Determining role of air temperature in predicting and controlling COVID-19 risk levels anywhere anytime using multiple modelling analyses

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Abstract

COVID-19 is a pandemic with no cure. There is an urgent need for low-cost interventions. Macroclimate work through affecting microclimate. In many situations, man-made microclimate, such as air conditioning, may override the effect of natural macroclimate in determining SARS-CoV-2 pathogenicity. Ambient temperature (AT) has been roughly associated to SARS-CoV-2 transmission. To translate into a feasible practice in controlling COVID-19 pandemic, in-depth and implementable knowledge of AT role in SARS-CoV-2 transmission should be unveiled. This study aimed to determine if there is a 'safe' temperature that is comfortable to human beings while significantly inhibitory for SARS-CoV-2 pathogenicity. Data on monthly new deaths or new cases per million population (MDPM or MCPM) and monthly cumulated days with more cases than the previous day (DI) from March 2 to June 30, 2020 were collected from all 118 countries with population over five million. Monthly average AT negatively correlated with the transmission parameters. A significant decrease in transmission was observed when AT reached above 20 ºC. Monthly average (not average high) AT of countries with MDPM <2, MCPM<10, or DI<=7 was found to be between 24.54 and 26.89 °C (25.18 °C on average) with average standard error of 4.81. Thus, average AT <20, 20-25, >25 °C were considered as high, medium, and low risk AT. Furthermore, MDPM in countries with AT <20 °C were 80.93, 50.23, 13.52, and 5.05 times of those in countries with AT >25 °C in March, April, May, and June, respectively. MDPM low-risk rates (<2) in countries with AT >25 °C were 100, 83.33, 52.73, and 52.46%, respectively. In countries with AT <20 °C, the trends were opposite. Setting indoor temperature to 25 °C could decrease the need of social distancing for containing SARS-CoV-2 transmission. Ventilation and sanitizing the air with ultraviolet light in nonbusiness hours may be additionally effective. Cooling indoor temperature too low may be a reason of COVID-19 outbreak in some high AT countries. Authorities and the general population can evaluate COVID-19 risk level and manipulate microclimate to reduce the risk anywhere anytime based on local day average AT.

Key words: COVID-19, SARS-CoV-2, ambient temperature, risk level, mortality

Highlights

- General person can evaluate COVID-19 risk anywhere anytime based on local temperature
- General person can manipulate microclimate to reduce COVID-19 risk anywhere anytime
- Cooling indoor temperature too low may be a reason of COVID-19 outbreak in some high AT countries
- An ambient temperature above 25 °C significantly contains SARS-CoV-2 pathogenicity
- Countries with ambient temperature above 20 °C face significantly decreased COVID-19-induced deaths

- Ambient temperature <20, 20-25, >25 ºC are high, medium, and low risk for COVID-19

1. Introduction

Novel coronavirus disease (COVID-19) has killed over 520,000 individuals globally. It may never go away, even with a vaccine. Severe COVID-19 is mainly an adult respiratory distress syndrome (ARDS) caused by SARS-CoV-2 virus. Therapeutic options for either viral diseases or ARDS are limited. Thus, till the development and availability of the vaccine or acquirement of herd immunity, decreasing the survival time of SARS-CoV-2 in the environment and preventing the spread of virus to susceptible people are the most effective approaches to prevent the disease[1].

In the battle between the causative agent of the disease and body's defense mechanism, the outcomes vary, ranging from disease-free, asymptomatic state to mild, severe, or deathly illness. While the basic characteristics of the disease are determined by the causative agent, the pathogenicity of disease is affected by numerous natural or social conditions, also called precipitating factors. In many situations, the precipitating factors determine the onset and development of a disease. For an infection disease like COVID-19, precipitating factors may affect a pathogen at various stages including reproduction, survival, or reaching host. When a precipitating factor becomes strong enough, it may dominantly control the virus' pathogenicity.

Social distancing has been demonstrated as an effective approach in containing SARS-CoV-2 transmission [1]. However, it is unsustainable because of its burden on economy and daily life activities [2,3]. Therefore, a less costly and more acceptable approach is urgently needed.

Ambient temperature (AT) is a seasonal and controllable natural factor. AT has been found to be associated with transmission of, influenza, and many other viruses [4,5]. For example, seasonal cycles are known to play a crucial role in the transmission of the common cold and flu. They usually reach epidemic in winters. The transmission by SARS-CoV-1 and SARS-CoV-2 also occur in the winters. Several studies have revealed that AT is negatively associated with COVID-19 transmission. It is possible that higher temperature is needed to contain SARS-CoV-2 pathogenicity than its peer coronaviruses. Most of our lives in the developed world are spent indoors. Overlap between SARS-CoV-2 transmission-favorable temperatures and common air-conditioned temperatures in business facilities could facilitate COVID-19 transmission. Heating and air conditioning are common utilities in many COVID-19 outbreak countries. The COVID-19 spreading from a wholesale meat and seafood market in Beijing and a meat plant in Germany in the past few days are fresh examples showing the importance of managing indoor temperature in business facilities because high end fresh seafood shops and meat plants use ice and cooling systems to keep room temperature down, usually lower than 20ºC. We expect the transmission outside the market in Beijing would be self-limited because of high AT. India is considered as an example that SARS-CoV-2 can transmitted in high ambient temperature because its total case (absolute) spike recently and is among the top five countries, although its population-adjusted rank of total deaths is 75th country worldwide as of June 30, 2020 (https://www.statista.com). Because 60.1% of its case cluster in three states with high slum living population, and cooling system become more popular in the past few years in Indian cities, even in the slum, due to summer heat wave, cooling system that turns room temperature down to SARS-CoV-2 transmittable temperature plus short social distance in slum living may contribute the outliner transmission pattern in India. Similar situation was noted in the dormitories of migrant workers in Singapore and United Arab Emirates. Thus, it is important to determine an AT that could contain SARS-CoV-2 transmission while providing human comfort because macroclimate works through microclimate. In many situations, man-made microclimate may override the effect of natural macroclimate.

In the present study, we aimed to identify a temperature comfortable to human beings while significantly inhibitory for SARS-CoV-2 transmission which may lower the risk of COVID-19 transmission. Data were collected from all 118 countries with population over five million and analyzed. In its important to notice that fluctuation range of AT in a single country or a region may not be large enough to unveil the real secret of SARS-CoV-2 transmission. In addition, we hypothesized that the AT may be used to classify risk level of a region and general people may predict and control COVID-19 risk based on local AT. This will also facilitate government bodies to use this criteria to identify, plan, respond to, and reduce the impact of COVID-19 in their entities. Printable heat maps for monthly (January to December) COVID-19 risk levels of all countries, major world cities, and subnational entities of representative countries can be provided for convenience. Surfing seasonal change of AT and conditioning temperature indoor would be a low cost and easy to implement approach in containing COVID-19 pandemic. Of course, when other precipitating factors are extremely strong too, the effectiveness of controlling AT could be limited. Ventilation and sanitizing the air with ultraviolet light in nonbusiness hours may be additionally effective.

2. Materials and Methods

2.1 Data collection

The relationship between monthly average ambient temperature and three epidemic parameters, including monthly data of new cases and new deaths per million population (MCPM and MDPM), or the total number of days with more cases than previous days (DI), were analyzed separately. Data for new cases and new deaths, from March 2 to June 30, 2020 for all 118 countries with population over five million were collected from the WHO daily COVID-19 situation reports (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports). Countries with population less than five million were excluded because their data may be affected by foreign visitors. Data about subnational divisions of representative countries for the same period were downloaded from the data repository for the 2019 Novel Coronavirus Visual Dashboard operated by the Johns Hopkins University Center for Systems Science and Engineering (https://github.com/). Monthly average ATs in 2019 for all countries were collected from Meteomanz.com (http://www.meteomanz.com/index?l=1) which is managed by the World Meteorological Organization (WMO). Using MATLAB R2020a (The MathWorks, Inc, Natick, MA), monthly average ATs in capitals of subnational divisions of representative countries were collected from National Oceanic and Atmospheric Administration U.S. Department of Commerce (NOAA) and used to represent the monthly temperatures of corresponding subnational subdivisions. The temperature data for 2019 were used throughout the study because those were the last available data. For comparison, data of the first day of March and the last day of May were excluded so that data of each month is for 30 days. A country was selected as a representative country based on its large intra-national climate diversity or specialty in COVID-19 epidemic. These were Argentina, Brazil, Canada, China, India, Italy, Russian, Sweden, and the United States.

160 major world cities were determined by two difference sources. First, the top 120 world cities (not including the United States and Canadian cities) and top 20 most popular cities in the United States and Canada listed by World Geography and United States Geography of InfoPlease (www.infoplease.com) were included. All 20 cities that were not in the above lists but belong to top 50 most popular cities in the world were added (https://www.worldatlas.com/citypops.htm).

2.2 Data analysis

The linear correlation coefficient of the two data sets, using monthly country data in March, April and May, between AT and MCPM, MDPM, or DI were calculated using Excel (Microsoft, Corporation, Redmond, Washington, United States). Nonlinear curve fitting between AT and the three epidemic parameters were performed using R software (version 3.6 .1, Lucent Technologies) for each month with 95% confidence intervals provided. Line chart of semi-monthly data between AT and MDPM were performed to see the moving trend of the outbreak from March 2 to June 30 in the 118 analyzed countries.

2.3 Rationale for setting low risk criteria for descriptive analysis

MDPM below two, MCPM below ten, and DI less than seven days were considered low risk in the descriptive analysis. When setting the criteria, COVID-19 is evaluated among the burden of all diseases. MDPM is believed to be the most reliable data because case-related data would be affected by the test capacity of the country and willingness of the individuals. A death rate less than two per million would be 43rd cause of death (after meningitis) according to WHO death data in 2016 (nearest available year). MCPM below ten was considered low risk because the average case fatality rate (CFR) of top the fifteen countries by CFR in May was 20.65 ± 6.73%. 20.65% of ten is approximately two, which is equivalent to MDPM<2. The reason that CFR was low may be low test rate in these fifteen countries. Low test rate would lead to higher CFR. Thus, MCPM<10 is low risk in the criteria MDPM<2 even in highest CFR countries. Theoretically, when new case-increased days (vs. previous days) are less than new case-decreased days, the epidemic would ease. Therefore, if the days with increased new cases than the previous day were less than 1/4 of the total days in a month i.e. seven days, DI was considered low risk.

2.4 Establishment of ambient temperature criteria for high, medium, and low risks

For each of the above four parameters, the average AT of the low-risk countries in March, April, May, and the first half of June were calculated. Average AT related to MDPM for March were excluded because many countries did not have any mortality cases yet. The remaining 11 AT were averaged (AT-M) and standard deviation (AT-SD) was calculated. Because AT is negatively correlated to epidemic according to our analysis and existing literature, AT higher than AT-M was considered low risk. The AT between AT-M and AT-M minus mean of AT-SD was considered medium risk. AT lower than AT-M minus mean of AT-SD was considered high risk.

2.5 Evaluation of accuracy of the risk classification criteria retrospectively

Based on the AT classification criteria, each country was allocated into corresponding categories of high, medium, and low risk. Match rates for March, April, May, and June were calculated separately. Reflection points of fitting curves between AT and each of the three epidemic parameters were observed to see if they were consistent with AT criteria. The match rates between AT-based risk allocation result and real risk levels based on MDPM were calculated. As previously stated, MDPM<2 is considered low risk. Here, MDPM>5 was considered high risk, ranking COVID-19 as the top 20th death cause in the world just after breast cancer. MDPM between two-five was considered as medium risk. The reason of using MDPM is that, among the three parameters analyzed, MDPM is the most reliable data. In addition to percentage match rate, corresponding MDPM of high, medium, and low risk AT were compared.

2.6 Monthly risk sheets for all countries, major world cities and subnational divisions of representative countries

According to AT classification criteria, monthly (January to December) COVID-19 risk levels were determined for all 187 countries in the world, 160 major world cities and subnational entities of representative countries.

3. Results

3.1 COVID-19 epidemic parameters are negatively correlated to ambient temperature

MDPM and MCPM were persistently negatively related to AT from March through June. However, the linear correlation coefficient is smaller than 0.49, indicating the negative relation was not linear. DI was negatively correlated to AT in two of the four months (Supplemental Table 1).

3.2 Continued curve fitting showed that the epidemic parameters decreased significantly at 20 ºC

Nonlinear curve fitting between AT and the three epidemic parameters in March, April, May, and June were performed separately. As shown in Figure 1, all the 12 nonlinear curve lines had a reflection point at approximately 20 ºC that showed significantly decrease in the epidemic incidence (Fig. 1).

3.2 Average AT and average standard deviation of low risk countries

Monthly average AT and standard deviation of three categories of low risk countries in March, April, May, and June were determined by the criteria described previously. MDPM in March, which was 21.35±8.22 ºC, was excluded because many countries did not observe any deaths yet. The remaining eight monthly average AT were between 24.54 and 26.89 ºC (25.18 ºC on average). The average of the 11 standard deviation is 4.81 (Table 1).

3.4 Determining AT criteria for high, medium, and low risk levels

The monthly average AT of 25.18 ºC consistently determined by three categories of low risk countries. Thus, 25 ºC served as standard of low risk. Because AT is negatively related to risk level, AT above 25 ºC was considered low risk. One standard deviation (4.81) down from the low risk AT was considered medium risk. Thus, temperature between 20-25ºC was considered medium risk. Temperature below 20 ºC was high risk AT. Consistently, all curve fitting results showed that the epidemic incidence decreased significantly when AT was above 20 ºC.

3.5 The risk level classification system accurately represented the real COVID-19 pandemic in the past three months

Using our risk classifying system to analyze March, April, May, and June data retrospectively, the MDPM low-risk rates (<2) of the four months in countries with AT >25 ºC were 100 (42/42), 83.83 (40/48), 52.73 (29/55) and 52.46% (32/61), respectively. In countries with AT<20 ºC, the trends were opposite. The high-risk rates in March, April, May, and June were 25.93 (14/54), 63.46 (33/52), 73.81% (31/42), and 61.54% (16/26), respectively, and the low-risk rates of the four months were 59.26 (32/54), 26.93 (14/52), 19.05% (8/42), and 23.08 (6/26), respectively (Fig. 2a).

The MDPM in countries with AT<20 ºC were 80.93, 50.23, 13.52 and 5.05 times of those in countries with AT >25 ºC in March, April, May and June, respectively (Fig. 2b). In May, daily average air temperatures approaches 20 ºC and above in many north hemisphere countries whereas it tends to decrease to 20 ºC and below in many south hemisphere countries. Line chart of semi-monthly data between AT and MDPM or MCPM showed that the new deaths and cases caused by COVID-19 decreased significantly in many north hemisphere countries, especially in European countries and the United States, and increased significantly in south hemisphere countries, especially in Brazil, Chile, and Peru (Fig. 3).

3.6 Monthly risk sheets for all countries, major world cities and subnational divisions of representative countries

Monthly (January to December) COVID-19 risk levels of all 187 countries, 160 major world cities, and subnational entities of Argentina, Brazil, Canada, China, India, Italy, Russian, Sweden, and the United States are shown in Figures 4 and 5 and Supplemental Figures S1-S9. For geographically large countries, subnational heat map was more accurate because there is a huge difference in AT among subnational entities. Furthermore, one can predict risk level anytime anywhere using our AT classification criteria.

4. Discussion

All observational and modeling studies to date indicated that the SARS-CoV-2 could produce a substantial outbreak regardless of the season [5,6]. The purpose of this study was to determine an AT that is comfortable for human as well as diminishing for SARS-CoV-2 transmission. However, isolating the effect of AT on COVID-19 transmission is difficult because the epidemic data is sometimes distorted by social distancing and air conditioning [1,3,7]. It is unlikely to adopt social interventions in countries when COVID-19 epidemicity is low. There are many countries that i. had high AT in March, April, and May, ii. experienced low COVID 19 epidemicity (and therefore were unlikely to respond with social distancing measures) and iii. were economically disadvantaged (indicating prevalence of air conditioning is low). This suggested that AT could play a role in inhibiting COVID-19 transmission, and data from these countries was especially useful in isolating the relationship between AT and COVID-19 transmission.

Using multiple epidemic parameters and analysis methods, the relationship between AT and epidemic dynamics were analyzed. All the results consistently showed AT above 25 ºC as low risk for SARS-CoV-2 transmission. Nonlinear curve fittings of all three epidemic parameter showed 20 ºC as the temperature that significantly decreased SARS-CoV-2 transmission. Retrospectively analysis showed that the low risk rates in countries with AT >25 ºC were high. In contrast, countries with AT <20 ºC were more at high-risk. The situation of countries with AT between 20-25 ºC was closer to that observed in countries with AT >25 ºC. Most countries with AT >25 ºC that were not in low risk had some regions with AT below 25 ºC. However, in United Arab Emirates, AT was higher than 25 ºC throughout the country in both April and May while MDPM was observed to be in high risk category in both the months. The reason for this discrepancy is not known although we noticed that it differs from other countries with AT >25 ºC in two aspects that may affect the transmission dynamics. It is a high -income country and has more visitors and migrant workers than their own nationals. Importantly, although the total cases and deaths per million population is high, CFR of the country is low (<0.85%). Similarity, several other countries with AT >25 ºC such as, Singapore and Oman, though were not in the list of high risk in term of MDPM, had high MCPM. In addition, these countries had even lower CFR (<0.50%).

The accuracy was also proven by two other ways. First, MDPM in countries with AT <20 ºC was 5.05 to 80.93 times more than that in countries with AT >25 ºC. Second, in May, SARS-CoV-2 transmission dynamic decreased in many north hemisphere countries because AT increased to 20 ºC or above. The transmission increased in many south hemisphere countries because AT decreased to 20 ºC or less**.** Furthermore, the accuracy of our conclusion may be undermined by countries such as China, Japan and Korea because strict social interventions in these countries distorted the data by turning high risk countries into low risk countries. Thus, using AT >25 ºC as a cut-off criterion for low risk is reliable. The safe temperature is independent of environmental temperature and viral mutation because the safe temperature mined from data of all the three months are the same.

We aimed to determine if there is an AT range that significantly contained SARS-CoV-2 pathogenicity. However, our study is not without limitation. First, because only single factor is analyzed, other natural and social factors not integrated into our model may affect the results, if they are in the extreme conditions. Social distancing has been proven to be effective in controlling SARS-CoV-2 pathogenicity. Extreme short social distance, such as those living in slums, may facilitate the virus transmission before high AT inhibits SARS-CoV-2 pathogenicity. Humidity also negative impacts the SARS-CoV-2 pathogenicity. In desert countries, the possible low risk AT may be higher. Second, AT may vary region-wise within a country or even within a subnational entity. Thus, people should evaluate risk level based on the real local AT. Besides, people migrating within a country may flatten transmission dynamic within a country. Thus, in a country with national monthly average temperature around 20 or 25 ºC, low AT areas may have more impact on national transmission dynamics. In addition, the effect of AT below 0ºC is not evaluated because the number of countries with AT < 0ºC is too less to be analyzed. Our criteria will have to be tailored to local conditions and updated as more accurate data become available. When other precipitating factors, such as social distance and humidity, become extremely favor to SARS-CoV-2 pathogenicity, the effectiveness of controlling AT could be limited. Even with all these limitations, our classification system is practical because all the above scenarios that distract the accuracy are uncommon and noticeable.

Determining the safe (low risk) AT has great potential in controlling COVID-19 pandemic while minimizing the restrictions on the daily life activities as well as burden on country's economic state [3]. Temperature sensitivity of SARS-CoV-2 pathogenicity indicates high seasonal variation in transmission. By surfing the wave of seasonal temperature change, intermittent instead of prolonged social interventions can be adopted to reduce adverse effects resulting from the interventions.

The optimal goal of finding safe AT is to control the transmission without the costly interventions or virtual elimination of SARS-CoV-2 transmission. Comfortable temperature varies from person to person due to metabolic rate, clothing insulation, radiant temperature, air speed, humidity, and psychological state (http://fh.almas-hvac.ir/download/ASHRAE_Thermal_Comfort_Standard.pdf). In the present study, we found that tuning indoor temperature to 25 ºC could be a potential low-cost intervention in reducing the spread of SARS-CoV-2 infection. It is possible to set room temperature at 25ºC instead of 20-22ºC in many offices and commercial spaces. Moderate ventilation or using fan may be used to increase comfort for those who prefer temperature at 20-22ºC. Other methods, such as ultraviolet light and ventilation in non-business hours may decrease virus retention in indoor spaces.

Thus, our result indicates that the transmission and CFR may be controlled to a level that social intervention is not necessary by heating room temperature up to 25ºC when AT is low and cooling room temperature downward to but not lower than 25ºC when AT is high. Because high AT decreases the initial viral load that an infected person receives, the battling balance of SARS-CoV-2 and the body may shift from severe and fatal infection to mild and asymptomatic infection. With the increase in the percentage of mild and symptomatic infections, high AT season may be the best season for achieving herd immunity.

The significance of our study is beyond SARS-CoV-2. The result indicated outbreak or re-outbreak of a viral disease may be caused by moving of human, animal co-host or freight carrying the virus from low risk area to high risk area, from an area with R0 (the basic reproduction number) smaller than 1 to an area with R0 larger than 1. Establishing potential virus list and vaccine bank may be a necessary way to prevent many local communicable viral diseases from becoming pandemic. Thus, our results also provide clue in preventing new viral pandemic in the future.

Contributors

SC conceived and designed the study, and drafted the manuscript. YR collected data and performed data analyses. Both SC and YR contributed to the interpretation of data and read and approved the final manuscript.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data sharing

Our data are accessible to researchers upon reasonable request for data sharing to the corresponding author.

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Figure legends

Figure 1: Nonlinear curve fitting between AT and the three epidemic parameters

Nonlinear curve fitting between AT and monthly deaths per million population, monthly new cases per million population, or the total number of days with more cases than previous days in March, April, May, and June were performed separately for all 118 countries with population over five million.

Figure 2: Evaluation of accuracy of the risk classification criteria retrospectively

Monthly deaths per million population (MDPM) <2, 2-5 and >5 in a country were considered low, medium and high risk. The match rates between ambient temperature-based risk allocation result and real risk levels based on MDPM were calculated (A). Corresponding MDPM of high (<20 ºC), medium (20-25 ºC), and low risk AT (>25 ºC) were shown (B). The results were from data of all 118 countries with population over five million.

Figure 3: Line chart of semi-monthly data between ambient temperature and Monthly deaths or cases per million population

In May and June, the new deaths (A) and cases (B) caused by COVID-19 decreased significantly in many north hemisphere countries, especially in European countries and the United States, and increased significantly in south hemisphere countries, especially in Brazil, Chile, and Peru.

Figure 4: Monthly predicted COVID-19 risk levels of 187 countries in the world

Figure 5: Monthly predicted COVID-19 risk levels of 160 major world cities

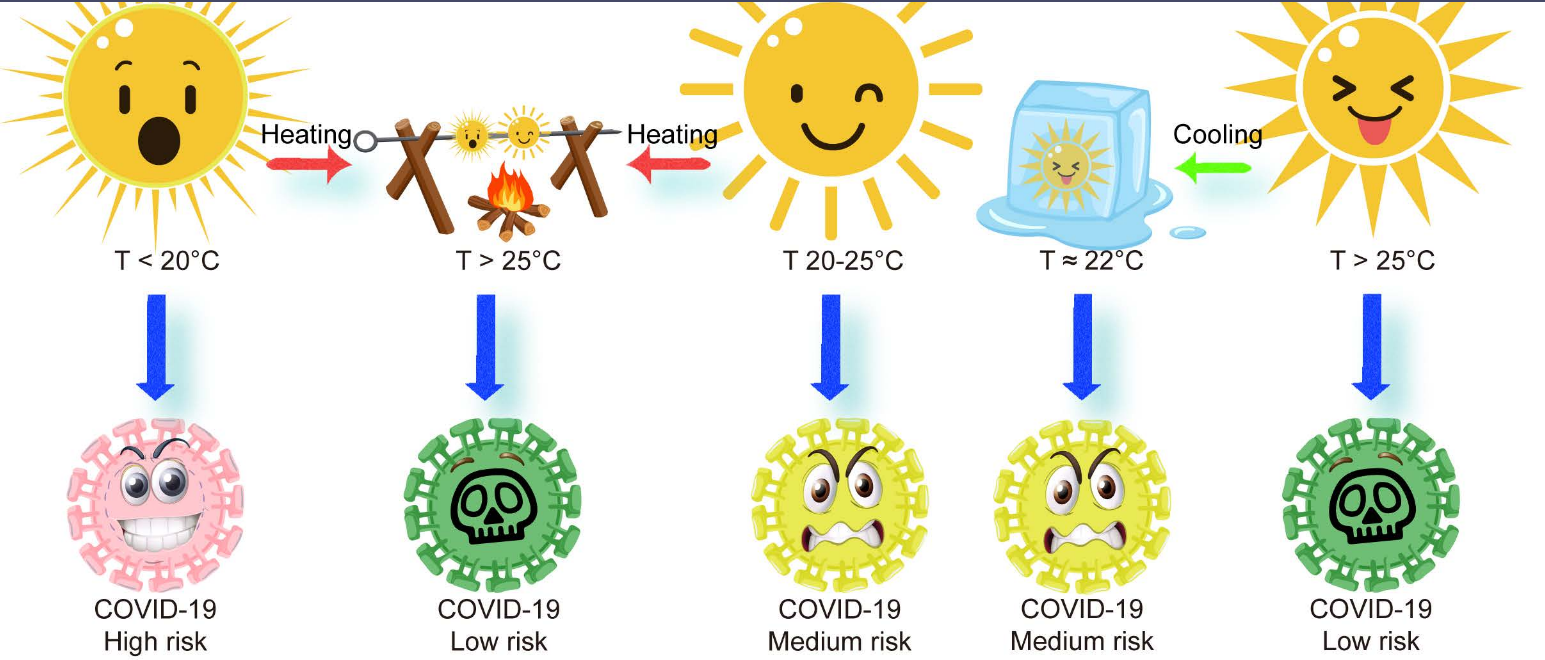

Heating
Heating
Cooling
T < 20°C
T > 25°C
T 20-25°C
T ≈ 22°C
T > 25°C
COVID-19
High risk
COVID-19
Low risk
COVID-19
Medium risk
COVID-19
Medium risk
COVID-19
Low risk

Table 1: Monthly average AT and standard deviation of low risk countries determined by three epidemic parameters in March, April, May and first half of June

Month	MDPM		MCPM		DI	
	<2 rate	AT in <2 countries	<10 rate	AT in <10 countries	<=7 rate	AT in <=7 countries
March 2-31	95/118	~~21.35±8.22~~	57/118	24.54±6.04	40/118	24.69±6.61
April 1-30	65/118	24.83±6.09	31/118	25.12±4.78	20/118	24.71±5.47
May 1-30	50/118	25.13±4.82	19/118	25.90±4.23	10/118	24.68±3.99
June 1-30	22/118	24.99±4.32	15/118	26.89±3.51	6/118	25.52±3.00

Note: Results are calculated from three epidemic data of all 118 countries with population over five million.

Figure 1

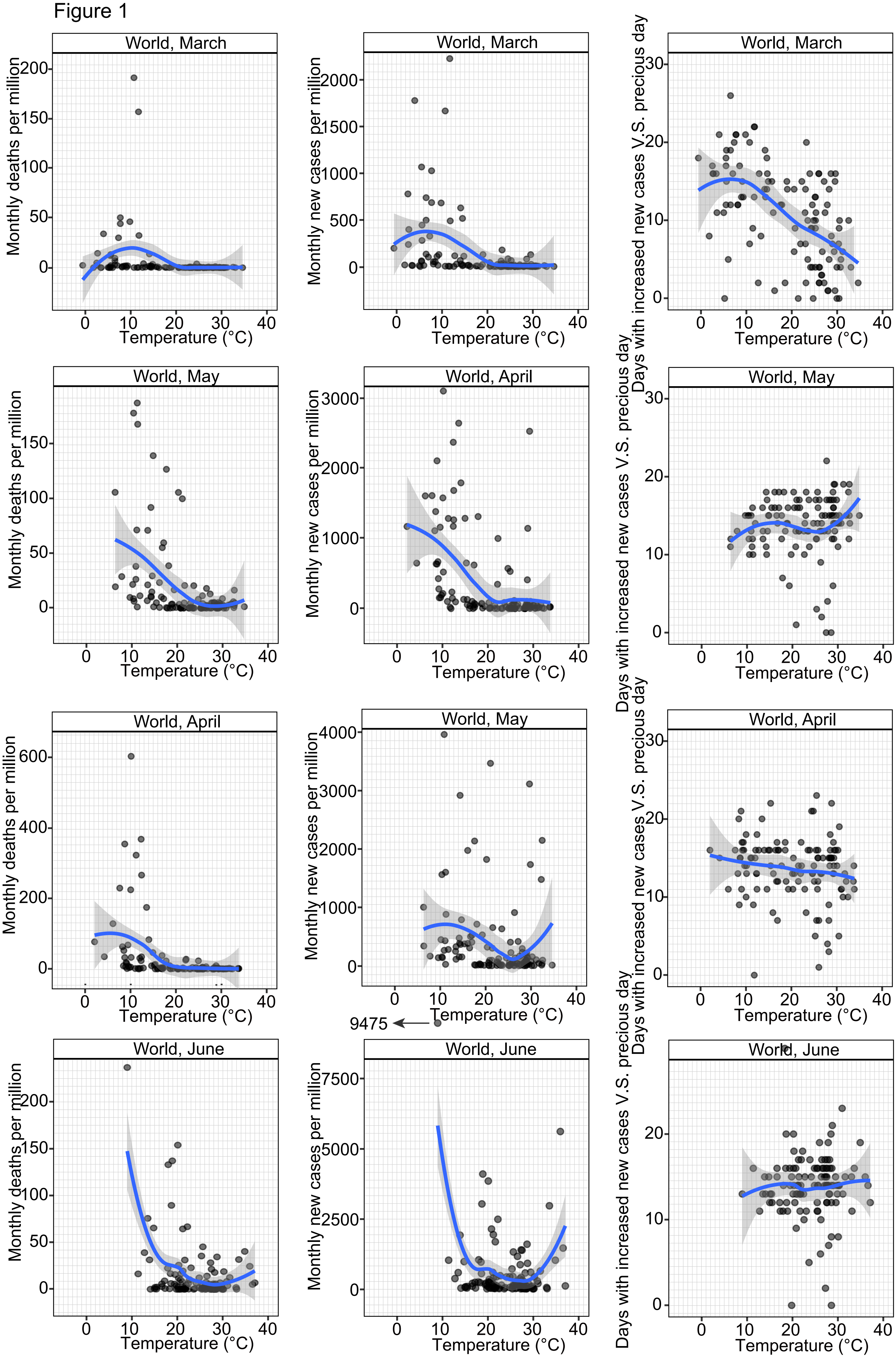

World, March
Monthly deaths per million
Temperature (°C)
World, March
Monthly new cases per million
Temperature (°C)
World, March
Days with increased new cases V.S. precious day
Temperature (°C)
World, May
Monthly deaths per million
Temperature (°C)
World, April
Monthly new cases per million
Temperature (°C)
World, May
Days with increased new cases V.S. precious day
Temperature (°C)
World, April
Monthly deaths per million
Temperature (°C)
World, May
Monthly new cases per million
Temperature (°C)
World, April
Days with increased new cases V.S. precious day
Temperature (°C)
9475
World, June
Monthly deaths per million
Temperature (°C)
World, June
Monthly new cases per million
Temperature (°C)
World, June
Days with increased new cases V.S. precious day
Temperature (°C)

Figure 2A

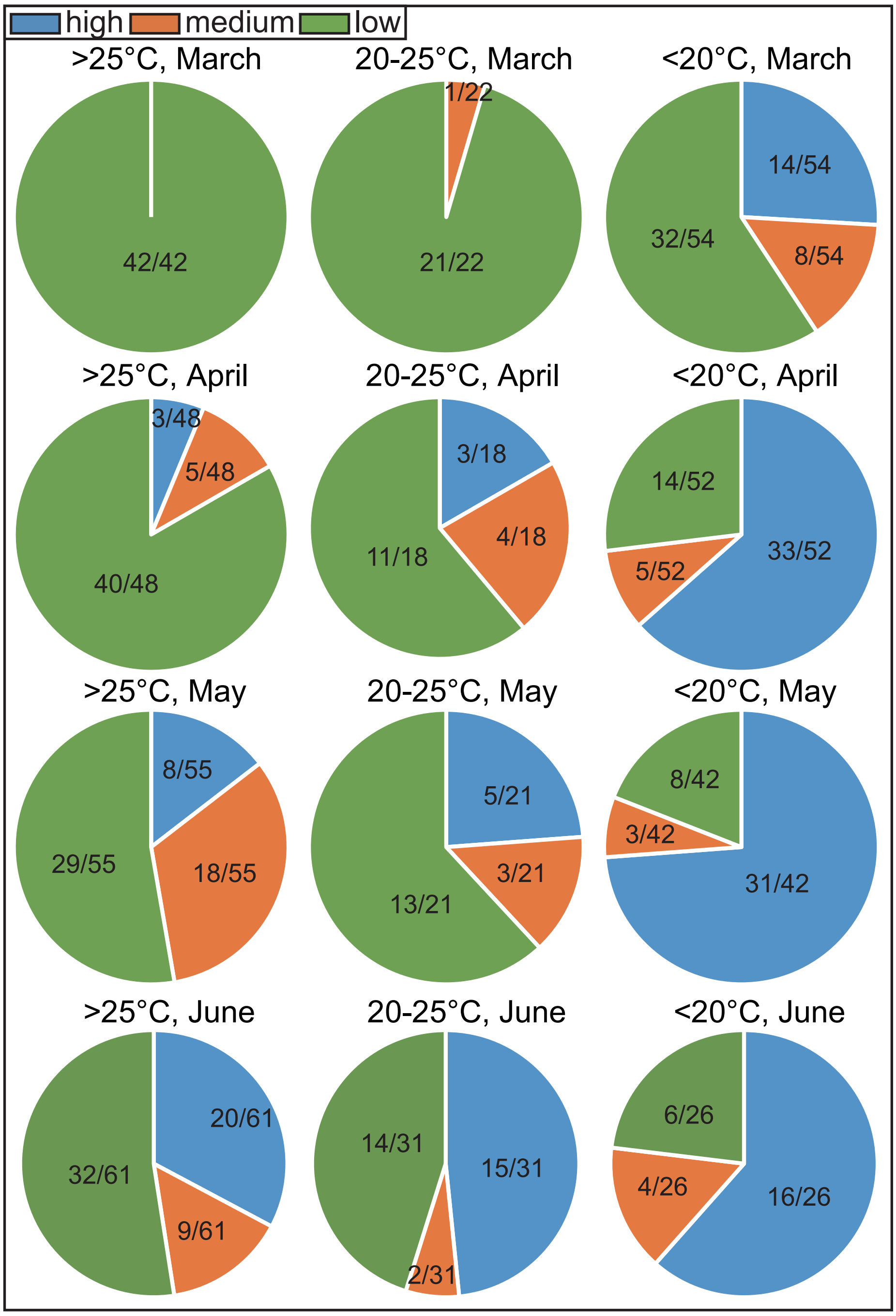


Figure 2B

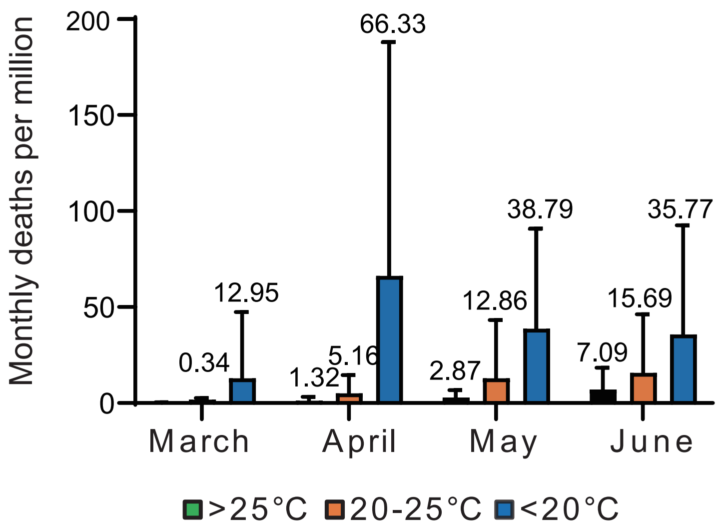


Figure 3A

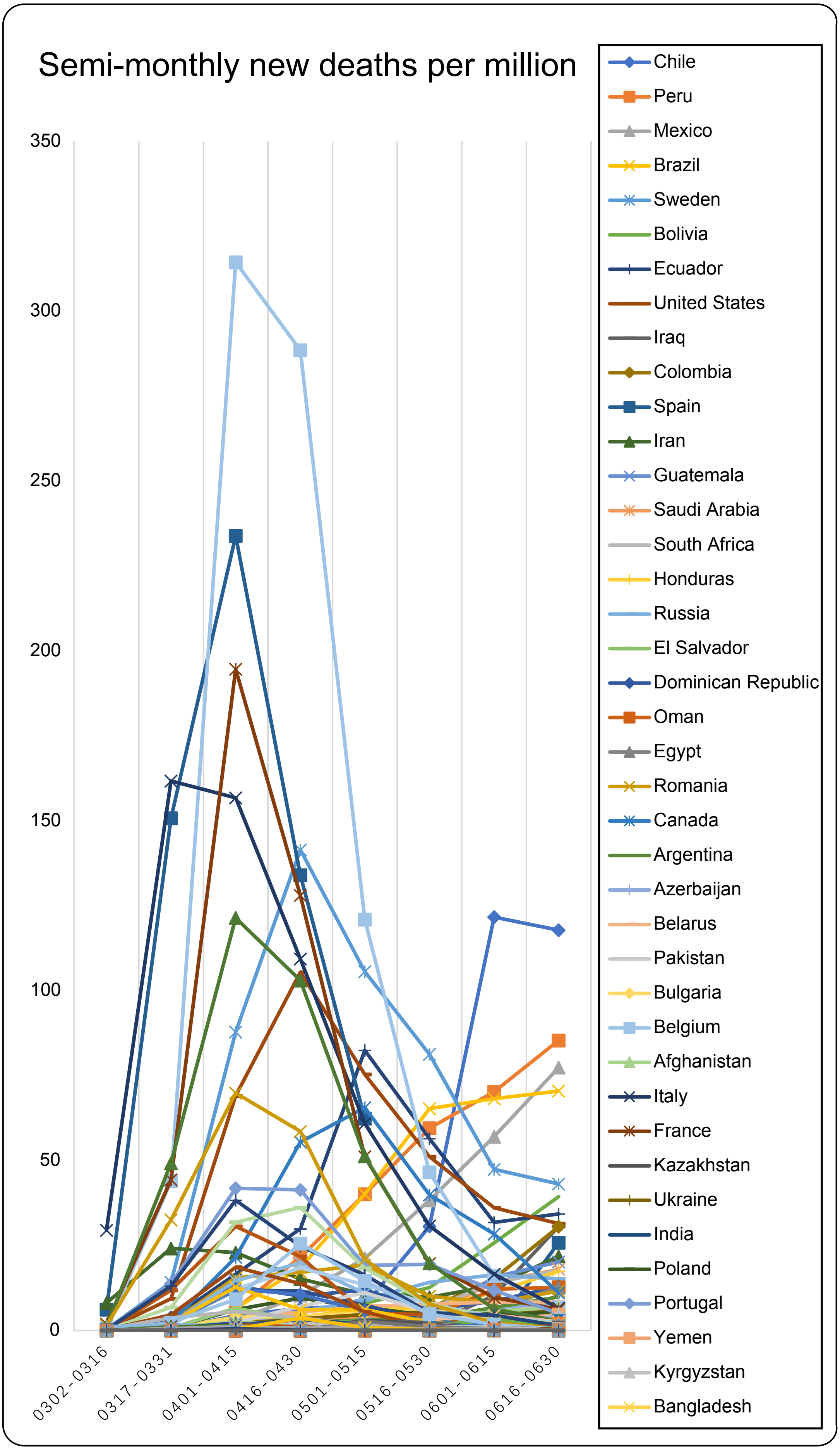
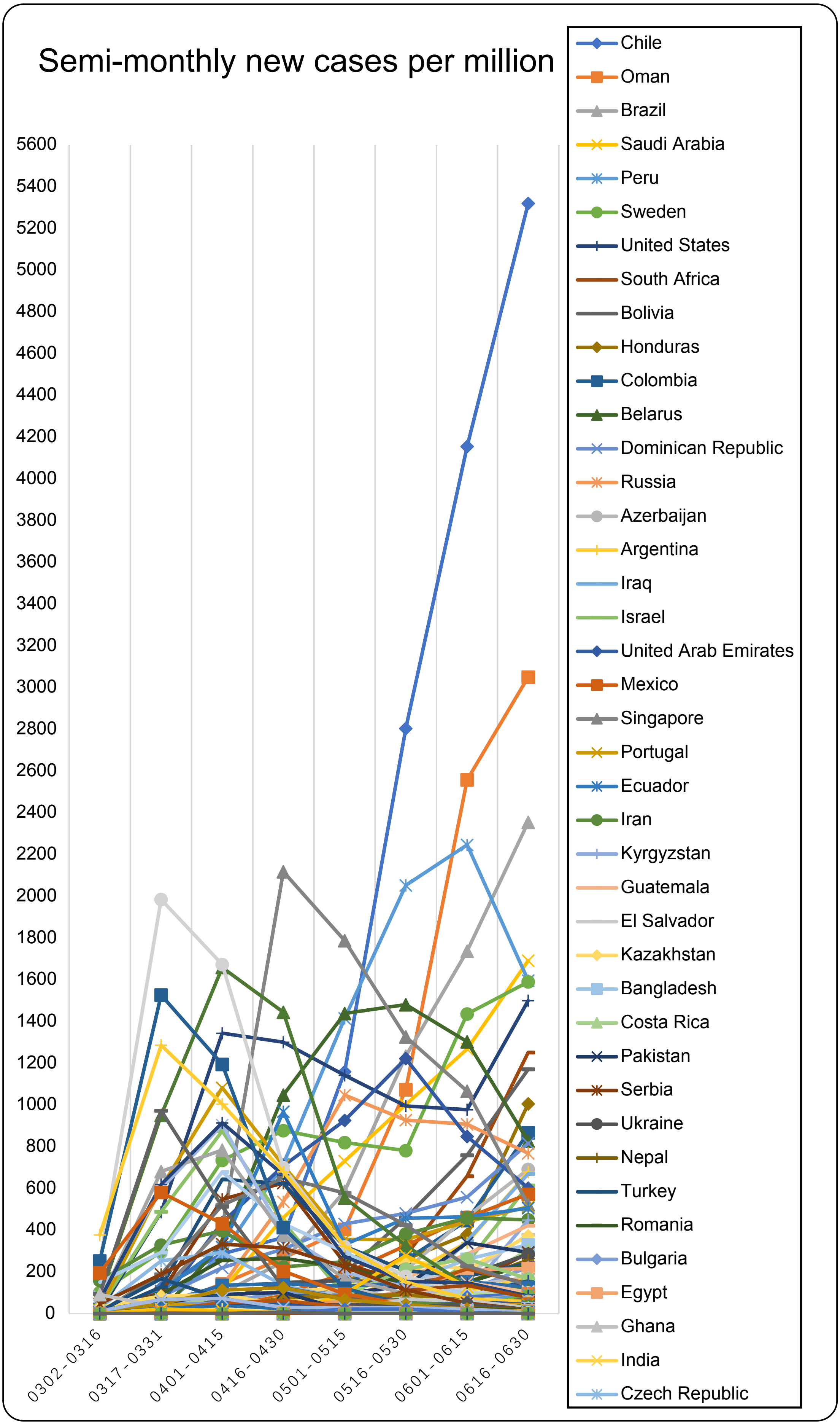

Semi-monthly new deaths per million
350
300
250
200
150
100
50
0
0302-0316
0317-0331
0401-0415
0416-0430
0501-0515
0516-0530
0601-0615
0616-0630
Chile
Peru
Mexico
Brazil
Sweden
Bolivia
Ecuador
United States
Iraq
Colombia
Spain
Iran
Guatemala
Saudi Arabia
South Africa
Honduras
Russia
El Salvador
Dominican Republic
Oman
Egypt
Romania
Canada
Argentina
Azerbaijan
Belarus
Pakistan
Bulgaria
Belgium
Afghanistan
Italy
France
Kazakhstan
Ukraine
India
Poland
Portugal
Yemen
Kyrgyzstan
Bangladesh

Figure 3B


Semi-monthly new cases per million
5600
5400
5200
5000
4800
4600
4400
4200
4000
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0302-0316
0317-0331
0401-0415
0416-0430
0501-0515
0516-0530
0601-0615
0616-0630
Chile
Oman
Brazil
Saudi Arabia
Peru
Sweden
United States
South Africa
Bolivia
Honduras
Colombia
Belarus
Dominican Republic
Russia
Azerbaijan
Argentina
Iraq
Israel
United Arab Emirates
Mexico
Singapore
Portugal
Ecuador
Iran
Kyrgyzstan
Guatemala
El Salvador
Kazakhstan
Bangladesh
Costa Rica
Pakistan
Serbia
Ukraine
Nepal
Turkey
Romania
Bulgaria
Egypt
Ghana
India
Czech Republic

Country	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Afghanistan	3.7	3.3	10.7	16.9	21.5	24.8	30.3	27.8	24.6	17.5	9.4	6.4
Albania	3.9	8.1	12.1	14.5	16.2	24.0	24.8	26.4	22.4	18.2	14.5	8.9
Algeria	9.9	11.4	15.6	18.7	22.9	28.4	31.3	30.7	27.1	22.0	15.6	13.7
American Samoa	20.5	21.8	21.5	24.1	25.5	26.7	23.6	21.2	24.5	24.0	25.4	24.6
Andorra	2.5	3.0	7.0	9.0	11.5	16.5	19.0	18.0	16.0	11.0	6.0	2.5
Angola	26.1	26.6	26.6	26.1	25.2	22.5	22.6	22.8	25.2	25.8	26.2	25.2
Antigua and Barbuda	25.0	25.0	26.0	26.0	27.5	28.0	28.0	28.5	28.0	27.5	27.0	26.0
Argentina	22.5	21.8	18.9	17.1	13.4	11.4	9.7	11.2	13.7	16.7	20.9	22.1
Armenia	-1.2	0.0	2.8	7.7	15.1	20.6	21.8	22.0	15.8	13.0	3.7	1.9
Aruba	26.5	26.5	27.5	27.5	28.5	28.5	28.5	28.5	28.5	28.5	28.0	27.0
Australia	25.9	23.9	23.2	20.3	17.6	14.1	14.7	14.4	17.2	19.9	22.0	23.6
Austria	-1.4	1.4	5.5	8.6	9.6	19.8	19.0	18.9	14.0	10.4	4.6	1.1
Azerbaijan	5.0	5.1	8.1	12.2	20.4	26.5	26.2	25.4	20.2	17.6	8.9	6.9
Bahamas	22.1	23.9	23.3	25.7	27.1	29.1	29.3	28.9	28.5	27.7	24.4	23.3
Bahrain	17.5	19.0	22.0	27.0	31.5	34.5	35.5	36.0	33.5	30.0	25.0	20.0
Bangladesh	18.3	20.0	23.0	25.6	29.1	29.4	29.2	29.9	29.1	27.6	24.9	19.5
Barbados	24.5	25.0	25.5	26.0	27.0	27.5	26.5	27.0	26.5	26.5	26.5	25.5
Belarus	-5.6	0.2	3.5	8.5	14.4	20.8	17.2	17.7	13.0	9.8	4.0	1.8
Belgium	2.5	6.5	7.7	10.2	11.3	17.9	18.6	18.6	14.8	11.8	6.1	5.6
Belize	24.0	25.0	26.0	27.5	28.5	28.5	28.0	28.5	28.0	27.5	25.5	24.5
benin	28.1	29.4	30.7	31.0	29.1	27.5	26.5	26.2	26.6	26.6	28.2	27.4
Bermuda	18.0	18.0	18.0	19.5	22.0	25.0	26.5	27.5	26.5	23.5	21.5	19.0
Bhutan	4.5	7.5	10.0	13.5	18.0	19.5	20.0	20.5	19.0	16.0	11.5	7.0
Bolivia	24.9	24.4	24.2	23.7	21.6	21.2	19.7	21.3	25.0	24.9	25.9	25.1
Bosnia and Herzegovina	0.0	4.2	8.6	11.3	12.4	21.3	21.4	22.9	17.7	14.5	10.6	4.8
Botswana	27.4	26.6	27.5	22.0	19.4	17.4	16.4	21.0	22.6	27.3	26.7	26.7
Brazil	24.3	24.5	23.9	22.2	22.4	18.9	18.5	19.3	20.4	21.5	22.5	23.5
Brunei	27.8	27.6	28.0	29.1	29.4	28.6	28.3	28.6	28.9	27.8	27.6	27.4
Bulgaria	-0.1	2.9	8.1	9.6	14.2	20.3	20.7	22.2	18.1	14.2	10.1	3.9
Burkina Faso	25.4	29.5	32.5	33.7	32.4	30.1	27.9	27.0	28.6	29.7	29.0	25.7
Burundi	25.9	25.4	24.7	25.6	25.3	26.1	24.4	24.9	26.7	24.9	24.6	25.1
Cambodia	22.9	23.8	24.8	25.3	26.4	23.6	25.7	25.7	25.4	25.4	24.8	22.7
Cameroon	26.6	27.2	28.7	31.8	29.3	26.2	26.0	25.5	26.7	26.6	27.6	26.0
Canada	-1.2	-2.3	-0.6	2.2	6.3	12.8	16.5	15.2	11.2	3.6	-1.5	-2.7
Cape Verde	21.0	20.5	21.0	21.5	21.5	23.5	24.5	25.0	24.5	24.5	24.0	22.5
Cayman Islands	24.0	24.5	24.5	26.0	27.0	28.0	28.0	28.0	28.0	27.0	26.0	25.0
Central African Republic	25.0	27.3	27.8	27.3	27.2	24.9	24.7	24.4	24.9	24.4	25.9	25.3
Chad	23.1	24.5	29.9	32.5	31.8	28.5	26.5	26.2	27.1	26.1	26.3	22.8
Chile	22.0	16.6	19.0	15.3	10.9	9.0	8.5	10.3	14.3	17.4	21.3	21.9
China	3.1	3.6	11.7	16.8	21.4	25.4	28.7	28.6	23.9	17.1	12.2	6.5
Colombia	25.3	25.9	25.9	25.9	25.5	25.6	25.6	25.9	25.7	25.0	25.4	25.6
Comoros	28.2	28.3	28.9	29.1	28.1	26.9	26.0	26.0	26.3	28.2	29.2	28.8
Congo	25.5	26.0	26.5	26.5	26.0	25.5	25.0	25.0	25.5	25.5	25.5	25.0
Cook Islands	26.7	26.9	27.0	25.6	25.0	24.3	22.7	23.7	22.6	23.1	24.3	25.2
Costa rica	24.1	24.8	25.2	25.8	25.3	25.5	25.1	25.1	24.6	23.9	24.5	24.7
Cote d'Ivoire	27.9	28.6	30.4	28.6	29.0	26.8	25.9	25.6	26.4	26.7	27.7	27.4
Croatia	3.3	7.1	10.6	13.1	14.2	23.5	23.7	24.6	19.4	15.7	11.9	7.5
Cuba	24.3	24.7	25.2	25.9	26.4	27.7	27.7	28.0	27.5	26.7	25.7	25.1
Cyprus	12.6	13.4	14.3	16.5	21.7	25.6	27.2	27.7	25.8	23.6	20.1	14.9
Czech republic	-1.8	2.2	5.6	9.1	10.4	20.2	18.8	19.2	13.6	9.9	5.2	1.6
Denmark	1.9	4.4	5.6	8.3	10.2	16.6	17.1	17.9	13.9	9.9	6.0	4.9
Djibouti	25.6	26.3	28.2	29.1	30.5	34.3	36.6	35.0	36.0	30.1	28.5	26.0
Dominica	25.0	25.5	26.1	26.2	27.4	28.0	28.0	27.9	27.9	27.5	26.8	26.3
Dominican Republic	24.2	23.9	24.5	25.0	26.4	27.5	27.7	27.7	27.5	27.3	25.8	24.5
DR of Congo	26.2	26.5	26.7	27.0	27.5	25.4	23.6	24.2	25.4	25.9	26.3	25.5
Ecuador	14.8	15.0	14.8	15.0	14.7	14.8	14.4	16.5	16.6	14.7	14.6	15.0
Egypt	13.6	15.2	17.5	21.6	27.5	30.2	31.0	31.0	28.5	26.4	21.9	16.5

Note: Numbers represent ambient temperatures (°C). Red: high risk. Yellow: moderate risk. Green: low risk.

Country	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
El Salvador	26.2	27.1	28.2	28.9	28.1	28.2	28.2	27.9	27.3	26.5	27.0	26.9
Equatorial Guinea	27.2	28.5	27.4	27.6	27.4	26.9	26.1	26.2	26.5	26.7	27.1	27.5
Eritrea	24.5	25.0	25.5	28.0	29.5	32.0	34.5	34.5	33.5	32.0	29.0	27.0
Estonia	-4.5	-0.3	1.1	6.8	10.6	17.4	16.3	16.7	12.3	7.4	3.2	2.3
Ethiopia	19.1	20.9	21.9	22.1	25.1	23.8	22.7	19.4	19.9	18.8	19.2	18.6
Fiji	27.6	28.4	27.1	24.1	25.8	25.4	25.0	25.3	25.1	26.4	26.1	27.6
Finland	3.6	1.8	2.6	4.3	6.4	15.1	16.6	16.8	13.1	7.3	3.6	3.1
France	4.7	8.0	9.8	11.3	13.5	19.5	22.3	21.2	18.1	14.8	8.8	8.1
Gabon	27.7	28.2	28.7	28.5	28.2	26.5	25.8	25.8	26.9	26.9	27.4	27.6
Gambia	27.1	28.6	29.2	33.2	30.4	33.5	30.2	28.9	28.3	29.1	30.0	27.5
Georgia	4.4	5.2	6.5	11.1	17.6	23.3	22.3	23.3	18.3	16.0	8.4	6.1
Germany	0.5	4.3	6.5	9.5	10.9	19.4	18.8	19.2	14.3	11.0	5.2	3.7
Ghana	29.0	29.9	30.3	30.1	28.7	27.6	26.5	26.3	26.7	27.1	28.7	28.6
Greece	8.3	10.1	12.8	14.7	18.7	24.8	25.9	26.8	23.4	20.1	17.1	11.7
Greenland	-6.4	-5.2	-6.9	-3.5	3.6	6.0	8.6	7.8	4.9	2.5	-0.3	-5.7
Grenada	26.4	26.9	27.3	27.5	28.5	28.4	28.0	28.5	28.9	28.2	28.2	27.8
Guatemala	21.4	23.2	23.5	24.9	25.6	25.3	24.5	25.1	24.7	24.2	23.1	22.1
Guinea	27.1	28.5	29.3	29.5	29.0	27.5	25.0	24.8	26.1	26.1	27.7	28.3
Guinea-Bissau	27.2	28.5	31.5	32.4	30.7	31.5	27.6	28.2	27.8	29.5	30.5	28.5
Guyana	26.7	26.8	27.5	28.1	27.0	27.1	27.0	27.5	28.6	28.4	28.2	27.3
Haiti	27.4	28.0	24.5	25.9	26.5	27.0	27.2	26.7	27.4	7.2	6.5	3.0
Holy See Vatican City	3.6	8.0	11.0	14.3	16.1	26.2	26.0	26.4	20.7	16.8	11.4	7.1
Honduras	23.4	25.0	25.2	26.7	27.2	27.3	26.8	27.2	27.0	25.9	24.9	24.1
Hungary	-0.7	3.9	8.5	12.1	13.5	22.4	21.5	22.6	16.8	12.8	8.7	3.4
Iceland	-1.5	-1.3	-0.7	4.6	4.7	7.9	10.5	8.6	7.6	3.3	0.1	-0.8
India	20.0	22.7	26.0	29.8	31.2	30.9	28.4	27.6	27.3	26.2	24.4	21.0
Indonesia	27.7	28.0	27.8	28.6	28.6	27.8	27.3	27.2	27.8	28.9	29.3	28.7
Iran	8.9	9.0	11.8	17.0	23.6	28.7	30.7	29.3	26.2	21.0	12.1	10.1
Iraq	10.4	12.3	14.6	19.4	29.0	34.8	35.1	36.1	32.2	26.8	18.0	12.9
Ireland	6.6	8.1	7.6	9.4	11.0	12.9	16.1	15.5	13.7	10.0	6.9	6.8
Israel	12.4	13.5	14.5	17.9	24.6	27.1	28.1	28.4	27.0	24.6	20.5	14.7
Italy	5.0	7.9	10.7	12.5	14.2	23.0	24.5	24.7	20.7	17.1	12.0	9.0
Jamaica	26.7	26.7	26.9	27.6	28.3	29.6	29.7	29.7	29.7	28.7	28.3	27.7
Japan	5.0	6.3	9.1	12.9	18.9	21.4	24.7	26.8	24.2	19.0	12.3	7.9
Jordan	10.2	11.0	13.2	17.1	25.5	28.1	28.4	28.9	26.5	23.7	17.4	11.8
Kazakhstan	-9.0	-8.8	1.8	9.3	16.1	21.1	25.0	21.9	14.7	9.6	-3.8	-4.8
Kenya	23.1	24.0	24.4	24.7	23.0	21.8	21.3	21.5	22.2	22.2	22.3	22.1
Kiribati	28.6	28.7	27.6	27.9	28.3	28.4	28.4	28.6	29.1	29.0	28.8	28.6
Kuwait	14.5	15.6	18.5	24.4	32.7	38.4	38.6	38.9	36.5	31.0	21.7	16.5
Kyrgyzstan	-3.8	-2.8	6.0	11.1	14.8	18.6	23.5	21.1	16.1	10.2	1.0	-1.9
Laos	21.0	23.0	26.0	28.0	28.5	28.5	28.0	27.5	27.5	26.0	23.5	20.5
Latvia	-3.7	0.6	2.0	7.5	11.6	18.1	16.3	17.0	12.7	8.6	4.0	2.6
Lebanon	9.3	11.4	14.0	16.1	22.6	25.5	26.8	27.5	26.0	24.0	19.4	13.4
Lesotho	22.0	20.9	20.1	15.2	11.3	10.5	7.3	14.2	16.8	18.9	22.5	21.4
Liberia	26.6	29.4	29.5	29.2	29.6	27.0	25.6	25.0	26.3	25.6	28.6	30.0
Libya	13.2	12.7	16.2	18.9	26.2	29.7	30.7	30.4	28.5	24.6	19.1	15.5
Liechtenstein	0.5	2.0	6.5	10.0	14.5	17.0	19.0	19.0	15.0	11.5	5.5	2.0
Lithuania	-4.2	1.2	3.2	8.5	12.6	19.8	17.2	17.9	13.1	9.4	4.7	2.4
Luxembourg	0.9	5.6	7.5	10.1	11.7	19.6	20.2	19.8	14.9	11.2	5.1	4.4
Macedonia	1.0	3.5	6.0	10.5	15.0	18.5	21.0	22.0	17.0	12.0	8.5	2.5
Madagascar	26.2	26.1	26.1	25.9	23.5	21.7	21.2	21.8	22.8	25.2	26.2	26.6
Malawi	21.9	22.1	21.4	20.4	18.4	15.0	14.9	17.8	20.0	22.8	23.6	22.8
Malaysia	27.7	28.1	28.6	28.7	28.5	28.0	28.0	27.9	27.8	27.4	27.5	27.2
Maldives	27.5	28.0	28.5	29.0	28.5	28.0	27.5	27.5	27.5	27.5	27.5	27.5
Mali	25.0	27.2	34.6	33.9	32.5	32.9	29.3	28.1	28.5	29.6	29.3	26.5
Malta	11.5	11.8	14.4	15.9	18.3	26.3	27.9	28.2	25.5	22.1	18.2	15.2
Mauritania	22.7	26.0	30.3	31.7	34.3	33.7	33.3	32.2	32.5	33.0	28.7	22.2

Note: Numbers represent ambient temperatures (°C). Red: high risk. Yellow: moderate risk. Green: low risk.

Country	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Mauritius	26.7	26.2	26.5	25.7	24.4	23.4	23.3	23.1	23.8	25.1	26.5	27.5
Mexico	14.5	14.5	14.5	15.5	17.0	18.0	19.5	21.0	20.0	19.0	16.5	15.0
Moldova	-0.2	4.0	8.8	11.5	16.4	22.4	21.4	23.8	18.0	13.7	9.8	4.7
Monaco	12.5	16.0	18.0	17.0	20.5	24.5	28.0	26.5	24.5	19.0	16.0	15.5
Mongolia	-16.3	-16.2	-3.7	3.2	8.5	17.2	19.4	16.0	14.0	1.3	-9.9	-17.2
Montenegro	3.6	7.4	11.4	14.0	15.2	23.7	24.4	25.8	21.3	16.8	13.5	8.5
Morocco	11.9	14.0	15.9	16.6	20.9	21.8	24.2	25.8	23.4	20.5	15.9	14.3
Mozambique	26.2	26.5	26.0	25.1	22.5	20.8	20.7	22.6	23.2	26.5	27.8	27.3
Myanmar	21.5	23.8	26.0	29.4	30.2	28.1	27.0	27.1	27.0	27.3	25.5	21.5
Namibia	26.6	26.6	26.6	23.1	21.2	17.7	17.2	20.1	21.7	25.2	26.6	25.5
Nepal	12.7	14.8	18.5	23.3	25.9	27.3	26.2	27.0	25.3	22.2	19.9	13.2
Netherlands	4.1	6.5	7.7	10.1	11.1	17.2	18.3	18.7	15.3	12.1	7.2	6.5
New Zealand	18.2	17.6	17.3	13.5	12.6	9.5	9.9	9.1	10.2	11.6	14.7	15.6
Nicaragua	25.9	26.7	27.1	28.3	27.7	27.9	27.4	27.8	27.5	26.5	26.8	26.5
Niger	22.9	24.5	30.8	33.8	34.7	33.0	30.8	28.8	30.9	30.5	29.1	23.5
Nigeria	28.8	29.5	30.5	30.6	29.3	27.5	26.7	26.2	27.0	26.8	28.4	27.8
North Korea	-8.2	-5.8	3.5	8.2	16.5	20.4	25.0	24.0	19.0	11.7	-0.4	-7.4
Norway	-2.7	0.7	2.5	8.8	10.5	15.5	18.2	17.2	11.7	5.6	1.2	0.3
Oman	21.4	21.4	23.5	28.8	32.3	35.9	34.3	34.2	33.0	29.9	24.9	22.5
Pakistan	11.5	12.8	17.8	25.5	28.1	31.5	31.4	29.8	29.3	23.7	17.2	12.3
Palau	26.5	26.5	26.5	27.5	27.5	27.5	27.0	27.0	27.0	27.5	27.5	27.5
Palestine	14.0	14.0	16.0	18.5	21.0	23.5	26.0	26.5	25.5	23.0	19.5	16.0
Panama	28.1	28.8	29.8	29.4	28.1	28.1	27.9	27.9	27.3	27.1	27.3	27.5
Papua New Guinea	28.7	29.2	27.9	28.3	27.4	27.2	27.0	27.3	27.6	28.2	28.0	29.3
Paraguay	29.0	27.5	25.3	24.1	21.4	21.2	17.3	19.9	23.3	26.1	28.1	26.4
Peru	22.7	23.2	22.9	22.3	21.1	20.1	19.2	19.2	20.1	20.4	21.5	22.0
Philippines	26.0	26.1	27.1	28.5	28.9	28.9	27.9	27.9	27.8	27.8	27.3	26.7
Poland	-1.7	2.8	5.5	9.2	11.8	20.7	18.2	19.7	14.3	10.8	6.1	3.0
Portugal	11.6	12.3	14.1	14.1	18.1	18.5	21.8	22.1	21.3	17.9	14.4	13.1
Puerto Rico	25.7	25.8	26.3	26.9	27.7	28.7	29.1	29.1	29.3	28.8	27.9	27.4
Qatar	19.9	19.5	21.3	26.5	31.7	35.4	35.5	35.6	34.0	31.5	24.8	21.2
Romania	-2.0	2.1	7.0	10.2	14.5	21.2	20.3	22.0	17.0	12.5	9.1	2.8
Russia	-0.2	0.6	3.4	9.0	16.1	21.6	21.3	20.3	15.4	10.2	2.9	1.6
Rwanda	20.9	21.2	20.7	20.5	20.7	20.2	20.3	21.2	21.3	19.8	20.3	21.2
Saint Kitts and Nevis	25.6	26.0	26.3	26.5	27.7	28.4	28.5	28.1	28.2	28.4	27.7	27.0
Saint Lucia	26.0	26.2	26.7	26.9	28.3	28.3	28.3	28.4	28.4	28.3	27.7	27.7
Saint Vincent	26.5	27.0	27.3	28.2	28.3	28.2	28.4	28.8	28.7	28.7	27.5	27.5
Saudi Arabia	17.7	18.3	20.5	24.5	29.9	33.5	33.7	33.2	32.1	28.2	21.8	17.9
Senegal	25.7	27.7	28.2	30.3	30.3	31.0	30.1	29.5	29.3	30.0	29.5	27.0
Serbia	-0.8	3.7	8.9	12.4	14.3	21.9	21.8	23.3	18.2	14.3	10.9	4.1
Seychelles	27.5	28.4	29.1	29.5	28.6	28.1	27.2	26.9	27.3	27.5	27.9	28.3
Sierra Leone	29.2	29.2	29.9	29.4	29.0	27.3	26.0	25.9	26.1	29.1	27.5	28.4
Singapore	28.7	29.1	29.5	29.3	29.7	28.6	29.4	29.9	29.9	29.0	28.8	27.3
Slovakia	-3.4	1.7	5.5	9.8	11.2	20.5	18.8	20.2	14.1	10.4	6.7	1.1
Slovenia	-0.9	3.9	6.8	9.5	10.8	20.7	20.6	20.6	15.4	12.1	7.3	3.1
Somalia	23.5	25.4	28.0	29.4	30.0	29.5	30.0	29.7	31.4	28.2	27.9	26.8
South Africa	22.9	23.0	22.2	18.7	17.0	13.9	13.9	15.5	17.9	19.9	21.6	21.7
South Korea	-0.7	-0.4	6.5	11.7	19.0	21.3	25.5	25.7	22.0	13.6	6.8	1.0
South Sudan	28.4	30.4	30.4	30.5	29.0	28.5	27.9	28.1	25.7	27.6	27.8	26.5
Spain	7.3	9.7	11.7	12.4	16.7	20.3	24.2	24.0	20.6	16.9	10.8	9.8
Sri Lanka	25.2	26.5	27.3	28.3	28.7	28.5	28.1	27.4	27.0	25.9	26.3	25.7
Sudan	23.3	28.2	33.0	32.1	32.6	37.0	36.7	34.6	35.1	30.6	34.1	23.4
Suriname	26.6	26.3	27.1	26.8	26.6	27.1	27.3	28.0	28.4	28.8	27.7	26.5
Swaziland	23.0	23.9	14.1	-1.2	20.1	16.9	19.7	20.9	6.8	13.2	16.8	15.8
Sweden	-1.7	2.0	2.7	7.7	11.2	18.7	18.1	18.5	13.4	6.4	4.6	1.0

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Country	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Switzerland	-2.7	1.9	4.0	6.2	7.8	16.6	17.9	16.7	13.0	9.9	2.9	1.7
Syria	9.8	10.9	12.6	16.0	23.7	27.8	28.8	30.0	26.9	23.7	16.6	11.3
Tajikistan	-2.6	-1.2	5.2	11.9	15.4	18.3	24.2	22.1	18.0	11.9	3.7	1.1
Tanzania	20.5	21.2	20.5	20.7	20.8	19.8	19.9	21.0	21.3	20.2	20.5	21.2
Thailand	26.3	28.3	29.6	31.4	30.7	29.8	29.3	28.5	28.3	28.6	27.2	25.2
The DR of the Congo	27.3	28.5	27.9	27.5	26.8	25.4	24.2	25.2	26.2	26.3	26.1	25.2
Timor Leste	28.2	27.7	28.1	29.6	28.4	27.6	27.5	27.7	27.7	28.0	28.2	28.1
Togo	28.8	30.1	31.2	31.1	29.3	27.6	26.6	26.3	26.8	27.1	28.6	28.3
Tonga	26.8	27.3	26.7	26.5	25.2	24.7	24.4	24.4	24.1	25.1	24.7	26.4
Trinidad and Tobago	26.3	26.5	27.0	27.7	28.4	27.9	27.9	28.4	28.8	28.3	28.1	27.2
Tunisia	10.4	11.2	14.2	17.3	19.7	27.5	29.6	30.0	26.4	22.0	15.5	14.2
Turkey	5.4	7.0	9.3	12.5	19.3	24.1	25.0	26.0	22.1	18.8	13.4	8.1
Turkmenistan	7.1	6.4	12.2	16.6	24.7	29.1	32.5	28.5	23.0	17.7	6.2	7.3
Tuvalu	28.7	27.8	28.8	28.4	28.3	28.7	28.5	28.2	28.1	28.4	28.9	28.5
Uganda	23.9	24.6	25.2	24.7	23.3	21.6	24.0	20.6	22.1	20.4	21.3	21.6
Ukraine	-3.5	1.0	5.0	10.1	16.5	22.7	20.4	21.0	16.2	11.4	6.0	2.9
United Arab emirates	21.5	21.0	23.0	28.9	32.5	36.5	36.6	36.9	35.2	31.6	24.7	22.4
United kindom	4.2	6.8	7.3	8.8	10.4	13.5	16.6	16.1	13.6	9.7	6.0	5.9
United States	1.9	2.6	6.5	13.6	17.6	22.2	25.4	24.7	22.3	13.8	6.8	4.8
Uruguay	24.3	23.2	20.8	18.7	15.7	14.7	11.1	11.7	13.9	17.5	21.9	22.8
Uzbekistan	3.6	3.6	11.4	15.5	22.7	26.4	31.0	26.5	20.7	15.1	3.7	4.0
Vanuatu	27.0	27.6	27.0	26.2	25.0	23.9	22.9	23.6	24.0	25.1	25.6	26.8
Venezuela	27.2	27.8	28.9	28.5	27.0	25.9	25.8	26.5	28.1	24.9	26.3	23.0
Vietnam	21.7	24.3	25.1	28.3	28.9	30.0	29.5	29.0	27.8	26.9	24.5	22.3
Western Sahara	18.3	20.5	19.1	19.4	20.0	21.2	21.8	22.6	23.1	23.2	19.7	19.9
Yemen	19.4	20.9	22.7	26.1	27.8	26.3	28.0	22.8	20.8	19.1	18.9	19.9
Zambia	23.1	23.7	24.1	23.0	20.7	17.3	18.2	22.7	24.3	26.6	25.9	24.4
Zimbabwe	24.8	23.7	23.1	21.6	17.8	15.4	16.6	18.3	20.0	25.1	25.5	24.6

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City	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Aberdeen, Scotland	4.3	5.7	6.3	7.7	9.2	12.1	14.9	14.6	12.3	9.3	6.6	5.4
Adelaide, Australia	30.8	28.6	25.8	21.6	15.1	11.8	12.6	12.4	17.6	23.1	23.8	29.7
Ahmadabad, India	20.0	22.2	27.3	31.4	33.8	32.7	29.6	28.4	28.9	28.6	24.7	21.3
Algiers, Algeria	12.2	12.7	14.6	16.5	20.1	24.6	28.7	28.7	25.7	22.3	16.8	15.1
Amsterdam, Netherlands	8.8	7.7	8.2	9.4	11.1	13.9	16.7	18.5	18.0	16.1	13.1	10.6
Ankara, Turkey	3.1	3.3	6.7	10.9	18.6	23.2	24.5	25.8	21.0	15.9	7.8	2.9
Asunción, Paraguay	30.6	29.2	26.1	24.6	21.8	20.6	17.4	19.4	23.3	26.3	29.0	27.4
Athens, Greece	4.2	5.8	8.9	11.5	15.1	22.2	24.1	25.5	21.5	16.7	12.8	8.0
Auckland, New Zealand	22.2	22.4	20.7	17.3	15.9	13.1	12.7	12.7	13.6	14.9	17.6	19.6
Baghdad, Iraq	10.1	12.5	16.4	22.1	28.2	32.5	35.1	34.2	30.5	24.8	16.9	11.5
Bangalore, India	21.0	23.2	25.9	27.7	27.2	24.6	23.7	23.6	23.5	23.3	21.9	20.9
Bangkok, Thailand	27.3	30.5	32.2	34.3	32.3	29.8	29.7	27.7	27.9	28.8	27.0	25.5
Barcelona, Spain	5.5	8.4	11.9	13.6	17.2	22.6	26.8	25.8	21.8	18.0	10.6	9.5
Beijing, China	-6.6	-5.2	2.8	8.5	15.3	20.8	22.2	20.3	17.8	9.1	1.3	-6.2
Belém, Brazil	26.6	26.6	26.5	25.8	24.9	23.7	22.9	23.1	24.4	25.5	26.1	26.5
Belfast, Northern Ireland	6.0	6.9	7.2	8.6	10.2	12.9	15.3	15.3	13.4	9.9	7.4	6.4
Belgrade, Serbia	1.9	4.2	9.8	14.0	15.2	23.3	24.1	25.1	19.4	14.2	11.8	4.7
Berlin, Germany	1.6	4.0	6.9	10.4	12.6	22.2	20.4	20.6	15.1	11.2	5.5	3.9
Birmingham, England	4.4	5.9	7.9	9.1	11.9	14.2	17.7	17.1	14.3	9.8	6.6	5.5
Bogotá, Colombia	15.4	15.7	15.4	15.3	15.3	15.2	15.7	16.5	16.9	15.0	15.0	15.2
Bombay, India	26.0	25.4	26.0	27.9	29.1	29.3	28.6	28.1	28.3	29.2	28.5	27.8
Bordeaux, France	5.1	8.2	10.9	12.7	14.8	20.3	24.5	22.4	19.9	16.0	10.0	9.2
Brampton	-7.7	-6.6	-1.5	5.8	12.4	17.1	20.1	19.0	14.8	8.6	2.8	-4.1
Bremen, Germany	2.7	4.9	7.3	10.2	12.0	18.6	18.8	18.7	14.4	11.0	5.7	5.0
Brisbane, Australia	24.0	23.9	23.4	19.3	16.0	14.0	13.3	13.7	17.3	19.0	22.8	24.6
Bristol, England	4.5	6.3	8.3	9.7	12.3	14.7	18.6	17.4	14.9	10.8	7.2	6.2
Brussels, Belgium	3.5	5.8	8.4	10.5	12.3	18.3	20.0	19.2	15.7	12.4	6.9	5.8
Bucharest, Romania	-0.4	2.9	8.7	11.7	17.2	22.9	23.1	25.1	20.4	14.0	10.4	4.0
Budapest, Hungary	-0.3	2.3	7.7	12.8	13.7	22.4	22.1	23.4	17.2	12.4	8.8	2.6
Buenos Aires, Argentina	25.0	24.2	20.8	18.6	15.5	14.4	11.2	12.1	14.2	17.4	22.7	24.5
Cairo, Egypt	13.2	15.2	18.2	22.5	29.2	32.2	33.5	33.5	30.7	27.3	22.7	16.4
Calcutta, India	19.2	23.9	26.9	31.0	32.6	32.4	30.8	30.0	29.3	28.0	24.4	20.4
Calgary, Canada	-3.9	-15.1	-4.4	4.2	7.6	13.6	14.6	15.2	10.9	1.5	-1.7	-4.8
Canton, China	16.5	18.9	20.2	24.3	25.7	29.0	29.7	29.7	28.3	26.5	22.8	18.6
Cape Town, South Africa	16.7	16.9	16.1	14.5	14.2	14.1	14.0	14.4	14.7	15.1	15.6	16.6
Caracas, Venezuela	24.1	25.0	25.7	25.4	25.7	24.9	25.5	25.5	26.6	24.6	24.4	25.2
Cayenne, French Guiana	25.7	26.0	26.3	26.4	26.4	26.4	26.2	26.5	27.4	27.3	27.4	26.4
Chengdu, China	5.8	7.6	12.0	17.2	21.6	24.0	25.8	25.7	21.7	17.4	12.2	7.3
Chennai, India	24.5	25.6	27.5	30.3	33.2	32.4	30.9	30.2	29.8	28.1	25.8	24.8
Chicago, United states	0.9	-0.1	0.4	4.6	9.2	14.1	19.8	21.8	18.2	12.1	5.8	2.8
Chihuahua, Mexico	11.8	15.1	19.8	23.4	28.0	30.9	31.4	31.9	26.0	20.5	15.9	12.0
Chongqing, China	9.5	11.5	14.8	21.4	21.4	24.8	26.7	29.4	24.4	19.9	15.0	11.4
Copenhagen, Denmark	1.9	3.9	5.5	8.5	11.3	18.1	18.8	18.2	14.3	9.9	6.4	4.6
Córdoba, Argentina	22.5	22.1	18.6	16.8	13.0	11.0	9.2	11.2	14.4	18.0	21.6	22.0
Dakar, Senegal	20.7	19.5	18.7	18.5	20.4	23.1	26.2	27.0	28.5	27.9	24.9	22.8
Dallas, United states	8.6	11.0	13.2	18.9	23.2	26.6	29.6	32.2	30.7	20.9	12.6	10.6
Darwin, Australia	29.7	29.5	30.1	29.8	29.0	27.4	26.5	26.5	26.8	28.4	30.0	30.8
Delhi, India	15.0	17.3	23.0	31.6	34.3	37.1	33.6	31.4	32.0	29.3	23.9	14.8
Dhaka, Bangladesh	19.1	21.8	26.4	28.7	28.7	29.1	28.8	28.9	28.8	27.7	24.4	20.3
Djibouti, Djibouti	25.1	25.9	27.2	28.8	31.0	33.9	35.9	35.5	32.9	29.3	27.1	25.5
Dongguan, China	4.9	6.0	10.1	16.3	21.1	24.9	29.3	29.0	24.4	18.9	13.3	7.3
Dublin, Ireland	5.5	6.6	7.1	8.5	10.9	13.0	16.2	15.5	13.5	9.6	6.9	5.8
Durban, South Africa	24.2	21.7	21.7	16.8	14.4	9.9	10.1	14.8	17.7	21.8	23.2	20.9
Edinburgh, Scotland	3.9	6.1	6.7	8.2	10.3	13.4	16.4	15.5	12.7	8.4	4.8	4.9

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Edmonton, Canada	-1.5	-2.7	-1.7	4.0	10.1	14.2	16.0	14.7	10.9	2.1	-1.7	-3.9
Foshan, China	14.1	14.9	18.1	22.5	26.2	28.0	29.2	29.0	27.6	24.6	20.1	15.8
Frankfurt, Germany	1.1	3.7	6.2	9.3	10.9	18.5	19.6	18.6	14.2	10.7	4.8	3.7
Georgetown, Guyana	26.1	26.1	26.9	27.5	27.4	27.3	27.5	28.0	28.6	28.3	28.0	27.0
Glasgow, Scotland	4.2	6.1	6.6	8.6	10.3	13.5	16.0	15.3	12.7	8.3	4.5	5.1
Guangzhou, China	14.2	14.9	18.3	22.4	26.2	27.9	29.1	28.9	27.7	24.5	20.0	15.7
Guatemala City, Guatemala	18.9	20.1	21.0	21.2	20.7	20.7	20.3	20.3	20.0	19.3	18.9	18.8
Guayaquil, Ecuador	27.0	26.9	27.4	27.4	26.4	25.5	24.7	24.8	25.1	25.3	25.7	26.7
Hamburg, Germany	2.1	4.2	6.6	9.7	11.6	19.3	18.7	19.1	14.6	10.8	5.8	4.6
Hamilton	-5.8	-4.9	0.1	6.9	13.1	18.4	21.5	20.4	16.3	10.0	4.1	-2.4
Hammerfest, Norway	5.4	4.3	3.9	4.0	5.0	7.0	9.7	9.6	9.1	7.7	6.5	5.6
Havana, Cuba	21.7	21.9	23.2	24.6	26.1	27.1	27.6	27.7	27.3	25.8	24.0	22.5
Helsinki, Finland	-1.4	-0.3	0.5	4.4	9.7	16.8	17.1	16.3	11.5	6.1	2.2	1.6
Ho Chi Minh City, Vietnam	25.7	26.8	28.0	29.4	28.9	28.1	27.6	27.5	27.4	27.0	26.6	26.1
Hobart, Tasmania	19.5	17.0	15.9	12.4	10.2	6.7	7.9	7.1	8.9	11.1	12.9	16.0
Hong Kong, China	18.5	20.2	21.0	24.0	26.0	28.4	29.2	29.3	28.9	27.9	24.2	20.2
Houston, United states	12.7	15.8	17.5	21.0	26.0	28.5	29.8	31.2	29.2	23.0	16.0	14.8
Hyderabad, India	22.0	25.0	28.5	31.0	32.5	29.0	27.0	26.0	26.0	25.5	23.0	21.0
Iquique, Chile	29.5	29.6	28.2	25.1	21.9	19.6	19.0	20.7	23.2	25.0	27.8	28.9
Irkutsk, Russia	-5.3	-6.0	-1.2	3.5	10.5	17.7	20.5	16.9	11.7	1.2	-9.7	-3.3
Istanbul, Turkey	5.4	5.9	7.5	11.7	16.1	20.4	22.7	22.7	19.8	15.5	11.7	7.9
Jakarta, Indonesia	26.6	27.0	27.4	27.9	28.0	27.5	27.2	27.4	27.7	28.0	28.0	27.3
Johannesburg, South Africa	25.2	24.5	25.7	19.7	17.8	13.6	13.2	18.3	21.0	25.9	25.4	23.2
Karachi, Pakistan	18.6	20.4	24.5	28.0	30.3	31.3	30.2	28.9	28.8	27.8	24.2	19.9
Kingston, Jamaica	24.6	24.8	25.4	26.0	26.6	27.1	27.5	27.6	27.1	26.6	26.0	25.4
Kinshasa, Congo	25.5	25.9	26.1	26.2	25.7	24.0	23.6	24.5	25.7	25.1	25.4	25.4
Kolkata，India	19.7	22.8	27.4	30.2	30.7	30.0	29.0	28.8	28.9	27.7	24.3	20.1
Kuala Lumpur, Malaysia	26.7	27.2	27.5	27.8	27.5	27.3	27.1	27.1	27.0	27.1	26.8	26.5
La Paz, Bolivia	18.3	18.1	18.0	17.8	16.5	15.7	14.9	14.4	16.7	17.2	18.2	18.2
Lagos, Nigeria	12.3	12.9	13.9	14.8	16.7	19.2	21.2	21.6	21.4	18.5	15.3	13.5
Lahore, Pakistan	12.5	15.1	20.4	26.4	30.9	33.7	31.4	30.4	29.3	25.4	19.0	13.7
Leeds, England	4.4	5.9	7.6	8.5	11.5	13.8	17.5	16.9	13.9	9.4	6.1	5.2
Lima, Peru	26.7	26.4	26.8	25.5	22.9	21.6	20.8	21.3	22.3	23.4	25.3	26.2
Lisbon, Portugal	11.1	12.3	14.6	15.0	18.9	19.3	21.3	21.7	21.3	18.0	15.0	13.2
Liverpool, England	6.0	6.3	7.7	9.5	12.2	14.7	17.7	17.5	15.1	11.6	8.1	6.5
London, England	4.4	6.3	8.6	9.8	12.9	16.1	19.2	18.6	15.7	11.3	7.1	6.1
Los Angeles, United states	13.1	11.3	15.3	20.4	20.1	24.4	27.2	27.4	26.7	22.3	17.3	12.8
Lyons, France	1.4	3.5	6.3	8.6	11.2	18.3	21.8	19.7	16.3	13.0	6.6	5.3
Madrid, Spain	3.7	7.5	11.8	12.7	19.4	24.4	29.0	27.0	21.7	16.4	10.0	7.7
Manchester, England	4.2	5.8	7.2	9.0	11.3	13.8	16.8	16.3	13.4	9.2	6.0	5.1
Manila, Philippines	25.6	26.1	27.5	29.0	29.3	28.3	27.7	27.4	27.6	27.3	26.8	25.9
Marseilles, France	13.4	12.4	13.3	14.1	15.6	20.6	24.8	23.8	21.9	19.5	16.8	14.9
Mazatlán, Mexico	23.5	22.1	21.6	23.6	25.0	27.7	29.9	30.4	30.2	29.3	27.6	24.6
Mecca, Saudi Arabia	26.4	26.1	25.1	25.5	28.4	29.9	30.8	31.5	30.9	31.0	29.8	27.6
Melbourne, Australia	29.5	25.7	23.4	18.5	12.9	9.6	10.0	9.0	11.1	16.5	19.2	25.6
Mexico City, Mexico	13.0	14.5	16.5	18.0	18.0	18.0	17.0	17.5	17.0	15.5	13.5	13.0
Milan, Italy	3.7	6.2	11.6	14.3	16.6	24.7	27.0	26.4	20.7	16.6	10.4	6.9
Mississauga	-5.7	-4.9	0.0	6.3	12.2	17.6	20.9	19.9	15.8	9.6	4.3	-2.2
Montevideo, Uruguay	24.9	24.1	21.1	19.2	15.7	15.0	11.3	11.9	14.0	17.4	21.9	23.7
Montreal	-10.0	-8.4	-2.0	6.2	13.4	18.6	21.5	20.0	14.9	8.6	1.9	-6.3
Moscow, Russia	-1.5	-0.8	-0.2	6.3	14.5	18.4	16.0	15.3	11.4	7.8	1.3	0.3
Munich, Germany	0.7	2.5	5.9	9.4	10.6	18.6	19.5	18.6	14.2	10.9	4.9	2.3
Nagasaki, Japan	18.1	17.0	16.9	17.7	19.8	21.7	25.4	28.6	27.3	25.2	22.9	20.4
Nagoya, Japan	4.8	6.4	9.2	13.1	19.5	23.1	25.6	28.5	25.3	19.3	12.2	7.5

Note: Numbers represent ambient temperatures (°C). Red: high risk. Yellow: moderate risk. Green: low risk.

City	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Nairobi, Kenya	21.7	24.0	24.1	23.6	21.6	20.2	20.1	20.6	21.0	21.0	20.8	20.3
Nanjing, China	4.5	4.8	12.2	17.5	21.9	26.0	29.0	29.9	26.1	19.9	14.1	7.6
Naples, Italy	15.1	13.9	14.2	15.3	17.4	23.6	26.4	26.9	25.4	22.8	20.0	17.5
New York, United states	0.2	1.3	4.9	11.9	16.3	21.3	25.8	23.7	20.4	15.2	5.9	2.5
Newcastle, England	4.4	6.0	7.3	8.8	11.8	14.4	18.1	17.0	14.0	9.2	6.5	5.2
Odessa, Ukraine	-1.4	2.1	6.4	10.4	17.3	23.7	22.8	23.4	18.3	13.0	8.0	3.3
Osaka, Japan	11.8	10.3	10.9	12.9	17.2	21.1	24.6	27.3	26.6	23.6	20.0	15.7
Oslo, Norway	-0.9	-0.6	-0.3	2.8	6.7	11.6	14.3	13.3	8.2	2.1	-1.6	-0.3
Ottawa, Canada	-3.7	-2.4	-1.6	3.2	10.2	15.8	20.7	18.5	14.2	8.1	-1.6	-4.7
Panama City, Panama	25.7	25.5	25.9	27.3	28.0	28.2	27.8	27.7	27.6	27.3	27.3	27.4
Paramaribo, Suriname	26.5	27.0	27.7	27.7	27.1	27.0	27.0	27.4	28.3	28.2	28.3	26.9
Paris, France	4.0	5.8	8.4	10.6	12.7	18.2	21.5	19.9	16.6	12.9	7.8	6.0
Perth, Australia	21.5	22.3	23.0	22.8	22.4	21.9	20.6	20.4	19.8	20.2	20.8	22.6
Philadelphia, United states	1.2	2.0	6.0	13.7	18.3	22.4	26.4	24.9	22.3	16.2	6.5	3.5
Phoenix, United states	12.2	12.2	19.1	26.7	28.9	36.9	40.3	39.7	34.5	25.2	18.8	12.2
Plymouth, England	5.3	6.7	8.5	9.7	12.0	14.7	18.3	16.9	15.0	11.4	7.8	6.8
Port Moresby, Papua New Guinea	23.7	24.0	23.3	23.7	23.2	23.1	21.8	22.1	22.0	23.1	23.0	24.0
Prague, Czech Republic	-0.2	1.5	5.8	9.6	11.1	20.7	20.6	19.6	14.3	10.0	4.9	2.0
Rangoon, Myanmar	25.9	27.9	30.6	34.2	32.6	28.6	27.7	27.3	27.9	29.6	28.1	25.4
Reykjavík, Iceland	2.2	1.6	1.9	6.3	8.2	11.7	13.9	11.7	9.4	5.3	2.5	1.3
Rio de Janeiro, Brazil	26.1	24.9	24.3	23.1	21.0	18.9	17.3	18.6	21.8	22.6	23.1	23.4
Rome, Italy	14.9	14.2	14.1	15.3	16.7	22.0	26.1	25.9	24.4	21.4	19.1	17.1
Salvador, Brazil	30.7	32.9	31.2	29.5	28.9	25.5	24.5	24.9	26.7	28.8	30.4	31.2
San Antonio, United states	11.3	13.6	16.2	20.6	24.7	28.9	30.5	32.9	31.2	23.5	14.8	13.2
San Diego, United states	14.4	13.6	15.5	19.0	19.1	22.2	24.2	24.8	25.0	21.5	17.9	14.8
San Jose, United states	10.0	8.4	10.8	14.2	14.7	19.0	19.7	20.8	19.6	15.4	11.5	10.2
Santiago, Chile	24.9	24.9	20.6	16.0	10.7	5.8	5.4	8.4	10.9	14.5	21.6	24.8
São Paulo, Brazil	25.3	23.8	22.5	21.6	19.4	17.3	15.8	18.1	22.2	23.9	23.6	23.2
Seoul, South Korea	-3.3	-1.0	4.7	12.0	17.7	21.8	25.0	25.6	20.9	14.4	6.7	-0.4
Shanghai, China	6.1	6.7	12.7	18.3	21.8	25.2	28.4	29.3	25.3	20.8	15.1	9.1
Shenzhen, China	15.1	15.5	18.6	22.5	26.0	27.7	28.6	28.3	27.3	24.7	20.5	16.8
Singapore, Singapore	26.1	26.7	27.1	27.4	27.6	27.4	27.1	27.0	26.9	27.0	26.6	26.1
Sofia, Bulgaria	0.0	1.7	5.2	8.6	11.7	17.8	18.7	19.6	15.7	11.1	8.2	1.5
St. Petersburg, Russia	-6.8	-2.4	-2.8	4.2	10.3	16.5	17.9	17.3	14.6	7.7	3.5	0.3
Stockholm, Sweden	-1.9	0.8	1.5	4.9	9.5	16.7	16.2	16.6	12.1	6.8	3.6	2.0
Sydney, Australia	26.2	23.9	22.2	18.8	14.8	12.3	11.6	12.2	15.2	18.3	21.5	23.8
Tananarive, Madagascar	28.6	28.5	28.1	28.3	26.6	25.0	24.4	25.9	29.0	31.3	31.0	29.2
Teheran, Iran	2.8	4.3	7.1	11.6	21.3	30.3	32.5	31.3	26.0	19.1	7.2	4.1
Tianjin, China	-3.2	-0.9	6.1	14.2	20.5	24.8	26.7	26.1	21.2	14.6	6.0	-0.9
Tokyo, Japan	-0.2	1.6	3.5	7.3	13.8	16.5	19.2	22.0	19.5	13.9	6.2	2.1
Toronto, Canada	-4.7	-3.5	-0.7	5.7	11.7	17.5	23.1	21.0	17.2	10.6	1.4	-1.1
Tripoli, Libya	16.3	14.9	15.4	16.7	19.0	22.8	26.7	28.0	27.2	25.5	22.2	19.1
Vancouver	3.2	5.1	6.7	9.1	12.4	15.5	17.6	17.7	14.7	10.4	6.1	3.6
Venice, Italy	2.7	5.9	10.0	13.9	15.7	24.5	26.1	25.7	20.6	16.6	11.1	6.1
Veracruz, Mexico	21.6	22.3	24.5	26.9	28.4	28.4	27.3	27.7	27.3	26.3	24.3	22.5
Vienna, Austria	1.0	3.2	7.3	10.6	11.8	21.6	21.8	22.0	16.5	11.1	6.8	2.6
Vladivostok, Russia	-5.1	-4.5	-1.7	1.3	9.4	15.3	19.1	22.2	18.7	11.9	3.9	-5.7
Warsaw, Poland	-1.2	2.4	5.4	10.3	13.5	22.7	19.6	20.9	15.0	10.8	5.9	2.9
Wellington, New Zealand	19.4	19.3	18.9	17.8	16.4	14.5	13.2	12.7	12.7	13.6	15.3	16.8
Winnipeg, Canada	-11.6	-7.5	-4.3	3.6	9.5	17.8	20.6	19.1	13.7	4.7	-3.5	-9.6
Wuhan, China	3.9	5.6	10.5	16.8	22.1	25.9	29.1	28.8	23.7	18.2	11.9	6.0
Zürich, Switzerland	0.8	1.3	5.7	8.2	10.1	17.6	19.7	18.4	14.5	11.0	4.9	2.8

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