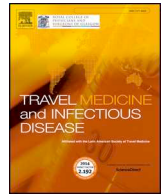




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## COVID-19 and dengue, co-epidemics in Ecuador and other countries in Latin America: Pushing strained health care systems over the edge



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#### Dear Editor,

Currently, the spread of Coronavirus-19 disease (COVID-19) from the emerging SARS-CoV-2 virus in Wuhan, China, has reached other Asian countries, Europe, North America as a pandemic situation, and has already entered Latin America with multiple implications [1]. One of these is the continuous dengue epidemic in Ecuador and other countries in 2019–2020. This period comprises a further increase in cases and one of the largest dengue outbreaks in the region with nearly 3 million cases, 8416 of them in Ecuador [2,3]. COVID-19 cases in Ecuador reached 1595 confirmed cases with 36 deaths nationwide (March 27, 2020) [4], while dengue, reached 3549 cases.

Ecuador has four geographic regions with marked climatic, social, and travellers entry differences (Coast, Andeans-Sierra, Amazon, and the Galapagos Islands) that influence dengue eco-epidemiological dynamics as well as the COVID-19 epidemic.

The coast and the city of Guayaquil present, simultaneously, 82.57% of the confirmed cases of COVID-19 and the highest number of dengue cases (84%). La Sierra (Quito, Capital and the principal city) presents 3.7% of dengue and 15.36% of the COVID-19 cases. Amazonia presents 11.3% of dengue and 1.82% of COVID-19, and Galapagos zero and four (0.25%) cases respectively.

Thus, the most significant public health problem occurs on the coast, with Guayaquil (officially Santiago de Guayaquil), capital of Guayas province, as the primary source of transmission and contagion. This city has not adopted new COVID-19 containment measures, nor is it conducting an optimal mitigation campaign. Its climatic characteristics and deficiencies in public services have led to the high endemic-epidemic transmission of dengue. The Sierra (Quito) has adopted drastic mitigation measures even with a low number of cases, while the average altitude (above 1,700 m, with the absence of *Aedes aegypti*) and its low temperatures provide areas free of dengue transmission.

Galapagos island has a higher containment capacity and has adopted recently substantial restrictions on tourist income. For their part, the Amazonian provinces have air and land access, however, their population density is very low. Only moderately large cities usually present cases of dengue, not the westernized indigenous communities [5], and the few cases of COVID-19 have been tourists who entered with

infection or local non-community transmission.

Ecuador, with 17 million inhabitants (58% coast, 38% sierra, 12% amazon, 3% Galapagos), has an availability of 389 intensive care units (ICU) (2 units/100,000 inhabitants) and 1183 ICU beds (7 beds/100,000 inhabitants) (Fig. 1). Galapagos has neither ICU rooms nor beds, and Amazonia only 10 and 19, respectively. The Coast, has the fewest number of ICU units and beds (139 rooms and 534 beds), the Sierra with 240 and 1219 respectively. Additionally, we will have a high probability of co-infections of both viruses, with mixing symptoms, which can worsen the epidemiological situation of diagnostic, control and treatment in Latin America, unlike in Europe and the USA and not reported in Asia due to the winter period. These data suggest that the health system on the coast could be simultaneously affected by both epidemics, and the number of seriously ill patients will exceed the availability of units and beds if mitigation measures are not carried out rigorously, and immediately.

According to the estimates of the percentage of seriously ill patients who may require ICU bed intake (5% of the total cases), if a doubling of cases is initiated every seven days, and with each patient requiring about 21 days on average to recover, the region could be outnumbered in the number of beds in a few weeks at the start of the infection exponential stage.

ICU care for patients with severe dengue will have less pressure on the system (severe dengue < 1%). However, most of the febrile dengue cases will overlap in health centres along with cases of COVID-19, sharing clinical features. If we add the possibility of some false positives by rapid dengue tests, the failure to consider COVID-19 due to this result will have serious implications not only for the patient but also for the public health. Hence, the importance of developing rapid and reliable tests for SARS-CoV-2/Dengue in the immediate future. Likewise, the differentiated supply of drugs such as ibuprofen, with different severity-COVID19 in Italy [6], and aspirin (contraindicated for dengue) will increase the complexity of medical care in the simultaneous epidemics. On April 5, 2020, time of proofs correction, there were 3,646 cases of COVID-19 in Ecuador.

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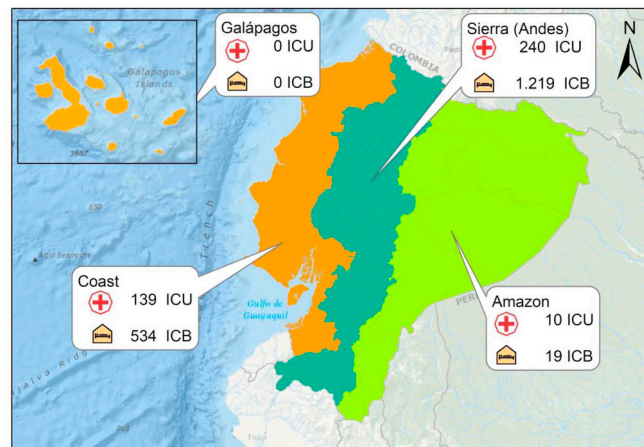


Fig. 1. ICUs and beds in Ecuador national health system.

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#### Declaration of competing interest

None of the authors reports a conflict of interests.

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