



Commentary

The Brazilian tragedy: Where patients living at the ‘Earth’s lungs’ die of asphyxia, and the fallacy of herd immunity is killing people.

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The Brazilian COVID-19 pandemic has stretched an already overwhelmed, understaffed and underfunded public health system to the breaking point [1]. Brazil's COVID-19 death toll is the second highest in the world behind only the United States, with more than 8.9 million reported cases and 220,000 deaths [at the time of writing]. In the first wave of COVID-19, between May and June 2020, Amazonas state has registered nearly 19 coronavirus deaths per 100,000 residents, compared to 4 deaths for all of Brazil. As the state experiences a second wave of COVID-19 in January 2021, Amazonas is registering 142 deaths per 100,000 inhabitants, while the national average is 98 [2].

Amazonas's estimated population of 4,200,000 includes nearly all of Brazil's reserved land for indigenous people (98.5%). The state has only 100 ICU beds, all located in the state capitol, Manaus, where laboratory surveillance is also centralized. During the first wave of COVID-19, around May 2020, Amazonas also experienced an exponential increase of deaths at home that led to a collapse of both the health care and funerary systems. However, in early June 2020, Manaus was already relaxing social-distancing requirements. By mid August 2020, Manaus had reduced its number of excess deaths from around 120 per day to nearly zero. Pre-prints subsequently suggested that Manaus had achieved herd immunity [3].

Less than a year later, Amazonas is experiencing its second wave of COVID-19, with a faster spread of infection, increased mortality and healthcare and funerary systems collapsing again. In January 2021, oxygen shortages led to the deaths of up to 40 COVID-19 ICU patients in Manaus [4]. The same month, police from Manaus found 33 oxygen cylinders hidden in a truck, which were reportedly being sold to wealthy families eager to save their dying family members. A

supply of 150 oxygen cylinders arriving in Manaus required military escort for delivery to hospitals and remote clinics [5]. Amazonas's remote location presents challenging logistics, requiring additional stocks of oxygen and other healthcare supplies to be transported by boat and by plane, making it even more difficult to provide timely surveillance, treatment and care.

Key failures at the local and national level contributed to these tragedies [6]. Brazilian President Jair Bolsonaro has been outspoken against lockdowns and described COVID-19 as a “little flu”, frequently appearing at rallies without masks and not observing social distancing. Brazil's federal government claimed that the crisis in Manaus was due to lack of ‘early treatment’ for COVID-19, including the anti-malaria drug hydroxychloroquine in combination with the antibiotic azithromycin, which have not shown efficacy [7]. Since the federal government has relied on clinical diagnoses of COVID-19 (e.g. patients with symptoms) instead of laboratory confirmed COVID-19 cases and contact tracing has been sub-optimal, [6] the true scope of the epidemic is unknown.

Amazonas' government did not reinforce the need to adopt preventive measures, and the vast majority of its population did not adhere to social distancing and facemasks. Many turned to herbs and traditional medicines collected in the forest to alleviate symptoms. With a deadly second wave of transmission now occurring in the early days of 2021, the assumption that Manaus achieving herd immunity has proven incorrect [8]. Laboratory surveillance of SARS-CoV-2 and its mutations has also been suboptimal - a new variant belonging to the B.1.1.248 lineage that has 12 mutations, including N501Y and E484K in its spike protein - was first detected by the Japanese government among four people who had travelled from Amazonas [9].

Lack of prompt government response, a public health system at the edge of collapse before the pandemic, a federal government in denial and a new, potentially more infectious variant have all likely contributed to a deadly resurgence of SARS-CoV-2 in Amazonas. New variants bring increasing concerns about re-infection and immune escape which may necessitate vaccine boosters [10]. The experience of Manaus is a clear example of how assumptions of reaching herd immunity in the absence of vaccination are counter-productive. This tragic scenario also highlights the urgency to improve the health care infrastructure, surveillance and adequate management of the supply chain to assure that vaccines, medications and health supplies (e.g. oxygen) are not diverted on the black market.

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Declaration of Competing Interest

None.

Contributors

MM conceived, drafted the manuscript and coordinated subsequent edits and revisions. SAS and PJG participated in drafting the manuscript and its finalization. All authors have read and approved the final manuscript.

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