Supplemental Material

Assessment of the Probability of Autochthonous Transmission of Chikungunya Virus in Canada under Recent and Projected Climate Change

Victoria Ng, Aamir Fazil, Philippe Gachon, Guillaume Deuymes, Milka Radojević, Mariola Mascarenhas, Sophiya Garasia, Michael A. Johansson, and Nicholas H. Ogden

Table of Contents

Figure S1  Comparison between the bias-corrected data from CRCM5-CanESM2-RCP4.5 and CRCM5-CanESM2-RCP8.5 with data from other RCMs and their ensemble mean.

Figure S2  Risk categories for autochthonous CHIKV transmission by Ae. albopictus in Canada derived from combining the climatic suitability for CHIKV transmission potential (R₀) with the climatic suitability for the presence of Ae. albopictus (SIG index) using the 75th percentile value of R₀ distributed across temperature range 10°C to 40°C as the cut-off.

Figure S3  Risk maps for autochthonous CHIKV transmission in Canada based solely on CHIKV transmission potential (R₀) using the 75th percentile value of R₀ distributed across temperature range of 10°C to 40°C as the cut-off.

Figure S4  Duration in months where mean R₀ >1.0 (mean monthly temperature between ≥22.8°C and 33.6°C) in Canada based solely on CHIKV transmission potential (R₀) using the 75th percentile value of R₀ distributed across temperature range 10°C to 40°C as the cut-off.
Figure S5  Risk maps for autochthonous CHIKV transmission in Canada combining the climatic suitability for CHIKV transmission potential ($R_0$) with the climatic suitability for the presence of *Ae. albopictus* (SIG index) using the 75th percentile value of $R_0$ distributed across temperature range 10°C to 40°C as the cut-off.

Figure S6  Duration in months for potential autochthonous CHIKV transmission in Canada combining the climatic suitability for CHIKV transmission potential ($R_0$) with the climatic suitability for the presence of *Ae. albopictus* (SIG index) using the 75th percentile value of $R_0$ distributed across temperature range 10°C to 40°C as the cut-off.
**Figure S1** Comparison between the bias-corrected data from CRCM5-CanESM2-RCP4.5 and CRCM5-CanESM2-RCP8.5 with data from other RCMs and their ensemble mean.

The figures in Figure S1 show the monthly mean of climate change for one month in winter (January) and the three summer months (June, July and August). We used two distinct future period (2011-2040) and (2041-2070) with respect to the historical reference period (1971-2000). The y-axis is for temperature and x-axis for total precipitation. For each RCM, climate change signal is computed by making the absolute difference between the future and the current climatological mean.

Filled circle symbols represent maximum temperature and hollowed circle symbols represent minimum temperature. The black triangle represents the ensemble RCM mean. The star symbols represent the climate change signal calculated with CRCM5 driven both by CanESM2-RCP4.5 and CanESM2-RCP8.5 with bias correction (corrected using the Linear Scaling approach). The Linear Scaling approach adjusts RCM time series with correction values based on the relationship between long-term mean monthly observed values (30-year climatological data over the period 1976-2015) and RCM control run values. This control run corresponds to the CRCM5 model driven by CanESM2 global climate model.
Figure S2  Risk categories for autochthonous CHIKV transmission by *Ae. albopictus* in Canada derived from combining the climatic suitability for CHIKV transmission potential (R₀) with the climatic suitability for the presence of *Ae. albopictus* (SIG index) using the 75th percentile value of R₀ distributed across temperature range 10°C to 40°C as the cut-off.

| CHIKV transmission potential (R₀) | Corresponding temperature | Climatic suitability for the presence of *Aedes albopictus* (SIG index) |
|----------------------------------|---------------------------|---------------------------------------------------------------|
|                                 |                           | Very unsuitable | Moderate | High | Very high | Totally suitable |
| R₀ ≤ 0.5                        | 10°C to < 19.8°C and ≥36.5°C | <66.7          | ≥66.7 - <75 | ≥75 - <85 | ≥85 - <95 | ≥95 - 100 |
| 0.5 < R₀ ≤ 0.7                  | ≥19.8°C to <20.7°C and ≥35.5°C to <36.5°C | <66.7          | ≥66.7 - <75 | ≥75 - <85 | ≥85 - <95 | ≥95 - 100 |
| 0.7 < R₀ ≤ 0.9                  | ≥20.7°C to <21.5°C and ≥34.8°C to <35.5°C | <66.7          | ≥66.7 - <75 | ≥75 - <85 | ≥85 - <95 | ≥95 - 100 |
| 0.9 < R₀ ≤ 1.0                  | ≥21.5°C to <21.8°C and ≥34.5 to <34.8°C | <66.7          | ≥66.7 - <75 | ≥75 - <85 | ≥85 - <95 | ≥95 - 100 |
| R₀ > 1.0                        | ≥21.8°C to <34.5°C         | <66.7          | ≥66.7 - <75 | ≥75 - <85 | ≥85 - <95 | ≥95 - 100 |

Overall CHIKV suitability risk categories: Unsuitable | Rather unsuitable | Partly suitable | Rather suitable | Suitable
Figure S3  Risk maps for autochthonous CHIKV transmission in Canada based solely on CHIKV transmission potential ($R_0$) using the 75th percentile value of $R_0$ distributed across temperature range of 10°C to 40°C as the cut-off.

**Recent climate (1981-2010)**

**Short-term projected climate (2011-2040)**

**Long-term projected climate (2041-2070)**

| Chikungunya virus transmission potential ($R_0$) | RCP4.5 | RCP8.5 | RCP8.5 |
|------------------------------------------------|--------|--------|--------|
| $R_0 \leq 0.5$                                  |        |        |        |
| $0.5 < R_0 \leq 0.7$                             |        |        |        |
| $0.7 < R_0 \leq 0.9$                             |        |        |        |
| $0.9 < R_0 \leq 1.0$                             |        |        |        |
| $R_0 > 1.0$                                      |        |        |        |
Figure S4 Duration in months where mean $R_0 > 1.0$ (mean monthly temperature between $\geq 22.8^\circ C$ and $33.6^\circ C$) in Canada based solely on CHIKV transmission potential ($R_0$) using the $75^{th}$ percentile value of $R_0$ distributed across temperature range $10^\circ C$ to $40^\circ C$ as the cut-off.

**Recent climate (1981-2010)**

**Short-term projected climate (2011-2040)**

**Long-term projected climate (2041-2070)**

**Number of months where $R_0 > 1.0$**

- 0
- 1 (July)
- 2 (July and August)
- 3 (June to August)
- 4 (June to September)
Figure S5  Risk maps for autochthonous CHIKV transmission in Canada combining the climatic suitability for CHIKV transmission potential ($R_0$) with the climatic suitability for the presence of *Ae. albopictus* (SIG index) using the 75th percentile value of $R_0$ distributed across temperature range 10°C to 40°C as the cut-off.
Figure S6  Duration in months for potential autochthonous CHIKV transmission in Canada combining the climatic suitability for CHIKV transmission potential ($R_0$) with the climatic suitability for the presence of *Ae. albopictus* (SIG index) using the 75th percentile value of $R_0$ distributed across temperature range 10°C to 40°C as the cut-off.

**Recent climate (1981-2010)**

**Short-term projected climate (2011-2040)**

**Long-term projected climate (2041-2070)**

**Number of months of climatic suitability for Chikungunya transmission**

- 0
- 1 (August)
- 2 (July and August)