Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Temperature and the difference in impact of SARS CoV-2 infection (COVID-19) between tropical and non-tropical regions in Taiwan

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Dear Editor

SARS CoV-2 is the newest, and seventh, human coronavirus (HCoV) infecting the human respiratory tract. HCoV-229E and HCoV-NL63 belong to the *Alphacoronavirus* genus, and HCoV-HKU1, HCoV-OC43, MERS-HCoV, and SARS-HCoV belong to the *Betacoronavirus* genus [1]. HCoVs are sensitive to environment temperature: SARS-HCoV, in particular, becomes inactive after exposure to temperatures >56 °C for >90 min [2].

Regions of the world can be divided into tropical and non-tropical regions, depending on where they lie relative to circles of latitude on the Earth's surface. Generally, tropical regions have higher annual average temperatures than do non-tropical ones. We noted significant differences between tropical and non-tropical countries with respect to SARS CoV-2–induced average number of cases (1206.93 vs. 17438.26, *p*

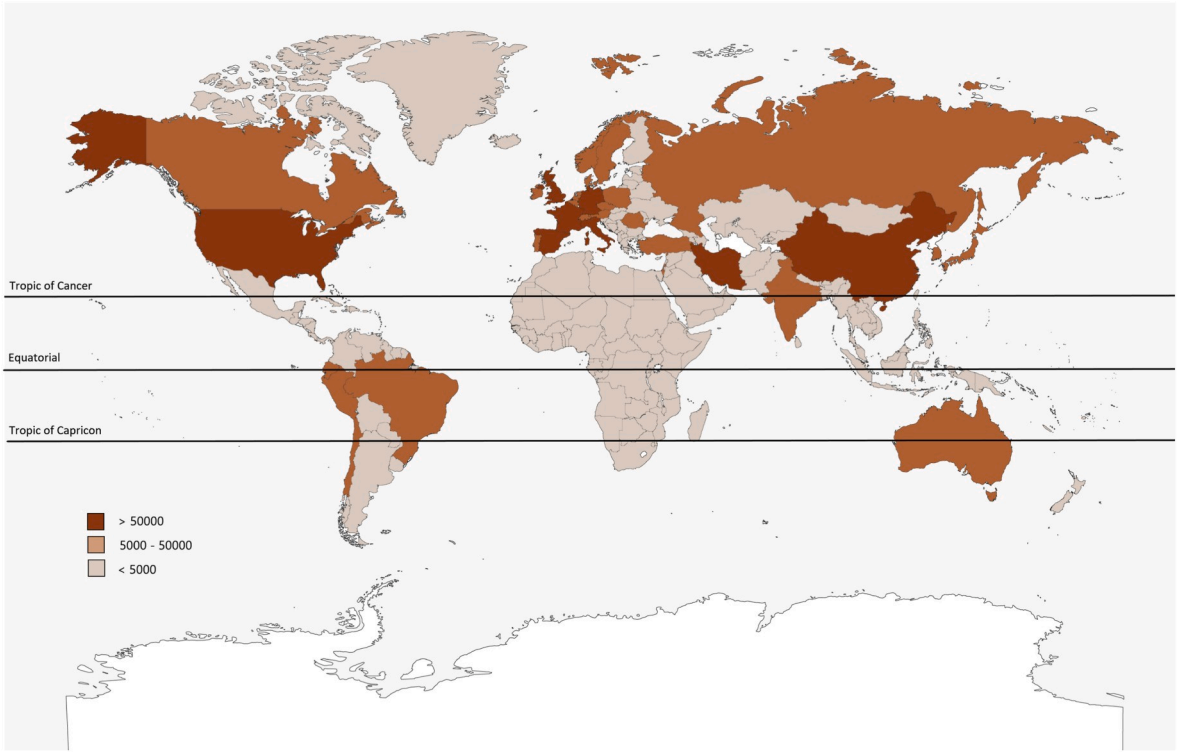

Fig. 1A. Distribution of COVID-19 patients around the world.

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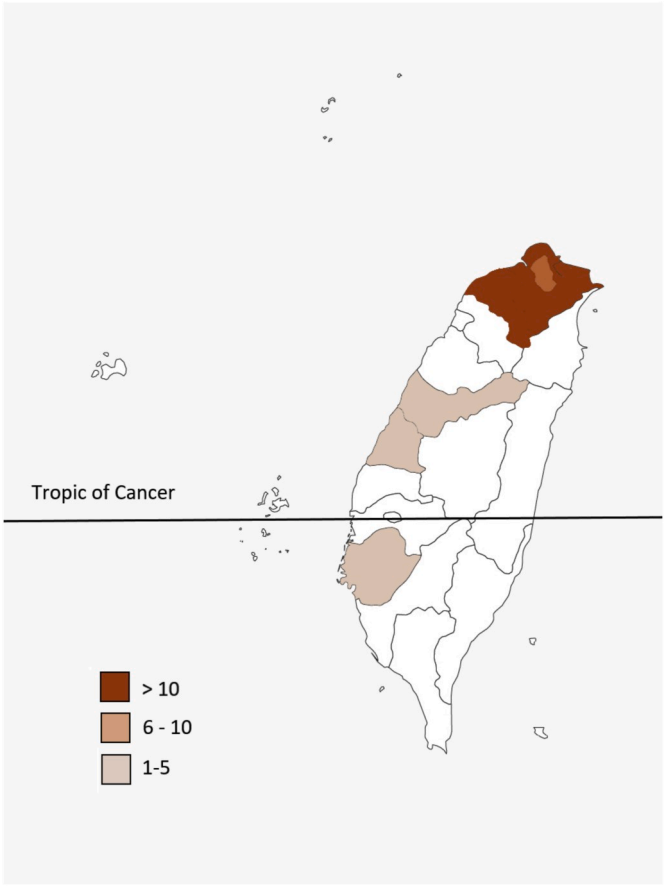

Fig. 1B. Distribution of local cases of COVID-19 in Taiwan.

= 0.013) (Fig. 1A) and mortality numbers (54.06 vs. 1251.17, p = 0.007). At present, the average incidence for tropical countries is 143.59 per million, much lower than the 1087.45 per million for non-tropical countries ($p < 0.001$). This result suggests that climatic temperature influences the transmission of SARS CoV-2.

Taiwan, in particular, has half of its territory (seven cities and counties) in a tropical zone, and the other half (15 cities and counties) in a non-tropical zone. As of April 10, Taiwan has had 54 and 328 local and imported cases of COVID-19, respectively. Fifty-three local cases occurred in non-tropical Taiwan, whereas only one case occurred in tropical Taiwan (p = 0.030) (Fig. 1B). The average incidences for tropical and non-tropical Taiwan are, at present, 0.08 and 1.99 per million, respectively ($p = 0.007$). The weather temperature during this period was 19.3°C-25.4 °C and 16.1°C-21.9 °C in tropical and non-tropical Taiwan, respectively.

In 2010, Gaunt et al. noted marked differences in the detection rates of coronaviruses (such as HCoV-OC43, HCoV-HKU, and HCoV-NL63) between winter and summer, with little to no detection during summer [3]. Two studies on pediatric HCoV infection also reported a lower rate of HCoV infection after May [4,5].

Therefore, we believe that, all things being equal, the transmission of SARS CoV-2 differs between tropical and non-tropical regions. However, we should not hastily conclude that COVID-19 incidence will decrease in the coming summer. This is because countries greatly differ with respect to population density, disease burden, health care quality, infection control policy, and availability of rapid tests. Nonetheless, Taiwan's tropical and non-tropical regions differ in COVID-19 incidence despite sharing the same population density (1100.89 vs. 1738.45, p = 0.470), infection control policy, and quality of health care.

Credit

All coauthors contributed to study design. Yu-Lung Hsu, Hsiu-Mei Wei, and Huan-Cheng Lai collected data; Yu-Lung Hsu, Hsiu-Mei Wei, and Huan-Cheng Lai analyzed data; Yu-Lung Hsu and Hsiao-Chuan Lin interpreted data; Yu-Lung Hsu, Hsiao-Chuan Lin and Kao-Pin Hwang wrote the paper; and Kao-Pin Hwang supervised the study.

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Declaration of competing interest

We declare that all authors have no competing interests.

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