Supplementary Material Figure 1. Rio de Janeiro city population density (inhabitants/m²) (A) and green areas (B), by region and neighbourhood, 2010.

Maps were produced using QGIS (version 3.8.1). Sources: The Brazilian Institute of Geography and Statistics (IBGE) and Instituto Pereira Passos (IPP), Brazil.
Supplementary Material Figure 2. Detection of Zika cases clusters according to different temporal and spatial parameters using SaTScan™ (version 9.5). A) Default parameters. B) Maximum temporal window of 1 week. C) Maximum temporal window of 4 weeks. D) Maximum temporal window of 4 weeks and maximum of 5% of population at risk. E) Maximum temporal window of 4 weeks and maximum of 1% of population at risk.

Note: This is the standard output of results from SaTScan™. A neighbourhood was considered part of a cluster if its centroid was inside the base of the cylinder (the circle, in this figure). Maps were created using R (version 3.4.4) with ggplot2 package (version 3.1.0). Sources: Sistema de Vigilância de Agravos de Notificação (SINAN) – Ministry of Health, Brazil, and Instituto Pereira Passos (IPP), Brazil.
Supplementary material Table 1. Characteristics of dengue clusters between epidemiological weeks 31-2015 and 52-2016, Rio de Janeiro city, Brazil. Clusters are ordered according to the maximum log likelihood ratio, with 1 being the most likely cluster.

| Cluster | Time period (week) | Population | Observed cases | Relative risk |
|---------|--------------------|------------|----------------|--------------|
| 1       | 10 to 14-2016      | 312654     | 1082           | 15.66        |
| 2       | 12 to 16-2016      | 12556      | 431            | 151.90       |
| 3       | 13 to 17-2016      | 296392     | 911            | 13.82        |
| 4       | 13 to 17-2016      | 243125     | 650            | 11.91        |
| 5       | 13 to 17-2016      | 105515     | 458            | 19.21        |
| 6       | 12 to 16-2016      | 290744     | 613            | 9.37         |
| 7       | 13 to 17-2016      | 283141     | 447            | 6.97         |
| 8       | 13 to 17-2016      | 278828     | 377            | 5.96         |
| 9       | 12 to 16-2016      | 304235     | 359            | 5.19         |
| 10      | 12 to 16-2016      | 217333     | 232            | 4.68         |
| 11      | 10 to 14-2016      | 313429     | 264            | 3.69         |
| 12      | 13 to 17-2016      | 94626      | 143            | 6.61         |
| 13      | 16 to 20-2016      | 225030     | 193            | 3.75         |
| 14      | 14 to 18-2016      | 3361       | 34             | 44.10        |
| 15      | 14 to 18-2016      | 315314     | 197            | 2.73         |
| 16      | 52-2015 to 4-2016  | 101443     | 89             | 3.83         |
| 17      | 12 to 16-2016      | 311869     | 151            | 2.11         |
| 18      | 12 to 14-2016      | 69356      | 29             | 3.64         |
Supplementary material Figure 3. Relative risks of clusters of (A) dengue, (B) chikungunya, and (C) Zika cases, detected between epidemiological weeks 30-2015 and 03-2017 in Rio de Janeiro city, Brazil.

Maps were created using R (version 3.4.4) with ggplot2 package (version 3.1.0). Sources: Sistema de Vigilância de Agravos de Notificação (SINAN) – Ministry of Health, Brazil, and Instituto Pereira Passos (IPP), Brazil.
Supplementary material Figure 4. Week of cluster detection for (A) dengue, (B) chikungunya, and (C) Zika cases, in Rio de Janeiro city, Brazil.

Maps were created using R (version 3.4.4) with ggplot2 package (version 3.1.0). Sources: Sistema de Vigilância de Agravos de Notificação (SINAN) – Ministry of Health, Brazil, and Instituto Pereira Passos (IPP), Brazil.
Supplementary material Table 2. Characteristics of chikungunya clusters between epidemiological weeks 31-2015 and 52-2016, Rio de Janeiro city, Brazil. Clusters are ordered according to the maximum log likelihood ratio, with 1 being the most likely cluster.

| Cluster | Time period (week) | Population | Observed cases | Relative risk |
|---------|--------------------|------------|----------------|--------------|
| 1       | 13 to 17-2016      | 154001     | 453            | 25.77        |
| 2       | 12 to 16-2016      | 210786     | 434            | 18.00        |
| 3       | 16 to 20-2016      | 312654     | 448            | 12.53        |
| 4       | 16 to 20-2016      | 314738     | 442            | 12.28        |
| 5       | 16 to 20-2016      | 268781     | 397            | 12.87        |
| 6       | 14 to 18-2016      | 296540     | 332            | 9.71         |
| 7       | 19 to 23-2016      | 284673     | 256            | 7.75         |
| 8       | 15 to 19-2016      | 243125     | 237            | 8.40         |
| 9       | 16 to 20-2016      | 309599     | 243            | 6.76         |
| 10      | 16 to 20-2016      | 105515     | 128            | 10.38        |
| 11      | 16 to 20-2016      | 314444     | 171            | 4.66         |
| 12      | 16 to 20-2016      | 119297     | 105            | 7.52         |
| 13      | 19 to 20-2016      | 54415      | 32             | 19.99        |
| 14      | 19 to 23-2016      | 277454     | 98             | 3.01         |
| 15      | 17 to 20-2016      | 251142     | 57             | 2.57         |
Supplementary material Table 3. Characteristics of Zika clusters between epidemiological weeks 31-2015 and 52-2016, Rio de Janeiro city, Brazil. Clusters are ordered according to the maximum log likelihood ratio, with 1 being the most likely cluster.

| Cluster | Time period (week) | Population | Observed cases | Relative risk |
|---------|--------------------|------------|----------------|---------------|
| 1       | 52-2015 to 4-2016  | 179689     | 742            | 13.57         |
| 2       | 49-2015 to 1-2016  | 236282     | 509            | 7.03          |
| 3       | 12 to 16-2016      | 247427     | 497            | 6.55          |
| 4       | 1 to 5-2016        | 309349     | 545            | 5.75          |
| 5       | 13 to 17-2016      | 307234     | 488            | 5.18          |
| 6       | 50-2015 to 1-2016  | 277724     | 404            | 6.31          |
| 7       | 7 to 11-2016       | 119297     | 307            | 8.36          |
| 8       | 49-2015 to 1-2016  | 294447     | 429            | 4.74          |
| 9       | 6 to 10-2016       | 231774     | 379            | 5.32          |
| 10      | 15 to 18-2016      | 297833     | 359            | 5.22          |
| 11      | 48 to 52-2015      | 298052     | 362            | 3.94          |
| 12      | 3 to 7-2016        | 233051     | 315            | 4.39          |
| 13      | 6 to 10-2016       | 203170     | 293            | 4.68          |
| 14      | 6 to 10-2016       | 306508     | 357            | 3.78          |
| 15      | 50-2015 to 2-2016  | 72058      | 105            | 4.71          |
Supplementary material Table 4. Characteristics of clusters of dengue, chikungunya, and Zika detected using multivariate scan statistic, between epidemiological weeks 31-2015 and 52-2016, Rio de Janeiro city, Brazil. Clusters are ordered according to the maximum log likelihood ratio, with 1 being the most likely cluster.

| Cluster | Time period (week) | Population | Dengue relative risk | Chikungunya relative risk | Zika relative risk |
|---------|--------------------|------------|----------------------|---------------------------|-------------------|
| 1       | 12 to 16-2016      | 154001     | 21.16                | 25.30                     | 7.66              |
| 2       | 13 to 17-2016      | 307234     | 13.50                | 8.04                      | 5.18              |
| 3       | 10 to 14-2016      | 312654     | 15.66                | 2.86                      | 3.27              |
| 4       | 12 to 16-2016      | 290744     | 9.37                 | 6.81                      | 4.11              |
| 5       | 52-2015 to 4-2016  | 179689     | 1.28                 | NA                        | 13.57             |
| 6       | 13 to 17-2016      | 243125     | 11.91                | 5.32                      | 1.18              |
| 7       | 14 to 18-2016      | 105515     | 19.04                | 7.93                      | 1.93              |
| 8       | 13 to 17-2016      | 306968     | 6.27                 | 8.86                      | 3.58              |
| 9       | 12 to 16-2016      | 285585     | 5.22                 | 6.84                      | 3.90              |
| 10      | 49-2015 to 1-2016  | 236282     | NA                   | NA                        | 7.03              |
| 11      | 17 to 21-2016      | 309599     | 4.61                 | 6.14                      | 1.40              |
| 12      | 1 to 5-2016        | 301626     | 2.38                 | NA                        | 4.98              |
| 13      | 7 to 11-2016       | 119297     | 1.09                 | NA                        | 8.36              |
| 14      | 3 to 7-2016        | 233051     | NA                   | NA                        | 4.39              |
| 15      | 6 to 10-2016       | 306508     | 1.02                 | NA                        | 3.78              |
| 16      | 50-2015 to 2-2016  | 72058      | 1.33                 | NA                        | 4.71              |
Supplementary material Figure 5. (A) Minimum temperature (°C) and (B) precipitation (mm/month) in Rio de Janeiro city, Brazil, at the monthly time scale from January 2001 to December 2017.

Figures created using R (version 3.5.2). Abatzoglou, J.T., S.Z. Dobrowski, S.A. Parks, K.C. Hegewisch, 2018, Terraclimate, a high-resolution global dataset of monthly climate and climatic water balance from 1958-2015, Scientific Data.