

SUPPLEMENTARY INFORMATION

Field and classroom initiatives for portable sequence-based monitoring of dengue virus in Brazil

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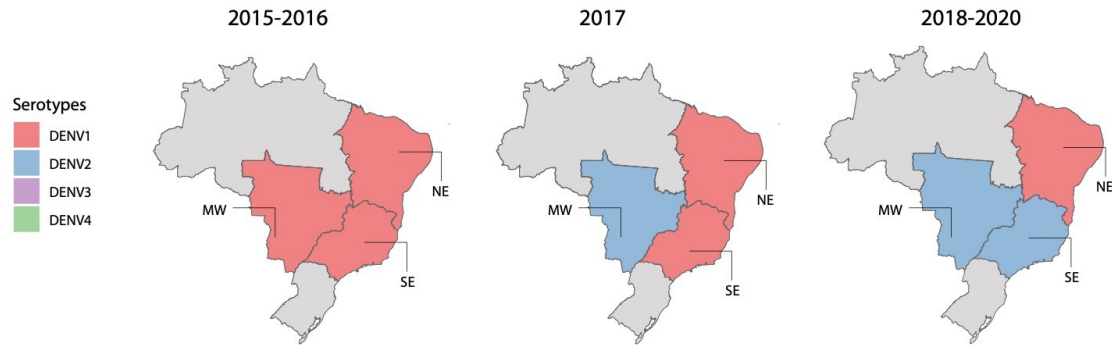
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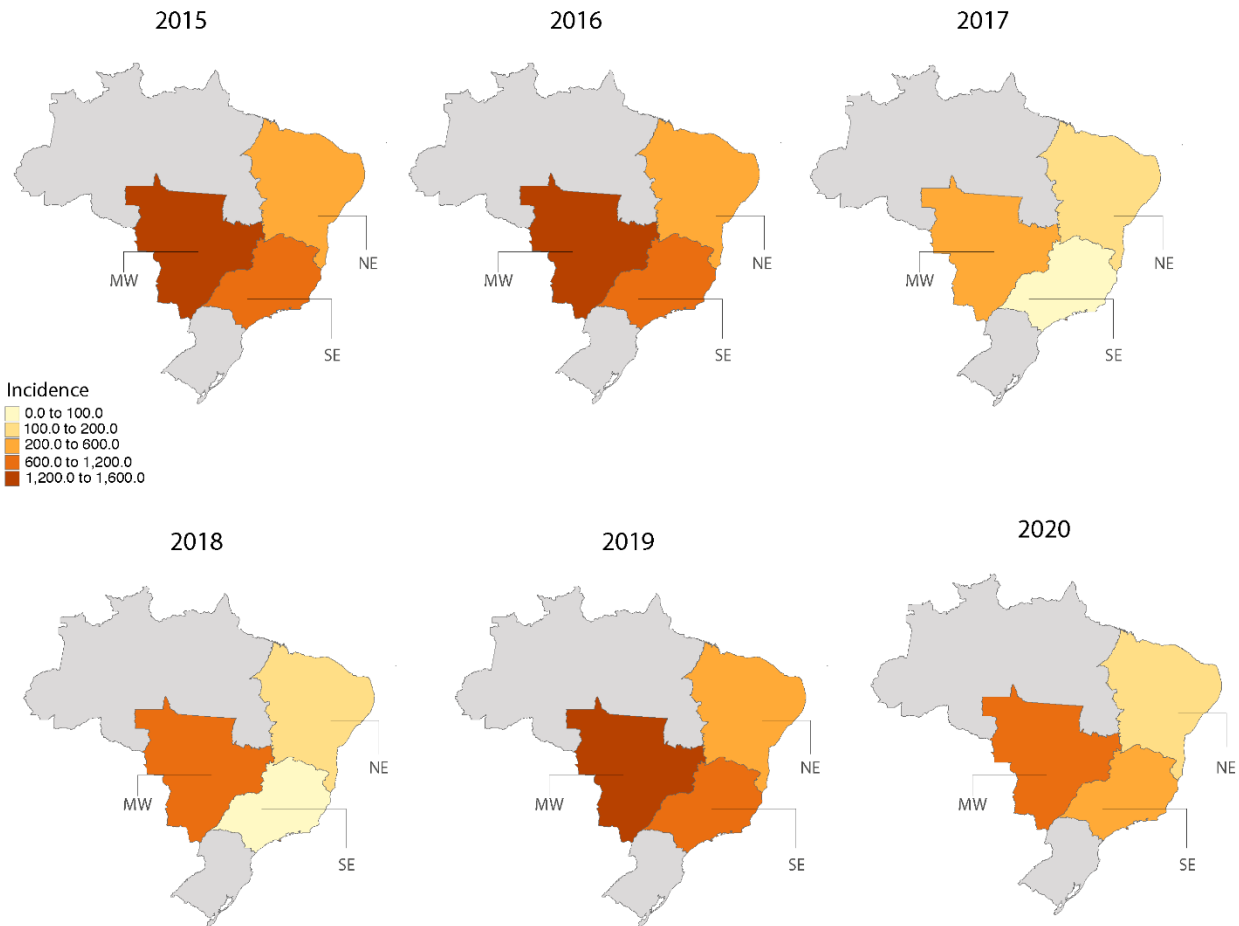
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Supplementary Figure 1



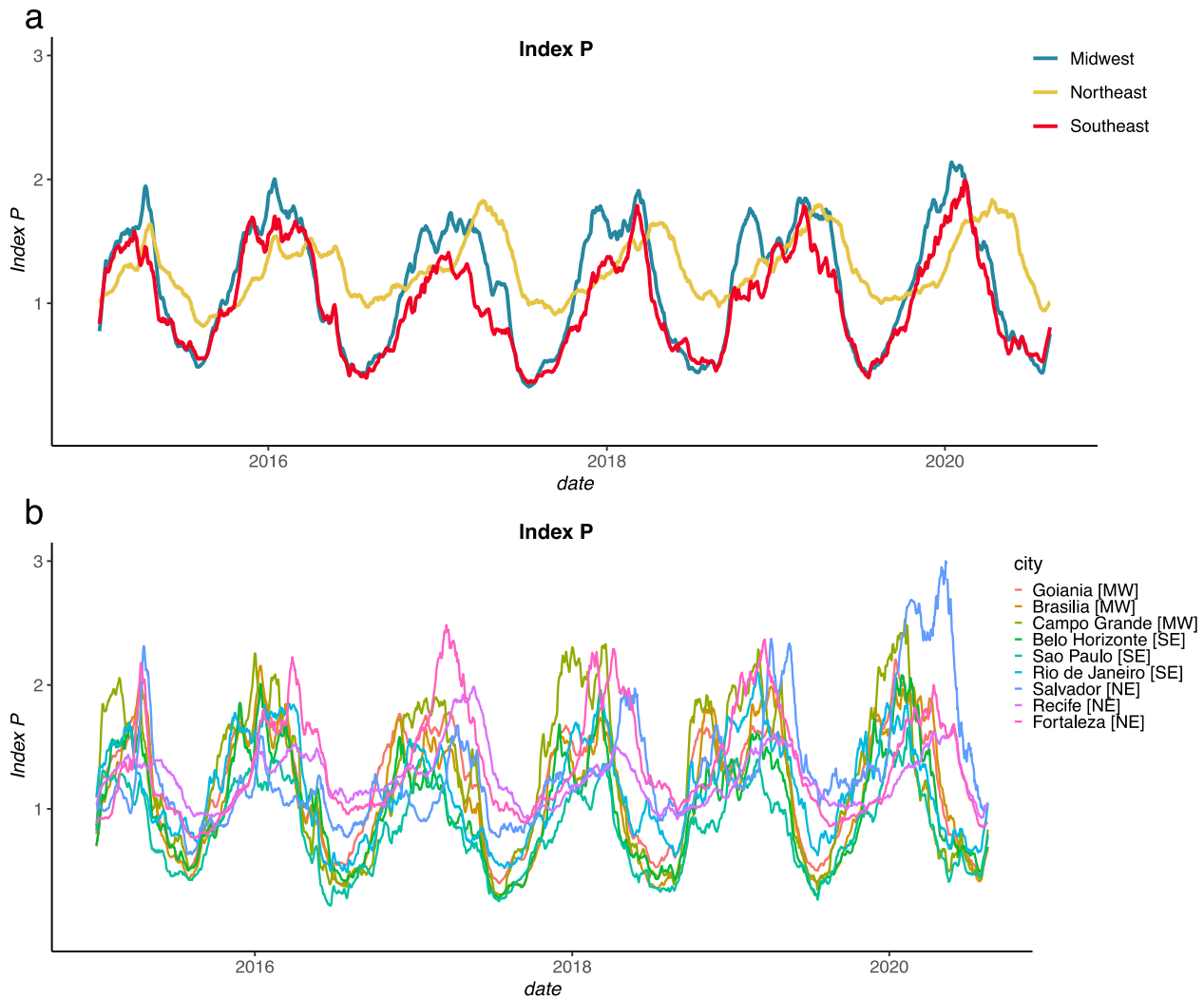
Supplementary Figure 1. Patterns of serotype dominance 2015-2020. Map of Brazil showing the progression of serotypes in the three geographic regions sampled in this study - Midwest (MW), Northeast (NE), and Southeast (SE) - between 2015 and 2020 (until EW06). Brazilian macro regions are coloured according to the dominant serotype. Grey represents northern and southern Brazilian macro regions. The initial map of Brazilian regions was obtained from the R package “get_brmap” (available at: https://rdr.io/cran/brazilmaps/man/get_brmap.html). Source data are provided as a Source Data file.

Supplementary Figure 2



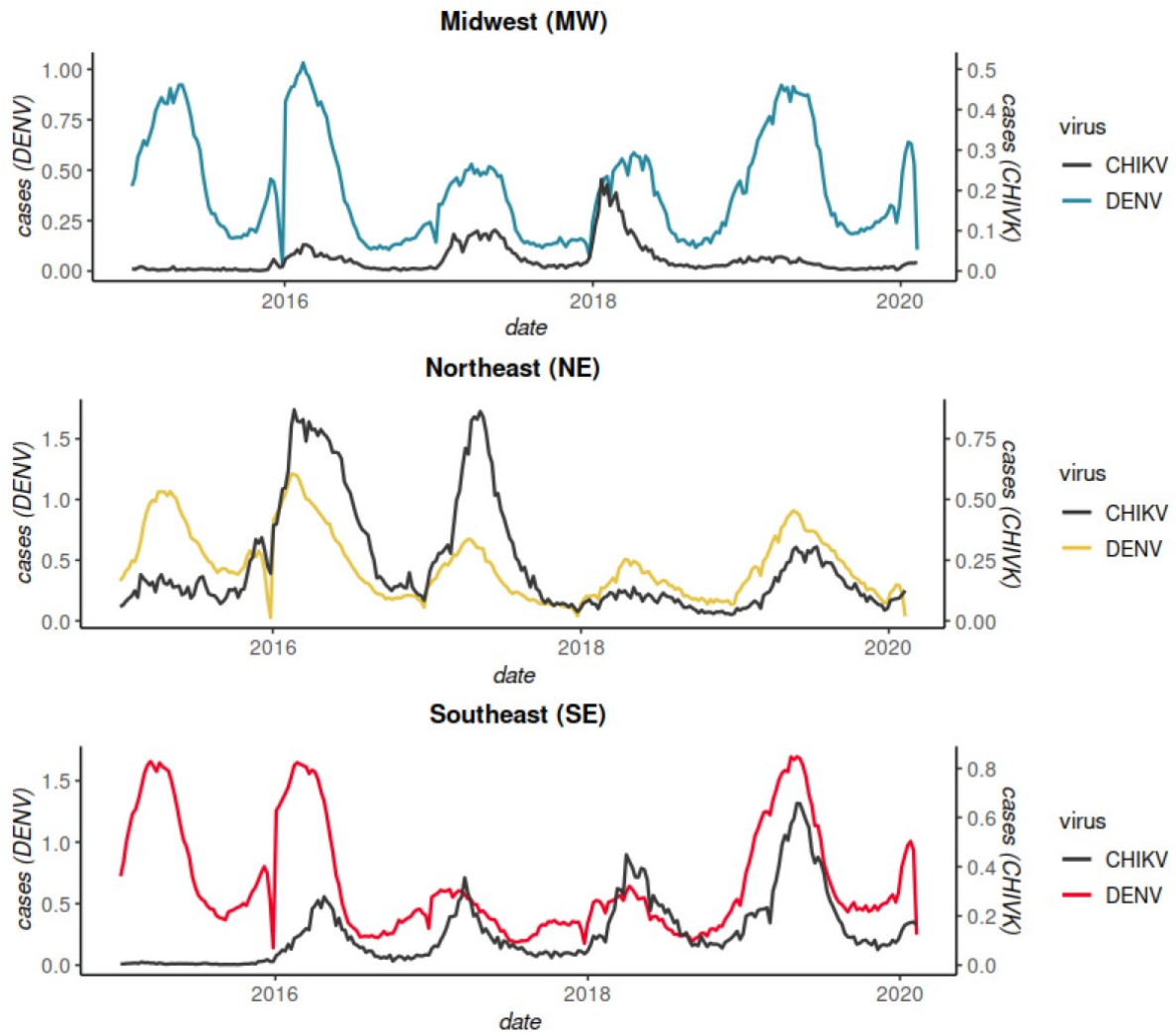
Supplementary Figure 2. Maps of yearly incidence of dengue in Brazil, 2015-2020. Maps of Brazil divided by regions (SE=Southeast, NE=Northeast, MW=Midwest) showing the yearly incidence of dengue between 2015 and 2020 (until EW06). Incidence = cases per 100,000 inhabitants per year. Grey represents northern and southern Brazilian macro regions. The initial map of Brazilian regions was obtained from the R package “get_brmmap” (available at: https://rdrr.io/cran/brazilmaps/man/get_brmmap.html).

Supplementary Figure 3



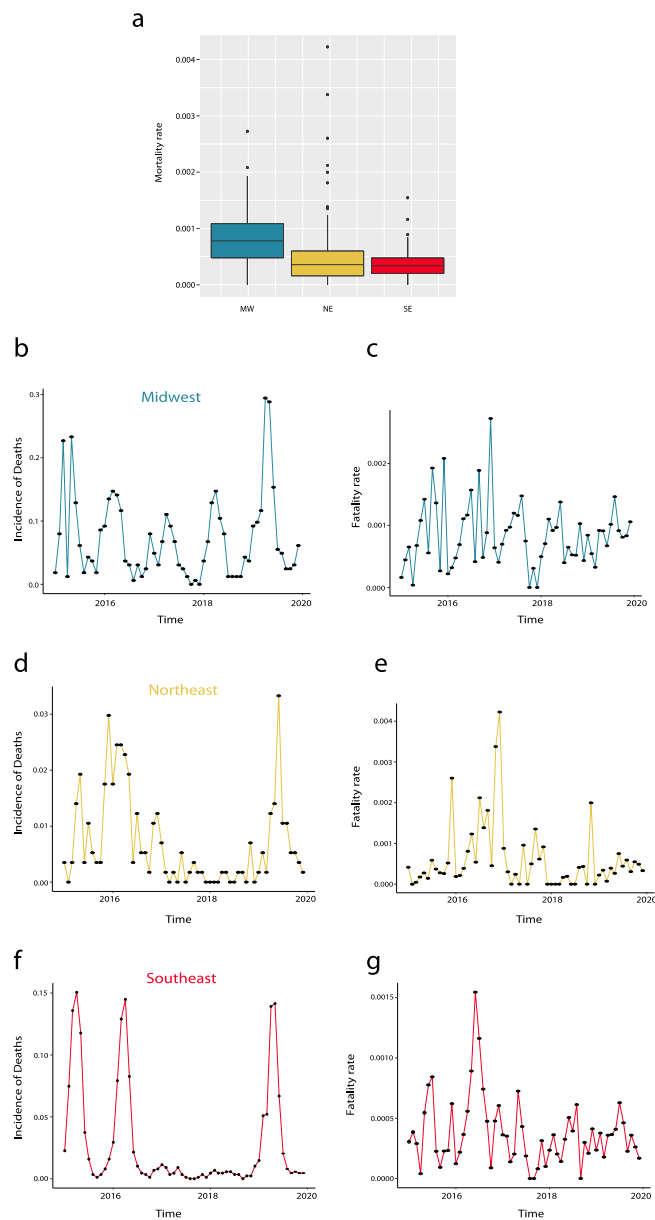
Supplementary Figure 3. Mosquito-borne viral suitability measure (index P). **a.** Daily mosquito-viral suitability measure (index P) for each of the macro regions from which new genomes were generated. The index P is obtained by averaging the climatic time series of the three largest urban centers in each region and then independently estimating index P. These series are presented in Figure 1 of the main text. **b.** Daily mosquito-viral suitability measure (index P) for the three cities per macro region used for panel A and for the main text. Cities are named in the color legend and tagged with their macro region. **(a-b)** The entomological and epidemiological priors used to estimate P are the (dengue) default for the MVSE R-package⁴⁹ (see Supplementary File 1). Source data are provided as a Source Data file.

Supplementary Figure 4



Supplementary Figure 4. Weekly notified dengue cases normalized per 100K individuals per region in 2015-2020 (until EW06). DENV epidemic curves are coloured according to geographical macro region: SE=Southeast, NE=Northeast, MW=Midwest. CHIKV epidemic curves are coloured in black for each of the macro regions. Incidence (cases per 100K population) is presented in log10 for visual purposes. Source data are provided as a Source Data file.

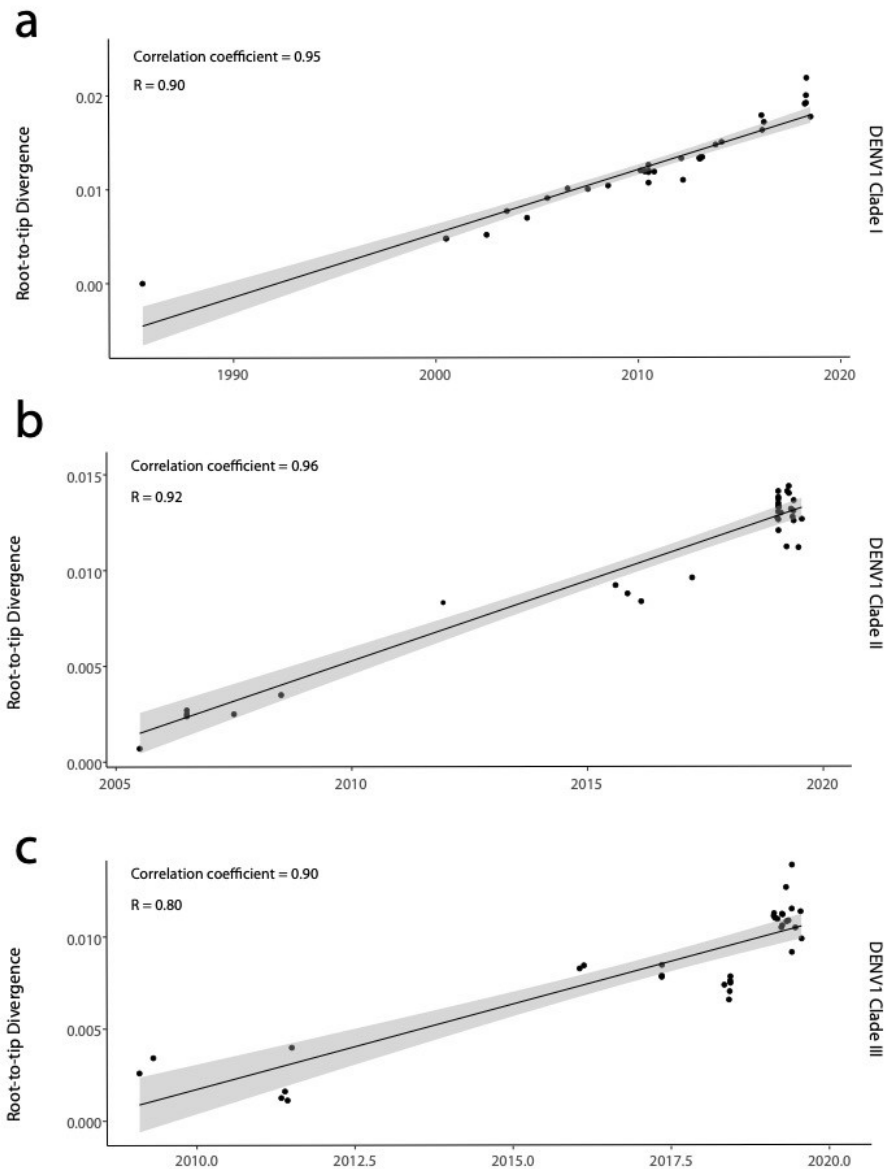
Supplementary Figure 5



Supplementary Figure 5. DENV mortality in Brazil, 2015-2019. **a.** Boxplot of the case fatality rate (deaths/cases) of dengue in the three Brazilian regions sampled in this study, 2015-2019. Boxplots are coloured according to Brazilian geographical region, Midwest (MW) $n=8$, Northeast (NE) $n=11$, and Southeast (SE) $n=20$. Boxplots show interquartile ranges, white lines are medians and box whiskers show the full range of posterior distribution. **b-c.** Time series of the incidence of deaths (number of fatal dengue /number of cases) reported weekly (c) and case fatality rate (number of fatal dengue /number of cases per 100K population) (d) in MW. **d-e.** Same as b and c but for NE. **f-g.** Same as b and c but for SE. Dates

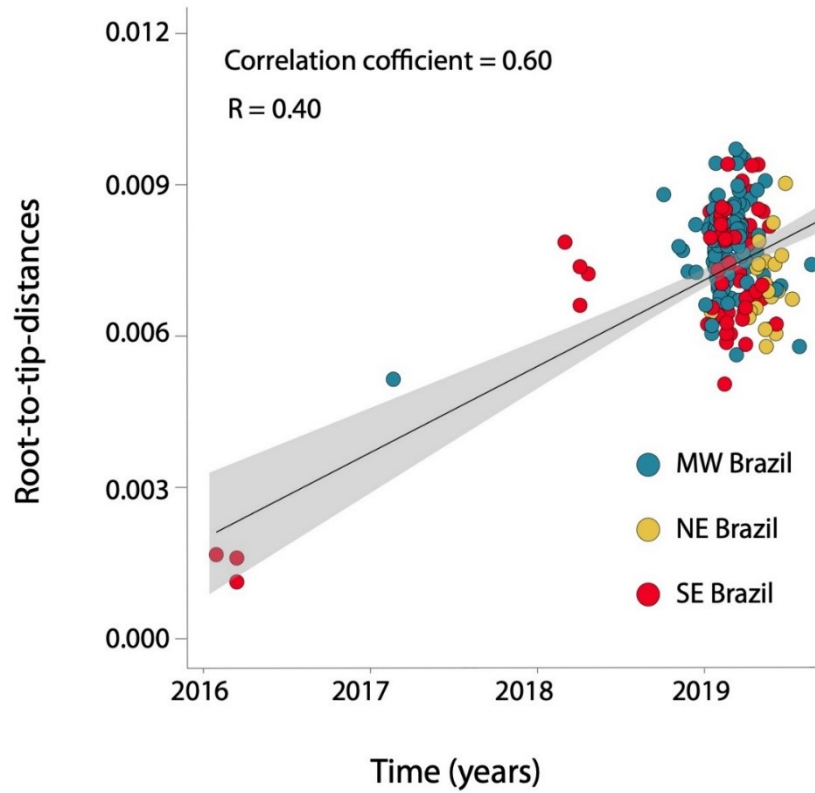
with no deaths reported were assumed to be reflective of no deaths, although it is possible that some instances of no deaths reflect a lack of reporting. Source data are provided as a Source Data file.

Supplementary Figure 6



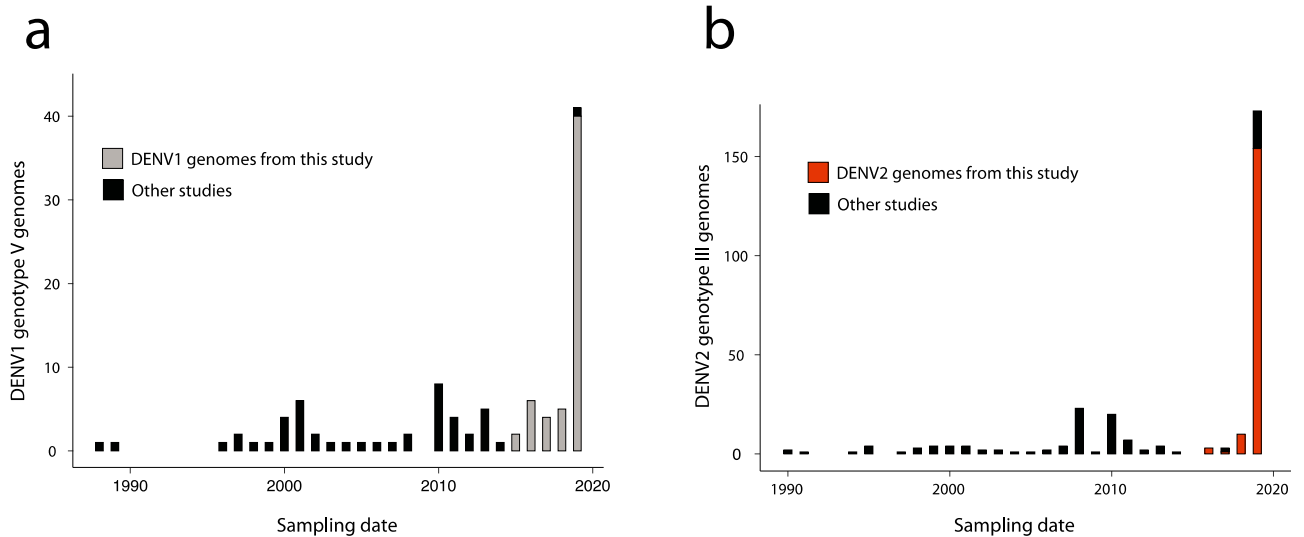
Supplementary Figure 6. Analysis of temporal structure in DENV1 genotype V clades I-III. a. Root-to-tip genetic divergence of Clade I against time of sampling ($n=33$) **b.** Root-to-tip genetic divergence for Clade II against time of sampling ($n=34$). **c.** Root-to-tip genetic divergence for Clade III against time of sampling ($n=34$). Black lines represent the medium values of the linear regression despite the grey ones represent the interval among the minimum and maximum values.

Supplementary Figure 7



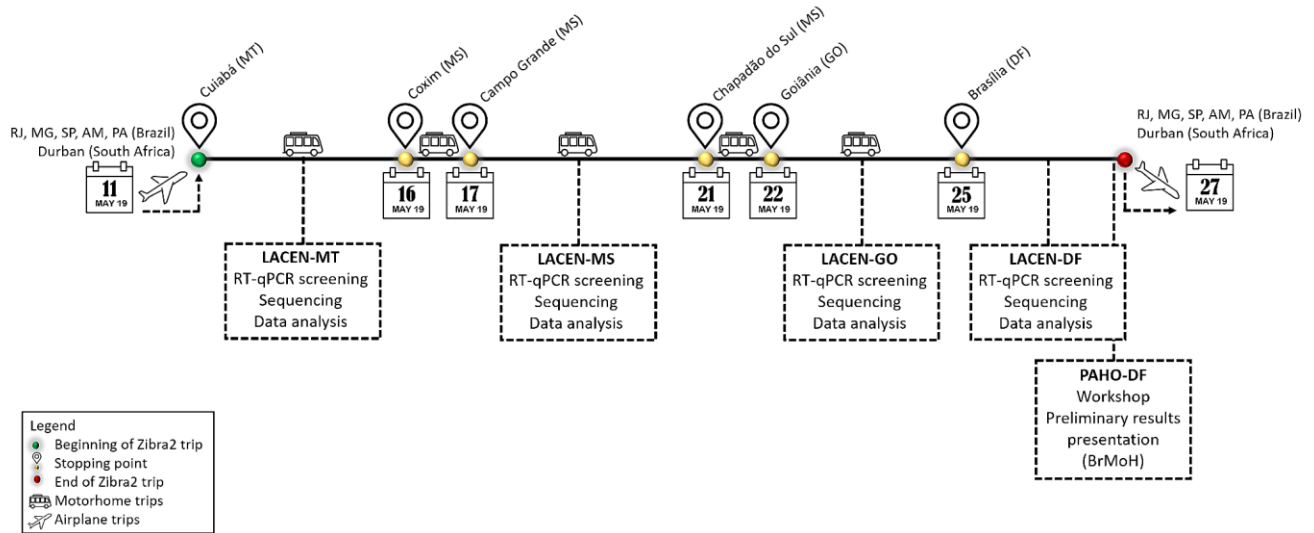
Supplementary Figure 7. Genetic divergence regressed against date of sample collection for the BR-4 clade of DENV2 ($n=181$). MW=Brazilian Midwest, NE Brazil=Brazilian Northeast, SE Brazil=Brazilian Southeast. Black lines represent the medium values of the linear regression despite the grey ones represent the interval among the minimum and maximum values.

Supplementary Figure 8



Supplementary Figure 8. Number of complete DENV1 and DENV2 genomes sequences from Brazil, 1988-2020. **a.** Comparative bar chart of the number of DENV1 genotype V complete genomes sequences generated in Brazil between 1988 and 2020 and available in public databases until May 2020. Gray bars represent the genomes from this study, while green bars indicate the genomes from previous studies. **b.** Comparative bar chart of the number of DENV2 genotype III complete genomes sequences generated in Brazil between 1990 and 2020 and available in public databases until May 2020. Red bars represent the genomes from this study, while green bars indicate the genomes from previous studies. Source data are provided as a Source Data file.

Supplementary Figure 9



Supplementary Figure 9. Timeline of the ZIBRA2 itinerant project across the Brazilian Midwest region. Researchers from Brazil (RJ=Rio de Janeiro, MG=Minas Gerais, SP=São Paulo, AM=Amazonas, and PA=Pará) and from Durban (South Africa) visited the public health laboratories (LACEN) in the Brazilian Midwest region (showed above the line) on board a mobile laboratory (motorhome) to carry out the field genomic surveillance activities (showed below the line). The event ended in a workshop held at PAHO/WHO to present the preliminary results to the health authorities. MT=Mato Grosso, MS=Mato Grosso do Sul, GO=Goiás, DF=Brazilian Federal District. The Bus and Airplane icons were created by Mariagloria Posani and Kiddo, respectively, and are currently available at the Noun Project (<https://thenounproject.com/>).

Supplementary Table 1. Number of molecularly confirmed DENV cases in the three Brazilian macro regions, 2015-2020.

REGION	SEROTYPE	YEAR					
		2015	2016	2017	2018	2019	2020*
MW	DENV1	2467	970	55	16	27	40
	DENV2	28	19	231	520	2361	2184
	DENV3	2	2	1	0	0	20
	DENV4	219	64	23	1	2	0
NE	DENV1	387	66	15	245	1398	68
	DENV2	15	7	3	38	456	36
	DENV3	37	17	0	0	0	0
	DENV4	44	0	0	1	0	0
SE	DENV1	2145	1703	48	132	274	173
	DENV2	15	81	19	333	3068	1086
	DENV3	0	7	10	1	5	2
	DENV4	72	13	1	0	3	0

MW=Midwest region; NE=Northeast region; SE=Southeast region

* Until EW06

Supplementary Table 2. Information on the 227 sequenced samples of DENV1 and DENV2.

ID	Serotype	Sample	Collection date	Date onset symptoms	Sex	Age	Municipality	State	Ct	DENV Classification
OPAS 41	DENV1	Serum	16/01/2019	16/01/2019	Female	77	Feira de Santana	BA	17	Dengue with no warning signs
OPAS 42	DENV1	Serum	17/01/2019	17/01/2019	Male	25	Feira de Santana	BA	17	Dengue with no warning signs
OPAS 43	DENV1	Serum	17/01/2019	17/01/2019	Female	59	Feira de Santana	BA	22	Dengue with no warning signs
OPAS 44	DENV1	Serum	18/01/2019	18/01/2019	Female	30	Feira de Santana	BA	24	Dengue with no warning signs
OPAS 45	DENV1	Serum	17/01/2019	17/01/2019	Female	4	Feira de Santana	BA	26	Dengue with no warning signs
OPAS 46	DENV1	Serum	17/01/2019	17/01/2019	Female	8	Feira de Santana	BA	23	Dengue with no warning signs
OPAS 47	DENV1	Serum	18/01/2019	17/01/2019	Female	13	Feira de Santana	BA	26	Dengue with no warning signs
OPAS 48	DENV1	Serum	17/01/2019	17/01/2019	Male	20	Feira de Santana	BA	20	Dengue with no warning signs
OPAS 49	DENV1	Serum	21/01/2019	21/01/2019	Female	14	Feira de Santana	BA	20	Dengue with no warning signs
OPAS 50	DENV1	Serum	15/01/2019	15/01/2019	Female	21	Feira de Santana	BA	22	Dengue with no warning signs
OPAS 56	DENV1	Serum	16/05/2019	16/05/2019	Female	11	Coração de Maria	BA	27	Dengue with no warning signs
OPAS 57	DENV1	Serum	08/04/2019	07/04/2019	Female	19	Barreiras	BA	20	Dengue with no warning signs
OPAS 58	DENV1	Serum	25/04/2019	20/04/2019	Male	15	Feira de Santana	BA	26	Dengue with no warning signs
OPAS 60	DENV1	Serum	09/01/2019	07/01/2019	Male	31	Feira de Santana	BA	21	Dengue with no warning signs
OPAS 61	DENV1	Serum	06/02/2019	06/02/2019	Male	35	Coração de Maria	BA	16	Dengue with no warning signs
OPAS 62	DENV1	Serum	07/05/2019	04/05/2019	Female	28	Coração de Maria	BA	26	Dengue with no warning signs
OPAS 63	DENV1	Serum	16/05/2019	12/05/2019	Female	27	Coração de Maria	BA	19	Dengue with no warning signs
OPAS 64	DENV1	Serum	27/03/2019	21/03/2019	Male	50	Coração de Maria	BA	23	Dengue with no warning signs
OPAS 65	DENV1	Serum	14/05/2019	10/05/2019	Female	13	Coração de Maria	BA	26	Dengue with no warning signs
OPAS 157	DENV1	Serum	05/04/2019	NA	Female	34	Brasília	DF	16	Severe dengue
OPAS 158	DENV1	Serum	18/07/2019	NA	Female	29	Brasília	DF	19	Severe dengue

GO03	DENV1	Serum	06/11/2015	02/11/2015	Female	41	Aparecida de Goiânia	GO	NA	Dengue with no warning signs
GO04	DENV1	Serum	05/08/2015	01/08/2015	Female	21	Goiânia	GO	NA	Dengue with no warning signs
OPAS 131	DENV1	Serum	07/03/2019	06/03/2019	Female	25	Valparaíso	GO	17	Dengue with no warning signs
OPAS 132	DENV1	Serum	03/04/2019	30/03/2019	Female	62	Novo Gama	GO	30	Dengue with no warning signs
OPAS 133	DENV1	Serum	02/04/2019	29/03/2019	Female	65	Valparaíso	GO	24	Dengue with no warning signs
OPAS 134	DENV1	Serum	09/04/2019	08/04/2019	Female	26	Goiânia	GO	20	Dengue with no warning signs
OPAS 135	DENV1	Serum	13/02/2019	08/02/2019	Female	47	Rio Verde	GO	28	Dengue with no warning signs
OPAS 136	DENV1	Serum	15/02/2019	11/02/2019	Female	49	Caldas Novas	GO	21	Dengue with no warning signs
OPAS 137	DENV1	Serum	21/02/2019	16/02/2019	Female	14	Rio Verde	GO	22	Dengue with no warning signs
OPAS 138	DENV1	Serum	29/03/2019	28/03/2019	Male	21	Valparaíso	GO	27	Dengue with no warning signs
OPAS 90	DENV1	Serum	13/02/2016	11/02/2016	Female	49	Conselheiro Lafaiete	MG	16	Death
OPAS 92	DENV1	Serum	14/03/2016	09/03/2016	Male	67	Juiz de Fora	MG	19	Death
OPAS 99	DENV1	Serum	19/04/2018	16/04/2018	Female	33	Montes Claros	MG	19	Dengue with no warning signs
OPAS 100	DENV1	Serum	12/04/2018	10/04/2018	Female	30	Janaúba	MG	20	Dengue with no warning signs
OPAS 101	DENV1	Serum	12/04/2018	09/04/2018	Female	43	Janaúba	MG	23	Dengue with no warning signs
OPAS 102	DENV1	Serum	22/03/2018	19/03/2018	Female	35	Belo Horizonte	MG	15	Dengue with no warning signs
OPAS 103	DENV1	Serum	05/07/2018	02/07/2018	Female	32	Coração de Jesus	MG	18	Dengue with no warning signs
OPAS 165	DENV1	Serum	21/03/2017	18/03/2017	Male	35	Brasília de Minas	MG	20	Dengue with no warning signs
OPAS 167	DENV1	Serum	09/05/2017	07/05/2017	Male	19	São Francisco	MG	18	Dengue with no warning signs
OPAS 168	DENV1	Serum	08/05/2017	05/05/2017	Male	53	Varzelândia	MG	18	Dengue with no warning signs
OPAS 169	DENV1	Serum	08/05/2017	05/05/2017	Female	72	Varzelândia	MG	19	Dengue with no warning signs
OPAS 148	DENV1	Liver	28/04/2019	24/04/2019	Female	12	Recife	PE	25	Death
OPAS 149	DENV1	Liver	29/05/2019	12/05/2019	Female	30	Cabo de Santo Agostino	PE	29	Death
OPAS 150	DENV1	Liver	28/05/2019	21/05/2019	Female	36	Buíque	PE	25	Death
OPAS 151	DENV1	Spleen	18/06/2019	10/06/2019	Male	15	Ipojuca	PE	29	Death

OPAS 152	DENV1	Liver	22/06/2019	19/06/2019	Male	78	Sertânia	PE	26	Death
OPAS 153	DENV1	Spleen	18/07/2019	14/07/2019	Male	5	Recife	PE	24	Death
OPAS 154	DENV1	Liver	24/07/2019	18/07/2019	Male	14	Carpina	PE	24	Death
OPAS 155	DENV1	Serum	09/05/2019	09/05/2019	Male	14	Custódia	PE	21	Dengue with no warning signs
OPAS 156	DENV1	Serum	29/05/2019	26/05/2019	Female	18	Jaboatão dos Guararapes	PE	17	Dengue with no warning signs
OPAS 162	DENV1	Spleen	22/03/2019	16/03/2019	Male	29	Bom Conselho	PE	24	Death
OPAS 163	DENV1	Spleen	25/04/2019	20/04/2019	Male	6	Timbaúba	PE	24	Death
OPAS 171	DENV1	Serum	19/01/2016	25/01/2016	Male	29	Ribeirão Preto	SP	35	Dengue with no warning signs
OPAS 173	DENV1	Serum	29/01/2016	01/02/2016	Female	42	Ribeirão Preto	SP	22	Dengue with no warning signs
OPAS 174	DENV1	Serum	13/02/2016	17/02/2016	Female	23	Ribeirão Preto	SP	33	Dengue with no warning signs
OPAS 175	DENV1	Serum	20/02/2016	23/02/2016	Female	28	Ribeirão Preto	SP	19	Dengue with no warning signs
OPAS 51	DENV2	Serum	25/04/2019	21/04/2019	Male	54	Barreiras	BA	25	Death
OPAS 52	DENV2	Serum	29/04/2019	28/04/2019	Female	16	Barreiras	BA	28	Dengue with no warning signs
OPAS 53	DENV2	Serum	07/06/2019	05/06/2019	Female	36	Feira de Santana	BA	24	Dengue with no warning signs
OPAS 54	DENV2	Serum	16/01/2019	12/01/2019	Female	11	Irece	BA	24	Dengue with no warning signs
OPAS 55	DENV2	Serum	11/04/2019	08/04/2019	Female	38	Barreiras	BA	26	Dengue with no warning signs
OPAS 110	DENV2	Serum	14/05/2019	13/05/2019	Male	20	Barreiras	BA	25	Dengue with no warning signs
OPAS 111	DENV2	Serum	19/06/2019	16/06/2019	Male	35	Juazeiro	BA	21	Severe dengue
OPAS 112	DENV2	Serum	11/06/2019	10/06/2019	Female	16	Presidente Dutra	BA	29	Death
OPAS 113	DENV2	Serum	06/06/2019	03/06/2019	Female	6	Feira de Santana	BA	26	Severe dengue
OPAS 114	DENV2	Serum	12/07/2019	12/07/2019	Female	61	Salvador	BA	27	Dengue with no warning signs
OPAS 115	DENV2	Serum	04/06/2019	01/06/2019	Female	43	Salvador	BA	27	Dengue with no warning signs
OPAS 116	DENV2	Serum	30/04/2019	26/04/2019	Female	15	Barreiras	BA	28	Dengue with no warning signs
OPAS 117	DENV2	Serum	24/04/2019	20/04/2019	Male	34	Barreiras	BA	25	Dengue with no warning signs
OPAS 118	DENV2	Serum	08/04/2019	06/04/2019	Female	39	Barreiras	BA	25	Dengue with no warning signs
OPAS 119	DENV2	Serum	16/05/2019	14/05/2019	Female	20	Barreiras	BA	26	Dengue with no warning signs
OPAS 120	DENV2	Serum	27/05/2019	24/05/2019	Female	63	Barreiras	BA	22	Dengue with no warning signs

OPAS 121	DENV2	Serum	14/05/2019	12/05/2019	Male	24	Barreiras	BA	29	Dengue with no warning signs
OPAS 122	DENV2	Serum	21/05/2019	19/05/2019	Female	12	Barreiras	BA	29	Dengue with no warning signs
OPAS 123	DENV2	Serum	20/05/2019	18/05/2019	Female	21	Barreiras	BA	22	Dengue with no warning signs
OPAS 124	DENV2	Serum	14/05/2019	10/05/2019	Female	24	Barreiras	BA	28	Dengue with no warning signs
OPAS 161	DENV2	Serum	23/08/2019	NA	Male	44	Brasília	DF	21	Severe dengue
GO72	DENV2	Liver	25/04/2019	12/04/2019	Male	53	Goiania	GO	25	Death
GO75	DENV2	Serum	29/04/2019	28/04/2019	Female	28	Goiania	GO	20	Dengue with no warning signs
OPAS 66	DENV2	Serum	17/01/2019	16/01/2019	Female	40	Luziânia	GO	19	Dengue with no warning signs
OPAS 67	DENV2	Serum	17/01/2019	15/01/2019	Male	44	Caldas Novas	GO	16	Dengue with no warning signs
OPAS 68	DENV2	Serum	18/01/2019	14/01/2019	Male	61	Firminópolis	GO	22	Dengue with no warning signs
OPAS 69	DENV2	Serum	24/01/2019	22/01/2019	Male	29	Caldas Novas	GO	20	Dengue with no warning signs
OPAS 70	DENV2	Serum	28/01/2019	25/01/2019	Female	39	Caldas Novas	GO	19	Dengue with no warning signs
OPAS 71	DENV2	Serum	01/02/2019	29/01/2019	Male	24	Goiânia	GO	19	Dengue with no warning signs
OPAS 72	DENV2	Serum	31/01/2019	28/01/2019	Female	79	São Luís de Montes Belos	GO	20	Dengue with no warning signs
OPAS 74	DENV2	Serum	04/02/2019	02/02/2019	Female	23	Caldas Novas	GO	19	Dengue with no warning signs
OPAS 75	DENV2	Serum	07/02/2019	06/02/2019	Female	20	Goiânia	GO	19	Dengue with no warning signs
OPAS 76	DENV2	Serum	11/02/2019	08/02/2019	Male	64	Firminópolis	GO	18	Dengue with no warning signs
OPAS 77	DENV2	Serum	11/02/2019	09/02/2019	Male	35	Turvânia	GO	16	Dengue with no warning signs
OPAS 78	DENV2	Serum	11/02/2019	08/02/2019	Male	60	Rio Verde	GO	17	Dengue with no warning signs
OPAS 79	DENV2	Serum	21/02/2019	18/02/2019	Male	84	Goiânia	GO	18	Dengue with no warning signs
OPAS 80	DENV2	Serum	22/02/2019	20/02/2019	Female	18	Corumbá	GO	16	Dengue with no warning signs
OPAS 81	DENV2	Serum	18/02/2019	16/02/2019	Female	41	Rio Verde	GO	18	Dengue with no warning signs
OPAS 82	DENV2	Serum	01/03/2019	27/02/2019	Female	29	Goiânia	GO	17	Dengue with no warning signs
OPAS 83	DENV2	Serum	12/03/2019	11/03/2019	Male	42	Caldas Novas	GO	19	Dengue with no warning signs

OPAS 84	DENV2	Serum	18/03/2019	16/03/2019	Female	36	Paraúna	GO	18	Dengue with no warning signs
OPAS 85	DENV2	Serum	26/03/2019	22/03/2019	Female	79	Goiatuba	GO	18	Dengue with no warning signs
OPAS 86	DENV2	Serum	04/04/2019	31/03/2019	Male	22	Goiânia	GO	24	Dengue with no warning signs
OPAS 87	DENV2	Serum	27/03/2019	26/03/2019	Male	30	Israelândia	GO	21	Dengue with no warning signs
OPAS 89	DENV2	Serum	27/03/2019	24/03/2019	Male	40	Israelândia	GO	21	Dengue with no warning signs
OPAS 125	DENV2	Liver	20/02/2017	16/02/2017	Male	47	Goiânia	GO	23	Death
OPAS 126	DENV2	Spleen	06/11/2018	01/11/2018	Female	47	Rio Verde	GO	22	Death
OPAS 127	DENV2	Liver	06/02/2019	03/02/2019	Female	63	Turvânia	GO	25	Death
OPAS 128	DENV2	Liver	23/02/2019	19/02/2019	Male	36	Anápolis	GO	22	Death
OPAS 129	DENV2	Serum	10/05/2019	04/05/2019	Female	76	Goiânia	GO	20	Death
OPAS 130	DENV2	Spleen	17/06/2019	13/06/2019	Male	25	Goianira	GO	19	Death
OPAS 139	DENV2	Serum	28/02/2008	25/02/2008	Female	34	Goiânia	GO	20	Dengue with no warning signs
OPAS 140	DENV2	Serum	04/03/2008	02/03/2008	Female	38	Aparecida de Goiânia	GO	26	Dengue with no warning signs
OPAS 142	DENV2	Serum	11/03/2008	09/03/2008	Male	23	Aparecida de Goiânia	GO	16	Dengue with no warning signs
OPAS 159	DENV2	Serum	14/05/2019	NA	Male	43	Valparaíso	GO	25	Severe dengue
OPAS 01	DENV2	Serum	07/02/2019	07/02/2019	Male	77	Betim	MG	28	Death
OPAS 02	DENV2	Serum	18/03/2019	15/03/2019	Male	80	Uberaba	MG	35	Death
OPAS 03	DENV2	Serum	27/03/2019	25/03/2019	Male	90	Uberlândia	MG	25	Death
OPAS 04	DENV2	Serum	14/01/2019	12/01/2019	Female	53	Uberaba	MG	20	Dengue with no warning signs
OPAS 05	DENV2	Serum	10/04/2019	07/04/2019	Male	49	Jaboticatubas	MG	23	Death
OPAS 06	DENV2	Serum	31/01/2019	30/01/2019	Male	46	Unai	MG	23	Dengue with no warning signs
OPAS 07	DENV2	Serum	31/01/2019	29/01/2019	Male	59	Unai	MG	23	Dengue with no warning signs
OPAS 08	DENV2	Serum	09/05/2019	08/05/2019	Female	54	Ribeirão das Neves	MG	22	Death
OPAS 09	DENV2	Serum	19/02/2019	18/02/2019	Male	39	Uberaba	MG	21	Dengue with no warning signs
OPAS 10	DENV2	Serum	01/02/2019	29/01/2019	Male	55	Patrocínio	MG	26	Death
OPAS 11	DENV2	Serum	25/05/2019	21/05/2019	Male	35	Ribeirão das Neves	MG	25	Death
OPAS 12	DENV2	Serum	23/05/2019	23/05/2019	Male	6	Patos de Minas	MG	27	Death
OPAS 13	DENV2	Serum	12/02/2019	09/02/2019	Female	39	Arinos	MG	21	Dengue with no warning signs

OPAS 14	DENV2	Serum	18/02/2019	16/02/2019	Male	61	Prata	MG	20	Dengue with no warning signs
OPAS 15	DENV2	Serum	18/02/2019	17/02/2019	Female	24	Prata	MG	20	Dengue with no warning signs
OPAS 16	DENV2	Serum	05/02/2019	03/02/2019	Female	54	Capinopolis	MG	20	Dengue with no warning signs
OPAS 17	DENV2	Serum	14/02/2019	12/02/2019	Male	79	Ipiacu	MG	21	Dengue with no warning signs
OPAS 18	DENV2	Serum	24/02/2019	22/02/2019	Male	19	Curvelo	MG	35	Death
OPAS 19	DENV2	Serum	26/02/2019	23/02/2019	Male	50	Uberaba	MG	16	Dengue with no warning signs
OPAS 20	DENV2	Serum	27/02/2019	24/02/2019	Female	52	Uberaba	MG	19	Dengue with no warning signs
OPAS 21	DENV2	Serum	22/02/2019	20/02/2019	Female	44	Januaria	MG	21	Dengue with no warning signs
OPAS 22	DENV2	Serum	19/03/2019	18/03/2019	Female	16	Uberlandia	MG	20	Dengue with no warning signs
OPAS 23	DENV2	Serum	19/03/2019	18/03/2019	Female	20	Uberlandia	MG	19	Dengue with no warning signs
OPAS 24	DENV2	Spleen	28/03/2019	28/03/2019	Female	47	Ibia	MG	34	Death
OPAS 25	DENV2	Serum	25/03/2019	23/03/2019	Male	43	Uberaba	MG	21	Dengue with no warning signs
OPAS 26	DENV2	Serum	21/03/2019	20/03/2019	Female	20	Uberaba	MG	20	Dengue with no warning signs
OPAS 27	DENV2	Serum	01/04/2019	31/03/2019	Female	6	Belo Horizonte	MG	32	Death
OPAS 28	DENV2	Serum	29/03/2019	26/03/2019	Female	60	Patrocínio	MG	19	Dengue with no warning signs
OPAS 29	DENV2	Serum	02/04/2019	30/03/2019	Male	46	Buritiz	MG	18	Dengue with no warning signs
OPAS 30	DENV2	Serum	01/04/2019	31/03/2019	Female	38	Natalândia	MG	21	Dengue with no warning signs
OPAS 31	DENV2	Serum	08/03/2019	03/04/2019	Male	67	Passos	MG	34	Death
OPAS 32	DENV2	Serum	12/04/2019	11/14/2019	Male	60	Ituiutaba	MG	17	Dengue with no warning signs
OPAS 33	DENV2	Serum	12/04/2019	09/04/2019	Female	68	Araguari	MG	20	Dengue with no warning signs
OPAS 34	DENV2	Serum	12/04/2019	10/04/2019	Male	77	Ituiutaba	MG	17	Death
OPAS 35	DENV2	Serum	24/04/2019	20/04/2019	Female	65	Campos Gerais	MG	35	Death
OPAS 36	DENV2	Plasma	07/05/2019	04/05/2019	Female	55	Contagem	MG	34	Death
OPAS 37	DENV2	Serum	07/05/2019	05/05/2019	Male	26	Ituiutaba	MG	22	Dengue with no warning signs
OPAS 38	DENV2	Serum	07/06/2019	04/06/2019	Male	26	Montes Claros	MG	25	Death
OPAS 39	DENV2	Serum	06/04/2019	03/04/2019	Female	59	Belo Horizonte	MG	25	Death
OPAS 40	DENV2	Serum	17/04/2019	12/04/2019	Male	11	Belo Horizonte	MG	35	Death

OPAS 93	DENV2	Serum	29/01/2016	28/01/2016	Female	31	Uberaba	MG	25	Dengue with no warning signs
OPAS 95	DENV2	Serum	14/03/2016	12/03/2016	Female	35	Uberaba	MG	23	Dengue with no warning signs
OPAS 96	DENV2	Serum	14/03/2016	12/03/2016	Male	59	Uberaba	MG	26	Dengue with no warning signs
OPAS 105	DENV2	Serum	22/04/2018	16/04/2018	Female	54	Ituiutaba	MG	21	Dengue with no warning signs
OPAS 106	DENV2	Serum	04/04/2018	02/04/2018	Female	24	Capinópolis	MG	25	Dengue with no warning signs
OPAS 107	DENV2	Serum	04/04/2018	03/04/2018	Female	39	Capinópolis	MG	19	Dengue with no warning signs
OPAS 108	DENV2	Serum	02/03/2018	27/02/2018	Female	31	Ituiutaba	MG	25	Dengue with no warning signs
CG02	DENV2	Serum	21/01/2019	20/01/2019	Male	40	Campo Grande	MS	24	Dengue with no warning signs
CG06	DENV2	Serum	22/03/2019	20/03/2019	Female	46	Campo Grande	MS	21	Dengue with no warning signs
CG07	DENV2	Serum	22/03/2019	21/03/2019	Male	12	Campo Grande	MS	20	Dengue with no warning signs
CG08	DENV2	Serum	26/02/2019	23/02/2019	Female	31	Jaraguari	MS	31	Dengue with no warning signs
CG09	DENV2	Serum	20/02/2019	18/02/2019	Female	4	Camapuã	MS	26	Dengue with no warning signs
CG10	DENV2	Serum	07/03/2019	03/03/2019	Female	24	Jaraguari	MS	27	Dengue with no warning signs
CG11	DENV2	Serum	14/12/2018	12/12/2018	Male	38	Campo Grande	MS	24	Dengue with no warning signs
CG12	DENV2	Serum	04/10/2018	01/10/2018	Male	39	Campo Grande	MS	26	Dengue with no warning signs
CG13	DENV2	Serum	14/11/2018	13/11/2018	Female	26	Campo Grande	MS	22	Dengue with no warning signs
CG14	DENV2	Serum	26/11/2018	23/11/2018	Female	27	Campo Grande	MS	21	Dengue with no warning signs
CG15	DENV2	Serum	13/12/2018	11/12/2018	Female	31	Campo Grande	MS	25	Dengue with no warning signs
CG16	DENV2	Serum	26/01/2019	25/01/2019	Male	41	Campo Grande	MS	18	Dengue with no warning signs
CG17	DENV2	Serum	24/01/2019	22/01/2019	Male	23	Campo Grande	MS	19	Dengue with no warning signs
CG18	DENV2	Serum	22/03/2019	21/03/2019	Female	20	Corumbá	MS	26	Dengue with no warning signs
CG19	DENV2	Serum	07/03/2019	06/03/2019	Female	13	Dois Irmãos do Buriti	MS	26	Dengue with no warning signs
CG20	DENV2	Serum	13/03/2019	11/03/2019	Female	9	Douradina	MS	32	Dengue with no warning signs

CG21	DENV2	Serum	14/03/2019	14/03/2019	Female	63	Nioaque	MS	22	Dengue with no warning signs
CG22	DENV2	Serum	17/03/2019	15/03/2019	Male	24	Mundo Novo	MS	30	Dengue with no warning signs
CG23	DENV2	Serum	31/01/2019	29/01/2019	Male	56	Campo Grande	MS	17	Dengue with no warning signs
CG24	DENV2	Serum	19/03/2019	16/03/2019	Male	69	Aparecida do Taboado	MS	25	Dengue with no warning signs
CG68	DENV2	Serum	25/01/2019	22/01/2019	Female	19	Campo Grande	MS	26	Dengue with no warning signs
CG69	DENV2	Serum	23/01/2019	21/01/2019	Female	46	Campo Grande	MS	24	Dengue with no warning signs
CG70	DENV2	Serum	26/01/2019	24/01/2019	Male	49	Campo Grande	MS	27	Dengue with no warning signs
CG71	DENV2	Serum	02/02/2019	31/01/2019	Male	42	Campo Grande	MS	17	Dengue with no warning signs
CG81	DENV2	Serum	31/01/2019	24/01/2019	Female	21	Campo Grande	MS	22	Dengue with no warning signs
CG86	DENV2	Serum	31/01/2019	30/01/2019	Male	11	Campo Grande	MS	17	Dengue with no warning signs
CG87	DENV2	Serum	25/01/2019	23/01/2019	Male	14	Campo Grande	MS	22	Dengue with no warning signs
CG90	DENV2	Serum	23/01/2019	23/01/2019	Male	15	Campo Grande	MS	16	Dengue with no warning signs
CG94	DENV2	Serum	21/01/2019	17/01/2019	Female	54	Campo Grande	MS	29	Dengue with no warning signs
CG96	DENV2	Serum	20/01/2019	18/01/2019	Female	41	Campo Grande	MS	16	Dengue with no warning signs
CG99	DENV2	Serum	06/03/2019	05/03/2019	Male	37	Campo Grande	MS	29	Dengue with no warning signs
CG100	DENV2	Serum	17/03/2019	16/03/2019	Female	19	Chapadão Do Sul	MS	20	Dengue with no warning signs
CG102	DENV2	Serum	27/01/2019	26/01/2019	Male	28	Campo Grande	MS	20	Dengue with no warning signs
CG103	DENV2	Serum	26/01/2019	25/01/2019	Male	32	Campo Grande	MS	22	Dengue with no warning signs
CG104	DENV2	Serum	23/01/2019	21/01/2019	Female	53	Campo Grande	MS	19	Dengue with no warning signs
CG105	DENV2	Serum	27/01/2019	24/01/2019	Female	31	Campo Grande	MS	19	Dengue with no warning signs
CG106	DENV2	Serum	24/01/2019	21/01/2019	Female	16	Campo Grande	MS	17	Dengue with no warning signs
CG107	DENV2	Serum	31/01/2019	29/01/2019	Male	18	Campo Grande	MS	22	Dengue with no warning signs
CG108	DENV2	Serum	26/03/2019	24/03/2019	Male	58	Maracajú	MS	20	Dengue with no warning signs

CG109	DENV2	Serum	26/01/2019	23/01/2019	Female	52	Campo Grande	MS	18	Dengue with no warning signs
CG110	DENV2	Serum	04/03/2019	01/03/2019	Female	25	Campo Grande	MS	26	Dengue with no warning signs
CG111	DENV2	Serum	26/03/2019	25/03/2019	Male	13	Corumbá	MS	25	Dengue with no warning signs
CG112	DENV2	Lymph node	11/04/2019	08/04/2019	Female	7	Campo Grande	MS	24	Death
CG116	DENV2	Serum	15/01/2019	13/01/2019	Male	13	Campo Grande	MS	26	Dengue with no warning signs
CG117	DENV2	Serum	31/01/2019	30/01/2019	Male	70	Campo Grande	MS	21	Dengue with no warning signs
CG119	DENV2	Serum	19/01/2019	17/01/2019	Male	37	Campo Grande	MS	16	Dengue with no warning signs
CG120	DENV2	Serum	26/01/2019	22/01/2019	Male	13	Campo Grande	MS	30	Dengue with no warning signs
CG121	DENV2	Serum	18/03/2019	15/03/2019	Female	7	Pedro Gomes	MS	24	Dengue with no warning signs
CG122	DENV2	Serum	15/03/2019	13/03/2019	Male	35	Nioaque	MS	34	Dengue with no warning signs
CG123	DENV2	Serum	19/03/2019	19/03/2019	Female	58	Chapadão do Sul	MS	25	Dengue with no warning signs
CG124	DENV2	Serum	18/03/2019	16/03/2019	Male	53	Nioaque	MS	26	Dengue with no warning signs
CG125	DENV2	Serum	15/03/2019	14/03/2019	Female	16	Dois Irmãos do Buriti	MS	24	Dengue with no warning signs
CG126	DENV2	Serum	20/03/2019	16/03/2019	Male	24	Ivinhema	MS	24	Dengue with no warning signs
CG128	DENV2	Serum	13/03/2019	11/03/2019	Female	65	Maracajú	MS	23	Dengue with no warning signs
CG129	DENV2	Serum	11/02/2019	10/02/2019	Female	14	Água Clara	MS	25	Dengue with no warning signs
CG130	DENV2	Serum	15/03/2019	14/03/2019	Male	21	Nioaque	MS	17	Dengue with no warning signs
CG132	DENV2	Serum	26/04/2019	23/04/2019	Male	38	Campo Grande	MS	25	Dengue with no warning signs
CG133	DENV2	Serum	19/03/2019	17/03/2019	Female	39	Itaquiraí	MS	29	Dengue with no warning signs
CG134	DENV2	Serum	10/01/2019	09/01/2019	Female	23	Campo Grande	MS	26	Dengue with no warning signs
CB02	DENV2	Serum	18/02/2019	15/02/2019	Male	36	Nova Xavantina	MT	23	Dengue with no warning signs
CB03	DENV2	Serum	02/03/2019	27/02/2019	Male	21	Cuiaba	MT	31	Dengue with no warning signs
OPAS 145	DENV2	Serum	09/05/2019	09/05/2019	Male	45	Custódia	PE	28	Dengue with no warning signs
OPAS 147	DENV2	Serum	31/05/2019	27/05/2019	Female	34	Santa Maria da Boa Vista	PE	27	Dengue with no warning signs

OPAS 164	DENV2	Serum	27/06/2019	23/06/2019	Female	8	Jaboatão dos Guararapes	PE	29	Dengue with no warning signs
OPAS 172	DENV2	Serum	25/01/2016	28/01/2016	Male	25	Ribeirão Preto	SP	27	Dengue with no warning signs
OPAS 176	DENV2	Serum	19/02/2016	26/02/2016	Male	25	Ribeirão Preto	SP	35	Dengue with no warning signs
OPAS 177	DENV2	Serum	01/03/2016	08/03/2016	Male	54	Ribeirão Preto	SP	28	Dengue with no warning signs
OPAS 178	DENV2	Serum	14/01/2019	11/01/2019	Female	38	Vassouras	RJ	27	Dengue with no warning signs

ID=study identifier; Collection date=Sample collection date; Municipality=Municipality of residence; State=BA-Bahia; DF-Distrito Federal; GO-Goiás; MG-Minas Gerais; MS-Mato Grosso do Sul; MT-Mato Grosso do Sul; PE-Pernambuco; SP-São Paulo; RJ-Rio de Janeiro; Ct=RT-qPCR quantification cycle threshold value; NA=Not Applicable.

Supplementary Table 3. Sequencing statistics for the 227 DENV1 and DENV2 sequences generated in this study.

ID	Serotype	Accession Number	Reads	Coverage (%)	GenBank link
OPAS 41	DENV1	MT929530	1148	67.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929530
OPAS 42	DENV1	MT929531	38409	89.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929531
OPAS 43	DENV1	MT929532	47835	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929532
OPAS 44	DENV1	MT929533	32466	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929533
OPAS 45	DENV1	MT929534	34796	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929534
OPAS 46	DENV1	MT929535	60684	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929535
OPAS 47	DENV1	MT929536	60872	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929536
OPAS 48	DENV1	MT929537	44516	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929537
OPAS 49	DENV1	MT929538	25874	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929538
OPAS 50	DENV1	MT929539	17230	89.4	https://www.ncbi.nlm.nih.gov/nuccore/MT929539
OPAS 56	DENV1	MT929540	36579	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929540
OPAS 57	DENV1	MT929541	34262	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929541
OPAS 58	DENV1	MT929542	13742	85.4	https://www.ncbi.nlm.nih.gov/nuccore/MT929542
OPAS 60	DENV1	MT929543	25105	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929543
OPAS 61	DENV1	MT929544	23023	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929544
OPAS 62	DENV1	MT929545	33004	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929545
OPAS 63	DENV1	MT929546	25770	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929546
OPAS 64	DENV1	MT929547	34030	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929547
OPAS 65	DENV1	MT929548	30509	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929548
OPAS 157	DENV1	MT929573	42518	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929573
OPAS 158	DENV1	MT929574	36165	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929574
GO03	DENV1	MT929528	22569	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929528
GO04	DENV1	MT929529	28354	89.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929529
OPAS 131	DENV1	MT929556	67644	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929556
OPAS 132	DENV1	MT929557	86925	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929557
OPAS 133	DENV1	MT929558	80673	89.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929558
OPAS 134	DENV1	MT929559	54060	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929559
OPAS 135	DENV1	MT929560	81799	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929560
OPAS 136	DENV1	MT929561	66262	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929561

OPAS 137	DENV1	MT929562	60855	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929562
OPAS 138	DENV1	MT929563	70760	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929563
OPAS 90	DENV1	MT929549	58872	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929549
OPAS 92	DENV1	MT929550	60850	94.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929550
OPAS 99	DENV1	MT929551	74959	78.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929551
OPAS 100	DENV1	MT929552	66474	86.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929552
OPAS 101	DENV1	MT929553	82037	80.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929553
OPAS 102	DENV1	MT929554	81787	94.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929554
OPAS 103	DENV1	MT929555	73129	89.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929555
OPAS 165	DENV1	MT929577	38272	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929577
OPAS 167	DENV1	MT929578	44365	93.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929578
OPAS 168	DENV1	MT929579	41920	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929579
OPAS 169	DENV1	MT929580	37728	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929580
OPAS 148	DENV1	MT929564	73395	89.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929564
OPAS 149	DENV1	MT929565	74685	70.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929565
OPAS 150	DENV1	MT929566	80594	75.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929566
OPAS 151	DENV1	MT929567	29271	82.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929567
OPAS 152	DENV1	MT929568	79935	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929568
OPAS 153	DENV1	MT929569	45364	82.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929569
OPAS 154	DENV1	MT929570	75476	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929570
OPAS 155	DENV1	MT929571	30379	91.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929571
OPAS 156	DENV1	MT929572	126739	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929572
OPAS 162	DENV1	MT929575	26821	85.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929575
OPAS 163	DENV1	MT929576	236906	77.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929576
OPAS 171	DENV1	MT929581	31506	78.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929581
OPAS 173	DENV1	MT929582	9180	74.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929582
OPAS 174	DENV1	MT929583	34410	78.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929583
OPAS 175	DENV1	MT929584	23241	94.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929584
OPAS 51	DENV2	MT929688	22430	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929688
OPAS 52	DENV2	MT929689	26105	84.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929689
OPAS 53	DENV2	MT929690	24082	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929690
OPAS 54	DENV2	MT929691	20538	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929691
OPAS 55	DENV2	MT929692	25194	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929692
OPAS 110	DENV2	MT929722	78479	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929722

OPAS 111	DENV2	MT929723	127120	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929723
OPAS 112	DENV2	MT929724	75160	77.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929724
OPAS 113	DENV2	MT929725	89452	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929725
OPAS 114	DENV2	MT929726	80250	85.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929726
OPAS 115	DENV2	MT929727	96331	73.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929727
OPAS 116	DENV2	MT929728	76730	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929728
OPAS 117	DENV2	MT929729	74632	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929729
OPAS 118	DENV2	MT929730	74663	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929730
OPAS 119	DENV2	MT929731	71196	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929731
OPAS 120	DENV2	MT929732	69618	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929732
OPAS 121	DENV2	MT929733	73302	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929733
OPAS 122	DENV2	MT929734	76102	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929734
OPAS 123	DENV2	MT929735	62619	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929735
OPAS 124	DENV2	MT929736	78826	80.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929736
OPAS 161	DENV2	MT929749	11924	69.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929749
GO72	DENV2	MT929646	33490	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929646
GO75	DENV2	MT929647	29201	92.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929647
OPAS 66	DENV2	MT929693	25861	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929693
OPAS 67	DENV2	MT929694	53737	93.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929694
OPAS 68	DENV2	MT929695	76127	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929695
OPAS 69	DENV2	MT929696	77345	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929696
OPAS 70	DENV2	MT929697	53087	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929697
OPAS 71	DENV2	MT929698	68171	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929698
OPAS 72	DENV2	MT929699	62398	76.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929699
OPAS 74	DENV2	MT929700	69451	93.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929700
OPAS 75	DENV2	MT929701	59345	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929701
OPAS 76	DENV2	MT929702	61310	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929702
OPAS 77	DENV2	MT929703	52796	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929703
OPAS 78	DENV2	MT929704	53603	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929704
OPAS 79	DENV2	MT929705	72112	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929705
OPAS 80	DENV2	MT929706	58137	93.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929706
OPAS 81	DENV2	MT929707	55335	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929707
OPAS 82	DENV2	MT929708	66133	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929708
OPAS 83	DENV2	MT929709	63357	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929709

OPAS 84	DENV2	MT929710	79443	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929710
OPAS 85	DENV2	MT929711	59880	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929711
OPAS 86	DENV2	MT929712	82765	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929712
OPAS 87	DENV2	MT929713	73573	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929713
OPAS 89	DENV2	MT929714	91026	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929714
OPAS 125	DENV2	MT929737	67578	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929737
OPAS 126	DENV2	MT929738	20234	69.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929738
OPAS 127	DENV2	MT929739	14215	79.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929739
OPAS 128	DENV2	MT929740	24790	82.4	https://www.ncbi.nlm.nih.gov/nuccore/MT929740
OPAS 129	DENV2	MT929741	35067	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929741
OPAS 130	DENV2	MT929742	33004	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929742
OPAS 139	DENV2	MT929743	36363	93.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929743
OPAS 140	DENV2	MT929744	13891	70.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929744
OPAS 142	DENV2	MT929745	9452	83.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929745
OPAS 159	DENV2	MT929748	16501	75.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929748
OPAS 01	DENV2	MT929648	67212	86.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929648
OPAS 02	DENV2	MT929649	79407	88.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929649
OPAS 03	DENV2	MT929650	64014	87.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929650
OPAS 04	DENV2	MT929651	64749	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929651
OPAS 05	DENV2	MT929652	54742	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929652
OPAS 06	DENV2	MT929653	55680	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929653
OPAS 07	DENV2	MT929654	66199	91.4	https://www.ncbi.nlm.nih.gov/nuccore/MT929654
OPAS 08	DENV2	MT929655	79984	86.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929655
OPAS 09	DENV2	MT929656	51403	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929656
OPAS 10	DENV2	MT929657	64173	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929657
OPAS 11	DENV2	MT929658	40468	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929658
OPAS 12	DENV2	MT929659	63797	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929659
OPAS 13	DENV2	MT929660	61680	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929660
OPAS 14	DENV2	MT929661	55153	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929661
OPAS 15	DENV2	MT929662	49508	90.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929662
OPAS 16	DENV2	MT929663	61994	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929663
OPAS 17	DENV2	MT929664	37366	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929664
OPAS 18	DENV2	MT929665	34881	66.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929665
OPAS 19	DENV2	MT929666	46152	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929666

OPAS 20	DENV2	MT929667	64056	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929667
OPAS 21	DENV2	MT929668	42803	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929668
OPAS 22	DENV2	MT929669	51459	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929669
OPAS 23	DENV2	MT929670	49658	92.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929670
OPAS 24	DENV2	MT929671	13142	60.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929671
OPAS 25	DENV2	MT929672	9737	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929672
OPAS 26	DENV2	MT929673	10315	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929673
OPAS 27	DENV2	MT929674	13660	73.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929674
OPAS 28	DENV2	MT929675	11857	89.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929675
OPAS 29	DENV2	MT929676	9867	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929676
OPAS 30	DENV2	MT929677	11290	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929677
OPAS 31	DENV2	MT929678	12548	73.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929678
OPAS 32	DENV2	MT929679	7967	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929679
OPAS 33	DENV2	MT929680	11544	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929680
OPAS 34	DENV2	MT929681	13239	93.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929681
OPAS 35	DENV2	MT929682	11617	89.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929682
OPAS 36	DENV2	MT929683	19614	73.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929683
OPAS 37	DENV2	MT929684	16382	88.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929684
OPAS 38	DENV2	MT929685	14810	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929685
OPAS 39	DENV2	MT929686	18506	83.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929686
OPAS 40	DENV2	MT929687	16077	66.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929687
OPAS 93	DENV2	MT929715	67656	88.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929715
OPAS 95	DENV2	MT929716	81051	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929716
OPAS 96	DENV2	MT929717	86395	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929717
OPAS 105	DENV2	MT929718	85629	86.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929718
OPAS 106	DENV2	MT929719	71717	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929719
OPAS 107	DENV2	MT929720	72564	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929720
OPAS 108	DENV2	MT929721	84260	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929721
CG02	DENV2	MT929587	58997	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929587
CG06	DENV2	MT929588	70195	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929588
CG07	DENV2	MT929589	41807	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929589
CG08	DENV2	MT929590	65721	67.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929590
CG09	DENV2	MT929591	47818	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929591
CG10	DENV2	MT929592	49514	73.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929592

CG11	DENV2	MT929593	42961	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929593
CG12	DENV2	MT929594	21079	73.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929594
CG13	DENV2	MT929595	34494	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929595
CG14	DENV2	MT929596	54053	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929596
CG15	DENV2	MT929597	53455	79.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929597
CG16	DENV2	MT929598	27224	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929598
CG17	DENV2	MT929599	49155	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929599
CG18	DENV2	MT929600	43608	73.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929600
CG19	DENV2	MT929601	27042	82.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929601
CG20	DENV2	MT929602	43832	73.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929602
CG21	DENV2	MT929603	22422	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929603
CG22	DENV2	MT929604	21798	73.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929604
CG23	DENV2	MT929605	42692	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929605
CG24	DENV2	MT929606	37019	93.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929606
CG68	DENV2	MT929607	101708	83.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929607
CG69	DENV2	MT929608	72620	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929608
CG70	DENV2	MT929609	116881	84.6	https://www.ncbi.nlm.nih.gov/nuccore/MT929609
CG71	DENV2	MT929610	5307	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929610
CG81	DENV2	MT929611	166110	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929611
CG86	DENV2	MT929612	114276	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929612
CG87	DENV2	MT929613	4710	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929613
CG90	DENV2	MT929614	103971	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929614
CG94	DENV2	MT929615	134892	80.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929615
CG96	DENV2	MT929616	148786	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929616
CG99	DENV2	MT929617	120232	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929617
CG100	DENV2	MT929618	116370	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929618
CG102	DENV2	MT929619	55098	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929619
CG103	DENV2	MT929620	50051	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929620
CG104	DENV2	MT929621	5237	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929621
CG105	DENV2	MT929622	30959	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929622
CG106	DENV2	MT929623	110736	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929623
CG107	DENV2	MT929624	1001632	73.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929624
CG108	DENV2	MT929625	88602	88.4	https://www.ncbi.nlm.nih.gov/nuccore/MT929625
CG109	DENV2	MT929626	57723	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929626

CG110	DENV2	MT929627	82777	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929627
CG111	DENV2	MT929628	72903	88.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929628
CG112	DENV2	MT929629	59051	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929629
CG116	DENV2	MT929630	48670	87.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929630
CG117	DENV2	MT929631	43758	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929631
CG119	DENV2	MT929632	66890	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929632
CG120	DENV2	MT929633	50837	88.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929633
CG121	DENV2	MT929634	123428	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929634
CG122	DENV2	MT929635	150786	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929635
CG123	DENV2	MT929636	98764	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929636
CG124	DENV2	MT929637	19138	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929637
CG125	DENV2	MT929638	44351	85.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929638
CG126	DENV2	MT929639	26287	73.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929639
CG128	DENV2	MT929640	38678	87.9	https://www.ncbi.nlm.nih.gov/nuccore/MT929640
CG129	DENV2	MT929641	45603	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929641
CG130	DENV2	MT929642	39445	93.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929642
CG132	DENV2	MT929643	39587	87.0	https://www.ncbi.nlm.nih.gov/nuccore/MT929643
CG133	DENV2	MT929644	83438	88.2	https://www.ncbi.nlm.nih.gov/nuccore/MT929644
CG134	DENV2	MT929645	45255	88.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929645
CB02	DENV2	MT929585	36474	51.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929585
CB03	DENV2	MT929586	32227	47.8	https://www.ncbi.nlm.nih.gov/nuccore/MT929586
OPAS 145	DENV2	MT929746	85028	74.3	https://www.ncbi.nlm.nih.gov/nuccore/MT929746
OPAS 147	DENV2	MT929747	62082	73.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929747
OPAS 164	DENV2	MT929750	16602	79.5	https://www.ncbi.nlm.nih.gov/nuccore/MT929750
OPAS 172	DENV2	MT929751	21448	93.7	https://www.ncbi.nlm.nih.gov/nuccore/MT929751
OPAS 176	DENV2	MT929752	3243	74.4	https://www.ncbi.nlm.nih.gov/nuccore/MT929752
OPAS 177	DENV2	MT929753	154641	94.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929753
OPAS 178	DENV2	MT929754	23384	89.1	https://www.ncbi.nlm.nih.gov/nuccore/MT929754

ID=study identifier; Accession Number=NCBI accession number

Supplementary Table 4. Genetic signatures for BR-4 lineages I and II.

SNV	nn position	Protein	nn position	aa position	aa LinI	aa LinII	codon LinI	codon LinII
1	450	membrane glycoprotein precursor prM	12	4	T	T	acc	act
2	954	envelope protein E	18	6	I	I	ata	atc
3	1986	envelope protein E	1050	350	R	R	cgc	cgc
4	2223	envelope protein E	1287	429	F	F	ttt	ttc
5	2276	envelope protein E	1340	447	V	A	ggt	gct
6	2319	envelope protein E	1383	461	V	V	gtc	gta
7	2448	nonstructural protein NS1	27	9	K	K	aaa	aag
8	3330	nonstructural protein NS1	909	303	A	A	gcc	gct
9	4341	nonstructural protein NS2B	210	70	S	S	agt	agc
10	4482	nonstructural protein NS2B	351	117	T	T	acg	aca
11	4974	nonstructural protein NS3	453	151	G	G	ggt	ggc
12	5190	nonstructural protein NS3	669	223	P	P	ccc	cct
13	5304	nonstructural protein NS3	783	261	C	C	tgt	tgc
14	5730	nonstructural protein NS3	1209	403	D	D	gat	gac
15	5835	nonstructural protein NS3	1314	438	E	E	gaa	gag
16	6966	nonstructural protein NS4B	141	47	F	F	ttt	ttt
17	7038	nonstructural protein NS4B	213	71	Q	Q	cag	caa
18	7059	nonstructural protein NS4B	234	78	L	L	ctt	ctc
19	7137	nonstructural protein NS4B	312	104	P	P	cct	ccc
20	7656	RNA-dependent RNA polymerase NS5	87	29	K	K	aag	aag
21	7758	RNA-dependent RNA polymerase NS5	189	63	R	R	agg	aga
22	7999	RNA-dependent RNA polymerase NS5	430	144	L	L	ctg	ttg
23	8298	RNA-dependent RNA polymerase NS5	729	243	F	F	ttc	ttt
24	8658	RNA-dependent RNA polymerase NS5	1089	363	T	T	act	acc
25	9208	RNA-dependent RNA polymerase NS5	1639	547	L	L	tta	cta
26	9226	RNA-dependent RNA polymerase NS5	1657	553	V	I	gta	ata
27	9303	RNA-dependent RNA polymerase NS5	1734	578	V	V	gtg	gtg

28	9399	RNA-dependent RNA polymerase NS5	1830	610	N	N	aat	aac
29	9424	RNA-dependent RNA polymerase NS5	1855	619	L	L	tta	cta
30	9576	RNA-dependent RNA polymerase NS5	2007	669	P	P	cct	ccc
31	9660	RNA-dependent RNA polymerase NS5	2091	697	S	S	tct	tca
32	9725	RNA-dependent RNA polymerase NS5	2156	719	I	K	ata	aaa
33	9795	RNA-dependent RNA polymerase NS5	2226	742	Q	Q	cag	caa
34	9942	RNA-dependent RNA polymerase NS5	2373	791	S	S	agc	agt

SNV=single nucleotide variant; nn=nucleotide; aa=amino acid; LinI=BR-4 lineage I; LinII=BR-4 lineage II

Supplementary Table 5. Primers for sequencing the complete genomes of DENV1 and DENV2

Primer Name	Sequence (5'-3')*
DENV1_1_LEFT	AATATGCTGAAACGCGCGAGAA
DENV1_1_RIGHT	CCGTCTTCAAGAGTTCAATGTCCA
DENV1_2_LEFT	ACCCAGGATTCACGGTGATAGC
DENV1_2_RIGHT	ACCAGCAAATCTTGTCTGTTCCA
DENV1_3_LEFT	GGAAATACAGCTGACCGACTACG
DENV1_3_RIGHT	ACTGCAATGCACGTCATCGAAA
DENV1_4_LEFT	CAAGAAAGGAAGCAGCATAGGGA
DENV1_4_RIGHT	TTGATGGCAGCTGACATTAGCC
DENV1_5_LEFT	TGGAACATTTGGGAAGTTGAGGAC
DENV1_5_RIGHT	ACTTCTCTGGATGTTAGTCTGCG
DENV1_6_LEFT	TGGATGAACATTGTGGAAATCGAGG
DENV1_6_RIGHT	GCATGCCTCCAGCTATTAGTGG
DENV1_7_LEFT	AGTTGGCCCCCTCAATGAAGGAA
DENV1_7_RIGHT	GCACTGACGTAGGTTCCACTTG
DENV1_8_LEFT	TTCATATGGAGGAGGTTGGAGG
DENV1_8_RIGHT	AGCCTGAGTTCCATGATCTCTCA
DENV1_9_LEFT	ATAGCGGCCAGAGGGTACATCT
DENV1_9_RIGHT	TGTTCTCCTCCAACACCTGGTT
DENV1_10_LEFT	AAAGAGTGCAGCAATAGACGGG
DENV1_10_RIGHT	ATAGAGGGTCCAGGCTGAAGCT
DENV1_11_LEFT	TGTGGTGATAGGTTTGTATTTCATGATACT
DENV1_11_RIGHT	CTTTGGCTTCGGATCTGTCCAC
DENV1_12_LEFT	GGGAAACACTGGGAGAGAAATGG
DENV1_12_RIGHT	TGATCCTGATGGCTTGACCTCA
DENV1_13_LEFT	TGGAGCAAATGCAAAGAAAACATGG
DENV1_13_RIGHT	TGCACGACTTCCTTTTGCCTTT
DENV1_14_LEFT	ACTCAGCAAAGAAGCAGTGGA
DENV1_14_RIGHT	GCATGGCACCCTATTTCCTC
DENV1_15_LEFT	AGACGTGACCAGAGAGGAAGTG
DENV1_15_RIGHT	TCACTTGGTTTATGGCCACTTGT
DENV2_1_LEFT	AGCAGATCTCTGATGAATAACCAACG
DENV2_1_RIGHT	TTTTTGCCATCGTCGTCACACA
DENV2_2_LEFT	TCGCTCCTTCAATGACAATGCG
DENV2_2_RIGHT	CCATTCTCAGCCTGCACTTGAG

DENV2_3_LEFT	ACATTGGTCACTTTCAAAAATCCCC
DENV2_3_RIGHT	TGAAGGGGATTCTGGTTGGA ACT
DENV2_4_LEFT	ATAGTGGTTGCGTTGTGAGCTG
DENV2_4_RIGHT	CGGCAGCACCACTTCTGTTATGA
DENV2_5_LEFT	TCATGCAGGCAGGAAAACGATC
DENV2_5_RIGHT	TCTCAAGAGTAGTCCAGCTGCA
DENV2_6_LEFT	TGGAAATCAGACCATTGAAAGAGAAAGA
DENV2_6_RIGHT	TGGTCAGTGTTTGTCTTCCTCTT
DENV2_7_LEFT	CCAATCCTGTCAATAACAATATCAGAAGAT
DENV2_7_RIGHT	TGATGGCTGGGGTTTGGTATCT
DENV2_8_LEFT	AGATCGAAGATGACATTTTCCGAAAGA
DENV2_8_RIGHT	CCCATGTATATGTACTGGTCATTTTCATT
DENV2_9_LEFT	ATGCCAGTGACCCACTCTAGTG
DENV2_9_RIGHT	CCACCACTGTGAGGATGGCTAT
DENV2_10_LEFT	ACCAGAAAAACAGAGAACACCCC
DENV2_10_RIGHT	CCACTTCCTGGATTCCACTTTTCT
DENV2_11_LEFT	GGAGCTGGACTTCTCTTTTCCAT
DENV2_11_RIGHT	GACGTCCCAAGGTTTTGTCAGC
DENV2_12_LEFT	AGAGCATGAAACATCATGGCACT
DENV2_12_RIGHT	GTGCCTCTTGGTGTGGTCTTT
DENV2_13_LEFT	TGGGACACAAGAATCACACTAGAAG
DENV2_13_RIGHT	CCGCACCATTGGTCTTCTCTTT

*Primers designed by the CADDE project (<https://www.caddecentre.org/>).

Supplementary Table 6. Members of Latin American Genomic Surveillance Arboviral Network.

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Supplementary Text File 1

Course “Nanopore-based genome sequencing technology for temporal investigation and epidemiology of dengue outbreak: training, research, surveillance, and scientific dissemination”

Recent progress in the sequencing of Ebola, Zika, and yellow fever viruses using Oxford Nanopore sequencing technology have shown that high quality complete genome sequences can be generated in real time during viral outbreaks and epidemics.¹⁻³ Portability and rapid production of data allows generation of genomes at the source of outbreaks, which in turn facilitate rapid intervention. Considering this and the strengthening of surveillance actions in Latin America, the Pan American Health Organization/World Health Organization (PAHO/WHO), together with the Brazilian Ministry of Health (BrMoH), planned the course entitled “Nanopore-based genome sequencing technology for temporal investigation and epidemiology of dengue outbreak: training, research, surveillance, and scientific dissemination”, under the coordination of Prof. Dr. Luiz Alcantara, researcher at Fundação Oswaldo Cruz (<https://portal.fiocruz.br/>).

The course took place in the city of Belo Horizonte, Minas Gerais state, from August 19 to 30, 2019 and it aimed at carrying out activities central to arbovirus genomic surveillance, focusing on the training of participants, dissemination of knowledge, and scientific communication. The course was taught by experienced researchers from national and international institutions, such as Oxford University (United Kingdom), University of KwaZulu-Natal (South Africa), Universidade Nova de Lisboa (Portugal), Sechenov First Moscow State Medical University (Russia), Oswaldo Cruz Foundation (Brazil), Federal University of Minas Gerais (Brazil), Federal University of Rio de Janeiro (Brazil), Federal University of Pernambuco (Brazil), University of São Paulo (Brazil), University of Brasilia (Brazil), State University of Feira de Santana (Brazil), and University of Salvador (Brazil). The course had 62 students from 34 national and international institutions. In addition to post-graduate students, course participants included laboratory technicians and health practitioners in universities and laboratories from several institutions responsible for laboratory-based surveillance of emerging and reemerging diseases, such as the Central Public Health Laboratories of the Brazilian states from the BrMoH's public laboratories network and public health laboratories from Paraguay, Argentina, Panama, Chile, Mexico, Uruguay, Costa Rica, and Ecuador.

The course lasted two weeks and comprised theoretical and practical classes focused on genomic surveillance of dengue (DENV1 and DENV2 serotypes), which was responsible for a large epidemic in

2019, accounting for 1,544,987 cases reported in Brazil.⁴ The first week of training addressed the genomic sequencing protocol using Nanopore technology and analysis of clinical and epidemiological data from selected samples collected in three Brazilian macro-regions (Midwest, Southeast, and Northeast), which historically has reported the largest incidences of dengue.⁵ In that stage, participants learned how to prepare DNA library and sequencing using the MinION portable sequencer (Oxford Nanopore Technologies). They were also trained on the generation of consensus sequences and genotyping using the Genome Detective tool (<https://www.genomedetective.com/>), on basic topics of epidemiological modeling, and epidemiological maps using R and QGIS software. The second week of the course focused on evolutionary analysis using the genome sequences of DENV1 and DENV2 generated in the previous week. Participants were trained in genomic data preparation, construction of genome dataset from public databases (such as Genbank and ViPR), genome alignment, alignment editing, phylogenetic reconstructions by Maximum Likelihood (ML) approach, in addition to temporal and phylogeographic inference using Bayesian approaches. Participants carried out preliminary epidemiological and evolutionary analyzes for the preparation of this manuscript.

Date: August 19-30, 2019

City: Belo Horizonte, Minas Gerais state, Brazil

Course hours: 96 hours (40h of theoretical classes and 56h of practical classes)

FUNDING

Pan American World Health Organization (PAHO/WHO) and Secretaria de Vigilância em Saúde (SVS)/Brazilian Ministry of Health.

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COURSE SCHEDULE

Day 1 – Monday – August 19, 2019 – Wet laboratories from Fundação Ezequiel Dias (FUNED)
(Coordinator: Ingra Morales)

08:00-09:00: Introduction to Nanopore-based sequencing technology. From sample handling to sequencing PCR. Lecturers: Ingra Morales e Jaqueline de Jesus (theory). Participants splitting into 3 classes of 12 students/class (A, B e C).

09:00-12:00: Library preparation:

Group A: DENV Library preparation from selected samples for group/class A. Lecturers: Jaqueline de Jesus, Flávia Sales, Valdinete Nascimento, and Flávia Chalhoub. (Theory and practice)

Group B: DENV Library preparation from selected samples for group/class B. Lecturers: Ingra Morales, Talita Adelino, Fernanda Nogueira, and Allison Fabri. (Theory and practice)

Group C: DENV Library preparation from selected samples for group/class C. Lecturers: Joilson Xavier, Mariane Menezes, Darlan Candido, and Felipe Iani. (Theory and practice)

12:00-13:00: Lunch time

13:00-16:00: DNA library preparation and sequencing on MinION. Wet lab at FUNED:

Group A: DNA library preparation and sequencing on MinION of samples from Group A. Lecturers: Jaqueline de Jesus, Flávia Sales, Valdinete Nascimento, and Flávia Chalhoub. (Theory and practice)

Group B: DNA library preparation and sequencing on MinION of samples from Group B. Lecturers: Ingra Morales, Talita Adelino, Fernanda Nogueira, and Allison Fabri. (Theory and practice)

Turma C: DNA library preparation and sequencing on MinION of samples from Group C. Lecturers: Joilson Xavier, Mariane Menezes, Darlan Candido, and Felipe Iani. (Theory and practice)

16:00-16:30: Coffee Break

16:30-17:00: Amphitheater at FUNED: Course presentation (Prof. Luiz Alcantara) and guests (Andre Abreu, Julio Croda, Wanderson Oliveira, Rodrigo Said, Carlos Eduardo Amaral Pereira da Silva, Dario Brock Ramalho, Maurício Santos, Marluce Oliveira, Gabriel Muricy, and Vinicius Silva)

17:00-17:30: Amphitheater at FUNED: Presentation of the coordination of the dengue surveillance group/DEVIT/SVS-MS and PAHO/WHO in Brazil. "Panorama and surveillance of dengue in the current outbreak in Brazil". Lecturer: Rodrigo Said

17:30-18:00: Amphitheater at FUNED: Historical overview of the dengue epidemic in Brazil. Lecturers: Rita Nogueira (speaker) and Ana de Filippis (moderator)

18:00-18:30: Amphitheater at FUNED: Genomic surveillance of arboviruses in Brazil and Paraguay.
Lecturer: Luiz Alcantara.

**Day 2 – Tuesday - August 20, 2019 – Computer room
(Coordinator: Wildo Navegantes)**

08:00-12:00: Basic concepts of “R” applied to studies of epidemiological modeling. Lecturers: Álvaro Salgado, Vagner Fonseca, Francielly Rodrigues, and Rodrigo Kato. (Theory)

12:00-13:30: Lunch time.

13:30-15:10: Basic concepts of “R” applied to studies of epidemiological modeling. Lecturers: Álvaro Salgado, Vagner Fonseca, Francielly Rodrigues, and Rodrigo Kato. (Theory and practice)

15:10-15:30: Coffee Break

15:30-17:00: Basic concepts of “R” applied to studies of epidemiological modeling. Lecturers: Álvaro Salgado, Vagner Fonseca, Francielly Rodrigues, and Rodrigo Kato. (Practice)

**Day 3 – Wednesday - August 21, 2019 – Computer room
(Coordinator: Renato Reis)**

08:00-12:00: Basic concepts of “R” applied to studies of epidemiological modeling. Lecturers: Álvaro Salgado, Vagner Fonseca, Francielly Rodrigues, and Rodrigo Kato. (Theory)

12:00-13:30: Lunch time.

13:30-15:10: Basic concepts of “R” applied to studies of epidemiological modeling. Lecturers: Álvaro Salgado, Vagner Fonseca, Francielly Rodrigues, and Rodrigo Kato. (Theory and practice)

15:10-15:30: Coffee Break

15:30-17:00: Basic concepts of “R” applied to studies of epidemiological modeling. Lecturers: Álvaro Salgado, Vagner Fonseca, Francielly Rodrigues, and Rodrigo Kato. (Practice)

**Day 4 – Thursday - August 22, 2019 – Computer room
(Coordinator: José Lourenço)**

08:00-12:00: Epidemiological modeling to predict outbreaks of arboviral diseases and estimation of epidemiological parameters of outbreaks. Lecturers: José Lourenço. (Theory)

12:00-13:30: Lunch time.

13:30-15:10: Epidemiological modeling to predict outbreaks of arboviral diseases and estimation of epidemiological parameters of outbreaks. Lecturers: José Lourenço, Erenilde Cerqueira, and Wildo Navegantes. (Theory and practice)

15:10-15:30: Coffee Break

15:30-17:00: Epidemiological modeling to predict outbreaks of arboviral diseases and estimation of epidemiological parameters of outbreaks. Lecturers: José Lourenço, Erenilde Cerqueira, and Wildo Navegantes. (Practice)

**Day 5 – Friday - August 23, 2019 – Computer room
(Coordinators: Wildo Navegantes and Renato Reis)**

08:00-12:00: Implementation of epidemiological maps from raw data, using "R" and "QGIS", and calculation of spatial and temporal determinants in arboviral infections. Lecturers: Renato Reis and Wildo Navegantes. (Theory)

12:00-13:30: Lunch time.

13:30-15:10: Implementation of epidemiological maps from raw data, using "R" and "QGIS", and calculation of spatial and temporal determinants in arboviral infections. Lecturers: Renato Reis, Wildo Navegantes, Isadora de Siqueira, and Maricélia Lima. (Theory and practice)

15:10-15:30: Coffee Break

15:30-17:00: Implementation of epidemiological maps from raw data, using "R" and "QGIS", and calculation of spatial and temporal determinants in arboviral infections. Lecturers: Wildo Navegantes, Renato Reis, Isadora de Siqueira, and Maricélia Lima. (Practice)

**Days 6 and 7 – Saturday and Sunday – August 24-25, 2019 – Computer room
(Coordinator: Luiz Alcantara)**

Generation of consensus sequences from MinION raw data. Lecturers: Vagner Fonseca, Álvaro Salgado, Marta Giovanetti, Ingra Morales, Flávia Aburjaile, and Rodrigo Dias de Oliveira Carvalho. (Practice)

Day 8 – Monday – August 26, 2019 – Computer room

08:00-12:00: Organization and alignment of genomes to reference sequences, and phylogenetic reconstruction: NJ and ML. Lecturers: Marta Giovanetti, Fernanda Nogueira, Luiz Alcantara, Flávia Aburjaile, and Rodrigo Dias de Oliveira Carvalho. (Theory and practice)

12:00-13:30: Lunch time.

13:30-15:10: Temporal evolutionary analyzes. Lecturers: Tiago Graf, Marta Giovanetti, Darlan Candido, and Jorlan de Jesus. (Theory and practice)

15:10-15:30: Coffee Break

15:30-16:30: Temporal evolutionary analyzes. Lecturers: Tiago Graf, Marta Giovanetti, Victor Pimentel, Jorlan de Jesus, and Flávia Aburjaile. (Practice)

16:30-17:30: “Genome Detective”, Viral Metagenomics and Online Viral Genotyping Tools. Lecturers: Vagner Fonseca, Ingra Morales, Marta Giovanetti, Flávia Aburjaile, and Rodrigo Dias de Oliveira Carvalho. (Theory)

Day 9 – Tuesday – August 27, 2019 – Computer room

08:00-12:00: Phylogeographic analysis. Lecturers: Tiago Graf, Marta Giovanetti, and Fernanda Nogueira. (Theory and practice)

12:00-13:30: Lunch time.

13:30-15:10: Phylogeographic analysis. Lecturers: Tiago Graf, Marta Giovanetti, and Fernanda Nogueira. (Theory and practice)

15:10-15:30: Coffee Break

15:30-16:10: “Genome Detective”, Viral Metagenomics and Online Viral Genotyping Tools. Lecturers: Vagner Fonseca, Ingra Morales, Marta Giovanetti, Flávia Aburjaile, and Rodrigo Dias de Oliveira Carvalho. (Theory)

16:10-18:00: Phylogeographic analysis. Lecturers: Tiago Graf, Marta Giovanetti, Darlan Cândido, and Fernanda Nogueira. (Practice)

Day 10 – Wednesday – August 28, 2019 – Amphitheater

08:00-12:00: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

12:00-13:30: Lunch time.

13:30-15:10: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

15:10-15:30: Coffee Break

15:30-17:00: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

17:00-18:00: Temporal clinical surveillance of dengue in Bahia and Brazil. Lecturers: Melissa Falcão and Rivaldo Venâncio.

Day 11 – Thursday – August 29, 2019 – Amphitheater

08:00-10:00: Surveillance of arboviral outbreaks through epidemiological and evolutionary temporal studies: putting the results in the format for a publication. Lecturers: Tulio de Oliveira, Tiago Graf, and Marta Giovanetti. (Theory and practice)

10:00-12:00: Surveillance of arboviral outbreaks through epidemiological and evolutionary temporal studies: putting the results in the format for a publication. Lecturers: Tulio de Oliveira, Tiago Graf, and Marta Giovanetti. (Theory and practice)

12:00-13:30: Lunch time.

13:30-15:10: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

15:10-15:30: Coffee Break

15:30-18:00: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

Day 12 – Friday – August 30, 2019 – Amphitheater

08:00-12:00: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

12:00-13:30: Lunch time.

13:30-15:10: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

15:10-15:30: Coffee Break

15:30-18:00: Preliminary epidemiological and evolutionary analyzes from the data generated during the course.

REFERENCES

- 1 Quick, J. *et al.* Real-time, portable genome sequencing for Ebola surveillance. *Nature* **530**, 228–232 (2016).
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- 3 Faria, N.R. *et al.* Genomic and epidemiological monitoring of yellow fever virus transmission potential. *Science* **361**, 894–899 (2018).
- 4 Brasil. Ministério da Saúde. Monitoramento dos casos de arboviroses urbanas transmitidas pelo *Aedes* (dengue, chikungunya e Zika), Semanas Epidemiológicas 01 a 52. 2020. <<https://www.saude.gov.br/images/pdf/2020/janeiro/20/Boletim-epidemiologico-SVS-02-1-.pdf>> (accessed May 20, 2020).
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