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The challenges of education in a continental country in the face of new severe acute respiratory coronavirus virus 2 (SARS-CoV-2) variant circulation

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To the Editor—On March 11, 2020, the World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19) a global pandemic. To contain the spread of new coronavirus (SARS-CoV-2), several contact-restriction measures were adopted by different countries, such as home quarantine and school closures.[1] According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), Brazilian students were the most affected by the closing of schools compared to students from other countries.[2,3] During the school closures, digital learning and other alternative educational strategies were implemented to avoid the academic regression of children and adolescents. However, home confinement and distance learning have caused psychological disorders for some students. At the same time, adequate communication between parents and children can play a protective role against mental health disorders in students.[1] Nevertheless, the return to face-to-face education is essential to reduce the harms resulting from digital exclusion, interruption of physical activities, the preclusion of social interaction, and other factors.[4]

The appropriate moment for schools to reopen should be assessed according to local epidemiological data. Cities with low prevalence rates and effective measures to mitigate SARS-CoV-2 transmission have not reported significant pediatric outbreaks. However, the main pediatric outbreaks have occurred in communities with less stringent mitigation measures and widespread SARS-CoV-2 transmission.[5,6] Pediatric patients affected by COVID-19 may be asymptomatic or may present with mild respiratory symptoms. The expression of angiotensin-converting enzyme 2 (ACE-2) in the nasal epithelium is age related, so the lower expression in pediatric patients is the probable reason for symptoms rarely involving the lower respiratory tract and loss of smell and taste, as occurs in adult patients. In addition, pediatric patients can also present with multisystemic inflammatory

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Table 1. Distribution of Different SARS-CoV-2 Lineages Identified in the Brazilian States

Region	State	SARS-CoV-2 Lineages	Total
North	Acre	B.1.1, B.1.1.33, B.1.212	3
	Amapá	B.1.1.33, B.1.160.25, N.10, P.1, P.2	5
	Amazonas	A.2, B.1, B.1.1, B.1.1.117, B.1.1.218, B.1.1.28, B.1.1.33, B.1.1.34, B.1.1.378, B.1.111, B.1.195, B.1.212, B.1.319, B.1.566, N.9, P.1, P.1.1, P.2	18
	Pará	B.1, B.1.1, B.1.1.1, B.1.1.28, B.1.1.33, B.1.212, B.1.395, B.39, N.9, P.1, P.2	11
	Rondônia	B.1.1.28, B.1.1.33, B.1.212, N.9, P.1, P.2	6
	Roraima	B.1, B.1.1.33, P.1	3
	Tocantins	B.1, B.1.1, B.1.1.28, B.1.1.33, P.1, P.2	6
Northeast	Alagoas	B.1.1, B.1.1.143, B.1.1.28, B.1.1.29, B.1.1.33, B.1.1.34, B.1.1.371, B.1.1.372, B.1.1.7, N.9, P.1, P.2	12
	Bahia	A.1, B.1, B.1.1, B.1.1.106, B.1.1.141, B.1.1.162, B.1.1.180, B.1.1.28, B.1.1.29, B.1.1.314, B.1.1.33, B.1.1.333, B.1.1.34, B.1.1.7, B.1.167, B.1.525, B.1.610, B.3, C.14, N.4, N.9, P.1, P.2	20
	Ceará	B, B.1, B.1.1, B.1.1.143, B.1.1.28, B.1.1.282, B.1.1.33, B.1.1.34, B.1.1.44, B.1.212, N.9, P.1, P.2	13
	Maranhão	B.1.1, B.1.1.28, B.1.1.33, B.1.1.332, B.1.234, N.10, N.9, P.1, P.2	9
	Paraíba	B.1, B.1.1, B.1.1.141, B.1.1.143, B.1.1.232, B.1.1.269, B.1.1.28, B.1.1.29, B.1.1.33, B.1.1.34, B.1.1.462, B.1.212, N.9, P.1, P.2	15
	Pernambuco	B, B.1, B.1.1, B.1.1.10, B.1.1.117, B.1.1.139, B.1.1.15, B.1.1.192, B.1.1.28, B.1.1.29, B.1.1.208, B.1.1.227, B.1.1.314, B.1.1.33, B.1.1.34, B.1.1.74, B.1.1.94, B.1.212, B.1.258, N.9, P.2	21
	Piauí	B.1.1.33, N.9	2
	Rio Grande do Norte	B.1.1, B.1.1.28, B.1.1.33, B.1.195, N.9, P.1, P.2	7
	Sergipe	B.1, B.1.1, B.1.1.28, B.1.1.29, B.1.1.33, B.1.1.7, B.1.212, B.1.610, B.59, N.9, P.1, P.2	12
Mid West	Distrito Federal	B, B.1, B.1.1, B.1.1.28, B.1.1.33, B.1.1.7, B.1.177.32, P.1, P.2	9
	Goiás	B.1, B.1.1.28, B.1.1.29, B.1.1.33, B.1.1.7, B.1.22, B.40, P.1, P.2	9
	Mato Grosso	B.1.1.28, B.1.1.33, B.1.1.7, B.4	4
	Mato Grosso do Sul	B.1, B.1.1, B.1.1.28, B.1.1.33, B.1.1.7, B.1.212, B.1.240, B.1.547, N.4, P.1, P.2	11
Southeast	Espírito Santo	B.1, B.1.1, B.1.1.143, B.1.1.28, B.1.1.33, B.1.1.7, B.40, P.1, P.2	9
	Minas Gerais	B, B.1, B.1.1, B.1.1.143, B.1.1.190, B.1.1.218, B.1.1.28, B.1.1.33, B.1.1.372, B.1.1.7, B.1.1.71, B.1.153, B.1.177, B.1.2, B.1.212, B.1.234, B.1.235, B.1.314, B.1.36.10, B.1.408, B.1.526.1, B.1.9, B.59, B.61, P.1, P.2	26
	Rio de Janeiro	A.2, B.1, B.1.1, B.1.1.109, B.1.1.143, B.1.1.218, B.1.1.222, B.1.1.277, B.1.1.28, B.1.1.29, B.1.1.306, B.1.1.31, B.1.1.314, B.1.1.33, B.1.1.393, B.1.1.7, B.1.1.94, B.1.111, B.1.153, B.1.167, B.1.222, B.1.398, B.1.422, B.1.565, B.1.577, B.1.582, B.1.596, B.39, N.1, N.4, N.9, P.1, P.2	33
	São Paulo	A, B, B.1, B.1.1, B.1.1.1, B.1.1.143, B.1.1.208, B.1.1.28, B.1.1.318, B.1.1.33, B.1.1.332, B.1.1.333, B.1.1.378, B.1.1.393, B.1.1.464, B.1.1.519, B.1.1.7, B.1.177.52, B.1.195, B.1.212, B.1.221, B.1.234, B.1.351, B.1.446, B.1.566, B.23, B.3, B.40, B.6, N.9, P.1, P.1.1, P.2	33
South	Paraná	A, B.1, B.1.1, B.1.1.1, B.1.1.143, B.1.1.250, B.1.1.28, B.1.1.29, B.1.1.33, B.1.1.7, B.1.195, B.1.375, B.1.498, B.1.98, P.1, P.1.1, P.2	17
	Rio Grande do Sul	A, B, B.1, B.1.1, B.1.1.143, B.1.1.28, B.1.1.29, B.1.1.33, B.1.1.332, B.1.1.7, B.1.1.70, B.1.177, B.1.195, B.1.212, B.1.416, B.1.575, B.1.91, P.1, P.2	19
	Santa Catarina	B.1, B.1.1, B.1.1.1, B.1.1.143, B.1.1.279, B.1.1.28, B.1.1.33, B.1.1.332, B.1.1.7, B.1.195, B.6, N.9, P.1, P.2	14

syndrome (MIS-C), a life-threatening disease, similar to toxic shock syndrome and Kawasaki disease. MIS-C is predominantly reported among children of Black and/or Latino ancestry. Thus, schools reopening in Africa and Latin America countries may generate epidemic patterns that differ from those on other continents, especially during the high local circulation of SARS-CoV-2. For example, more transmissible variants have emerged in Brazil (P.1 lineage) and South Africa (B.1.351 lineage).[4,6]

In 2020, researchers verified high rates of SARS-CoV-2 infection by B.1.195 and B.1.1.28 lineages, with subsequent seroconversion in the population of Manaus, Brazil. However, the P.1 lineage, a variant with mutations related to increased transmissibility, ACE-2 affinity, and antibody evasion, resulted in outbreaks and COVID-19 recurrence in Manaus during January 2021, spreading throughout the country thereafter, including municipalities bordering Peru, Colombia, and Venezuela. Hence, the genetic, immunological, and epidemiological characteristics of new SARS-CoV-2 lineages should be monitored regionally, and the clinical risk for new patients should be assessed, especially in grouping situations, such as children in classrooms.[7] The emergence and dissemination of new variants occur due to epidemiological factors, such as the lack of efficient social distancing, contributing to the occurrence of pediatric outbreaks, increased hospitalizations and bed occupations.[6,7] Recently, the Oswaldo

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Cruz Foundation (FIOCRUZ) Genomics Network reported the presence of 110 SARS-CoV-2 lineages in Brazilian states, including highly transmissible lineages related to outbreaks and more severe cases of COVID-19. This finding reinforces the genomic surveillance need to properly manage the COVID-19 pandemic in Brazil (Table 1).[8]

The ethnic diversity and socioeconomic inequalities present in Brazil also determine the epidemiology of COVID-19. Although studies performed in developed countries have determined that the spread and worsening of COVID-19 among children have low significance, regional differences have been observed among Brazilian children and adolescents with COVID-19 such as higher mortality in less socioeconomically developed municipalities, especially in the northern region of Brazil. Furthermore, individuals with 2 or more comorbidities may have 9.6-fold increased risk of death from COVID-19.[4,9] Another Brazilian study analyzed patients aged <19 years infected with SARS-CoV-2 in the state of Sergipe, Northeastern Brazil, and verified that the mortality rate was 37-fold higher than that reported in the United States and the United Kingdom. This unusual and high mortality rate increases with the local absence of pediatric intensive care unit (ICU) beds and the presence of comorbidities, such as neurological diseases and prematurity.[10] To avoid COVID-19 and subsequent pediatric hospitalizations with the return of face-to-face classes, appropriate mitigation measures are necessary.

The main strategies in health protocols for preventing the COVID-19 spread in face-to-face classes are mask wearing, sanitization of hands, surface disinfection, guidance for home quarantine of students or employees with a positive test for SARS-CoV-2, and adjustment of infrastructure in schools.[4] On the other hand, the scarce resources invested in Brazilian public education in recent years have placed these educational institutions in very precarious conditions, increasing social inequalities. The average amount spent per student in Brazil is half that spent by Brazilian private schools and countries of the Organization for Economic Co-operation and Development (OECD). In addition, the adverse economic effects caused by the COVID-19 pandemic have also resulted in reduced resources for basic education, as seen in countries with an educational financing system similar to the Brazilian system. Thus, the lack of basic infrastructure in Brazilian public schools represents an obstacle to the necessary adaptations to prevent the spread of SARS-CoV-2 among students and staff.[2]

Therefore, the elaboration and execution of health protocols for the schools reopening during the pandemic should be supported by real data representative of each region and Brazilian context because socioeconomic vulnerabilities and comorbidities are risk factors for the worsening of COVID-19 rates among Brazilian children. As long as no COVID-19 vaccination or treatment is available for children, the return to face-to-face classes places Brazilian students at higher risk for COVID-19 due to the national circulation of highly transmissible SARS-CoV-2 lineages and the lack of hospital beds in low-income regions of the country.

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