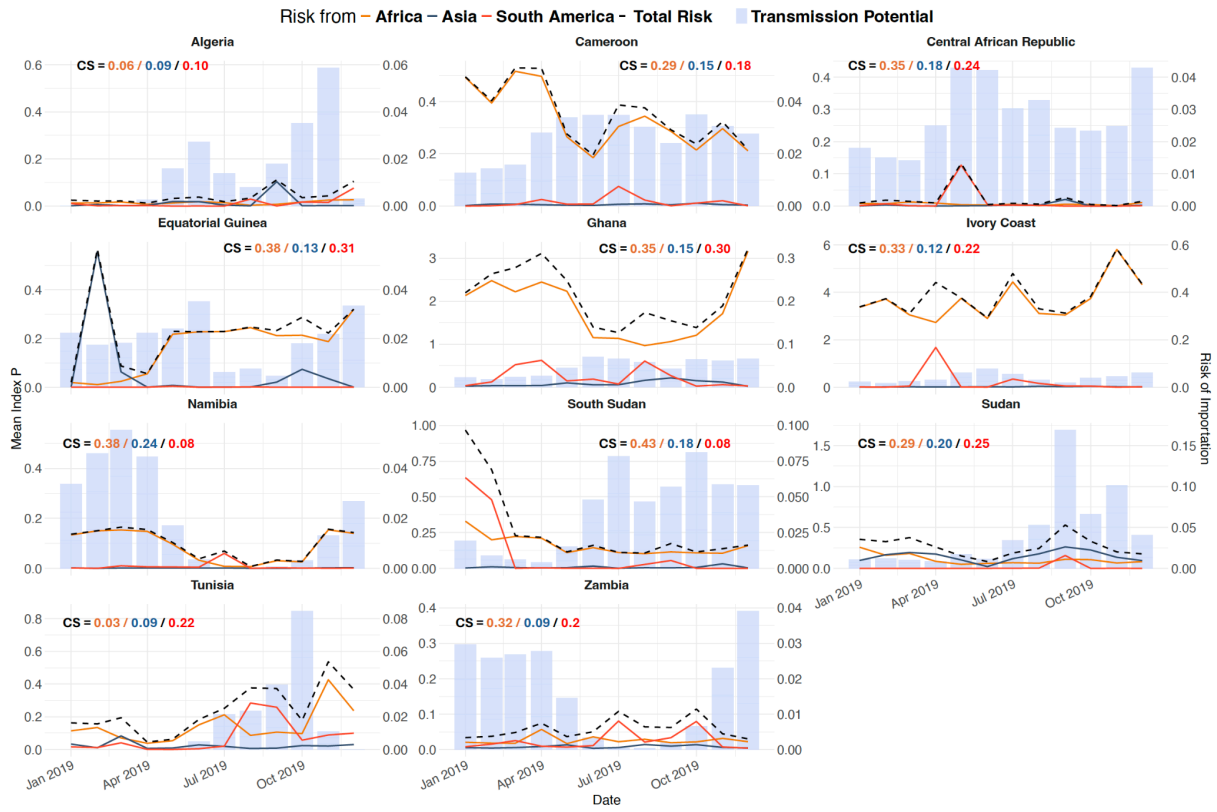


Figure S7: Time-varying risk of introduction into African countries in 2019 from Asia (blue line) and South America (red line) along with time-varying transmission suitability index nationally. The combined risk is represented by the black dotted line. Panel A) Chad, Gambia, Lesotho, Mali, Mozambique, Niger, Sao Tome and Principe, Somalia. B) Comoros, Libya, Swaziland. C) Benin, Burkina Faso, Burundi, Congo, Djibouti, Eritrea, Guinea Bissau, Liberia, Sierra Leone. D) Botswana, DRC, Gabon, Guinea, Madagascar, Malawi, Mauritania, Zimbabwe. E) Algeria, Cameroon, Central African Republic, EquatorialGuinea, Ghana, Ivory Coast, Namibia, South Sudan, Sudan and Tunisia.

Figure S8

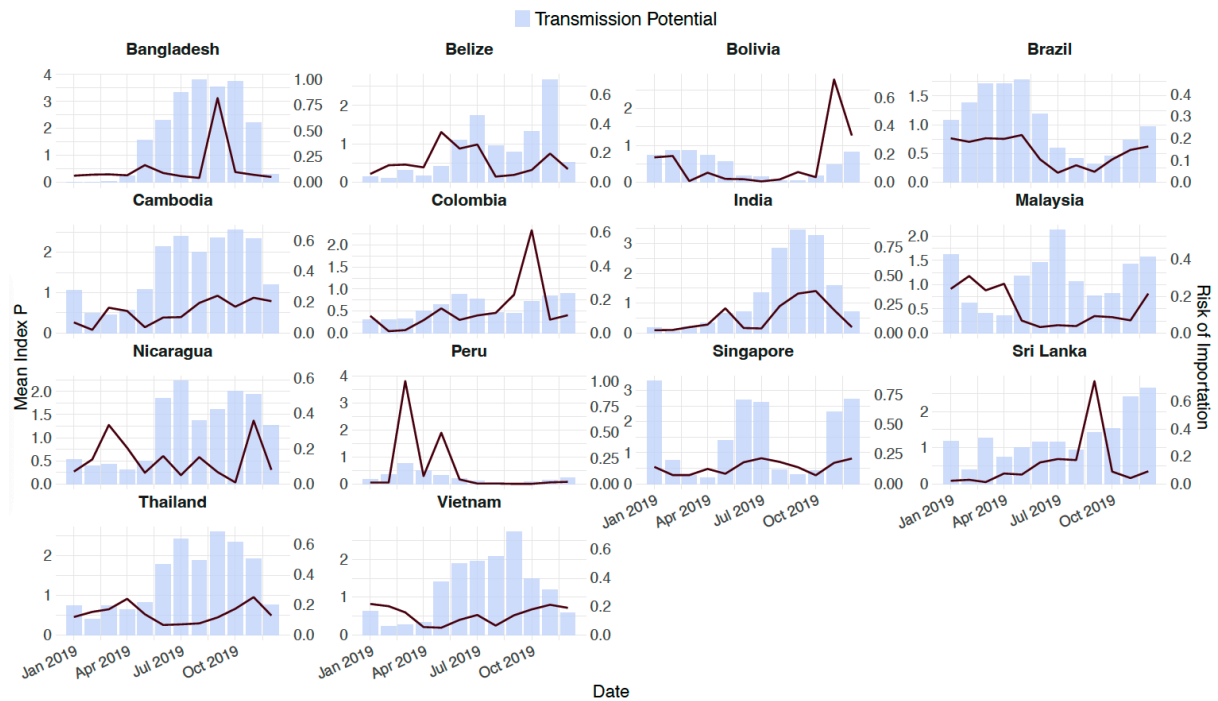


Figure S8: Risk of Exportation from countries of high incidence (n=14) considered in this study overlaid across their respective transmission suitability across the year.

Table S1

Table S1: Annual risk of dengue importation into various countries and the cosine similarity between the risk of importation and the local transmission suitability. The cosine similarity values highlight the level of synchrony between the timing of importation risk and transmission suitability.

Destination Country	Africa		Asia		South America	
	Mean Annual Risk	Cosine Similarity	Mean Annual Risk	Cosine Similarity	Mean Annual Risk	Cosine Similarity
Algeria	8.58793E-05	0.058328731	4.75473E-05	0.092625456	0.000128602	0.099100722
Angola	0.000871512	0.190891518	0.001993496	0.452737102	0.000366653	0.274175799
Benin	0.003930211	0.389007711	3.47791E-06	0.228437938	1.68932E-06	0.396225317
Botswana	3.51387E-05	0.215154412	2.13379E-05	0.117967166	2.78784E-05	0.194705357
Burkina Faso	0.006646177	0.385177331	4.09467E-06	0.286753612	1.88572E-06	0.087784552
Burundi	0.000837797	0.611547737	2.34401E-06	0.011767048	1.54542E-07	0.642582104
Cameroon	0.008447926	0.295619467	2.95063E-05	0.153247624	2.19541E-05	0.181770533
Central African Republic	0.000218083	0.353990993	3.91664E-05	0.177757447	9.86087E-06	0.23872773
Chad	0.000274719	0.369497313	1.53444E-06	0.238037186	2.49248E-08	0.316180995
Comoros	0.001294683	0.209741644	4.3464E-07	0.27279957	-	-
Congo	0.000586055	0.324397585	4.35204E-06	0.14248563	1.69903E-05	0.016785495
Democratic Republic of the Congo	0.001303986	0.393800624	8.2923E-06	0.162595074	7.14804E-06	0.132166652
Djibouti	0.001532898	0.494685428	7.89399E-06	0.187134913	3.04414E-08	0.316606702
Egypt	0.000936993	0.099743346	0.001444715	0.310977716	0.003022812	0.146581553
Equatorial Guinea	0.001953211	0.381572116	0.00014837	0.130329526	4.96267E-06	0.316211807
Eritrea	0.008478351	0.777500496	9.86055E-07	0.4451418	3.4245E-08	0.26141747
Ethiopia	0.005274767	0.150157274	0.000581153	0.00676671	0.000591047	0.194017404
Gabon	0.007230396	0.375102928	8.65829E-06	0.27379809	4.1067E-06	0.336726972
Gambia	0.003186559	0.458145605	8.03388E-06	0.201716686	0.005653556	-
Ghana	0.00955636	0.351897748	0.000170407	0.150931437	5.47708E-05	0.295709752
Guinea	0.003630093	0.383805206	1.21755E-05	0.19985256	1.44646E-07	0.407950221
Guinea-Bissau	0.001072629	0.457622528	-	-	-	-
Ivory Coast	0.020974173	0.325717678	6.57972E-05	0.12354295	0.00107263	0.215319706

Kenya	0.005731245	0.036114895	0.000988367	0.069622909	0.001494575	0.154600402
Lesotho	3.56208E-07	0.15289133	1.02055E-05	0.094732527	3.14016E-07	0.0085123
Liberia	0.002223941	0.552593253	3.04256E-06	0.280318149	9.93E-08	0.24756365
Libya	0.015078074	0.398317605	2.5673E-07	0.299733067	-	-
Madagascar	0.002337154	0.049387505	2.94347E-05	0.168038552	4.71908E-07	0.260730525
Malawi	0.000321708	0.300413857	5.119E-06	0.158354803	1.16176E-06	0.211343472
Mali	0.015824618	0.480114221	3.1599E-05	0.151662472	2.32159E-06	0.191559015
Mauritania	0.001212314	0.455332323	1.61734E-05	0.438664787	6.37599E-07	0.364489628
Mauritius	9.70938E-05	0.130737683	0.001849354	0.437307709	5.49418E-05	0.183208942
Morocco	0.003680877	0.032089383	0.000168915	0.062747594	0.001201956	0.08396825
Mozambique	8.16851E-05	0.265098023	1.54534E-05	0.158473509	2.75049E-05	0.302516564
Namibia	0.001218896	0.379170333	4.50418E-06	0.243176458	2.5075E-05	0.084827259
Niger	0.006007527	0.373429595	8.00839E-06	0.196077917	2.6152E-08	0.332386386
Nigeria	0.002684687	0.175464736	0.000385632	0.129285607	0.003900263	0.166146102
Rwanda	0.001544029	0.534617381	7.87532E-05	0.082448877	7.02317E-06	0.178981757
Sao Tome and Principe	0.000170228	0.616702222	-	-	1.15721E-05	0.02254764
Senegal	0.022102646	0.354560297	2.50289E-05	0.078299913	0.00144425	0.090820404
Sierra Leone	0.000356306	0.414192321	4.02423E-06	0.020192397	1.28825E-08	0.690094408
Somalia	0.001317879	0.315245767	1.73787E-05	0.082469611	3.80101E-05	0.21881435
South Africa	0.005954194	0.123350931	0.001192238	0.102518352	0.003235918	0.100622363
South Sudan	0.001536735	0.43148707	1.00949E-05	0.183587161	0.001606043	0.081165463
Sudan	0.001331234	0.292155652	0.000214187	0.196758845	0.000140615	0.248052223
Swaziland	0	-	5.24909E-07	0.024587963	1.42E-08	-
Tanzania	0.004724326	0.252885566	6.78168E-05	0.121105075	3.23203E-05	0.161858017
Togo	0.002531176	0.526981151	4.93146E-06	0.141542277	5.21319E-06	0.274707511
Tunisia	0.00353866	0.030401063	9.32356E-05	0.085759411	0.00045281	0.223887708
Uganda	0.006595113	0.294246386	0.00036009	0.174638736	0.00022749	0.139245862
Zambia	0.000214647	0.324477152	3.77893E-05	0.088560608	1.53366E-05	0.200134605
Zimbabwe	0.00058781	0.146458059	1.07493E-05	0.201679279	1.38175E-05	0.094483847

Table S2

Table S2: List of data sources for dengue cases and surveillance by country. The table provides links to official or publicly available repositories where dengue-related data, including case counts and epidemiological reports, can be accessed for each respective country.

Country	Link
Sri Lanka	https://www.epid.gov.lk/web/index.php?Itemid=448&lang=en&option=com_casesanddeaths#
Singapore	https://www.nea.gov.sg/dengue-zika/dengue/quarterly-dengue-surveillance-data
Americas	https://www3.paho.org/data/index.php/en/mnu-topics/indicadores-dengue-en/dengue-nacional-en/252-dengue-pais-ano-en.html
Philippines	https://www.kaggle.com/datasets/vincentgupo/dengue-cases-in-the-philippines?resource=download
Brazil	https://data.mendeley.com/datasets/2d3kr8zynf/4/files/98d18d18-9e49-4256-8607-369585adcf56
Philippines	https://data.humdata.org/dataset/philippine-dengue-cases-and-deaths?
Hong Kong	https://data.gov.hk/en-data/dataset/hk-dh-chpsebcdde-dengue-fever-cases/resource/633ef897-7503-4aef-b6cd-6a31e62aca46
India	https://idsp.mohfw.gov.in/index4.php?lang=1&level=0&linkid=406&lid=3689
Bangladesh	https://old.dghs.gov.bd/index.php/bd/home/5200-daily-dengue-status-report
Cabo Verde	https://minsaude.gov.cv/documentos/#all_0-114-relatorio-estatistico
Benin	https://sante.gouv.bj/MS_console/recherche_avancee
Ivory Coast	https://www.snisdiiis.com/rass/
Liberia	http://moh.gov.lr/documents/reports/epi-reports/
Mali	http://www.sante.gov.ml/index.php/2014-11-10-17-29-36/documents-sante
Senegal	https://www.sante.gouv.sn/les-directions/la-direction-de-la-planification-de-la-recherche-et-des-statistiques-0
Cameroon	http://onsp.minsante.cm/fr/publications
Congo	https://sante.gouv.cg/annuaire-statistique-2017-2018/
Sao Tome and Principe	https://minsaude.st/boletim-epidemiologico/
Burkina Faso	http://cns.bf/spip.php?id_rubrique=17&page=publdetails
Mauritius	https://statsmauriti.us.govmu.org/SitePages/Index.aspx
Mozambique	https://www.ine.gov.mz/web/guest/estat%C3%ADsticas/-/document_library/pfpz/view/45332?_com_liferay_document_library_web_portlet_DLPortlet_INSTANCE_pfpz_redirect=https%3A%2F%2Fwww.ine.gov.mz%2Fweb%2Fguest%2Festat%25C3%25ADsticas
Seychelles	https://www.health.gov.sc/index.php/reports/