



Preparing schools for future pandemics: Insights on water, sanitation and hygiene solutions from the Brazilian school reopening policies

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ARTICLE INFO

Keywords:

Infection prevention and control
 COVID-19
 Education
 WASH
 Public policies

ABSTRACT

Post-COVID-19, schools urgently need to enhance infection control and prevention (IPC) measures, including water, sanitation, and hygiene (WASH), to prepare for future outbreaks and pandemics. Particularly in Brazil, that is of particular concern, as students are still recovering from the 20th longest school closure in the world. Hence, the current study had two goals: (i) to describe WASH solutions outlined in policies released at the federal, state, and capital city levels in Brazil during the COVID-19 pandemic for the safe reopening of schools and (ii) to discuss their potential to enhance school's capacity to remain operational during a new pandemic or outbreak. With a qualitative exploratory approach, we performed content analysis to discuss the direction (what, where, how and for whom?) of 66 public policies by integrating four frameworks. Solutions were discussed in the light of the principles of human rights and the human rights to water and sanitation, international guidelines for WASH and IPC in schools and the Sphere minimum standards for humanitarian aid. One hundred and fifty-nine solutions, spanning five thematic areas and five population groups, including software and hardware interventions, were compiled for potential use in Brazil and beyond. While suggested solutions have the potential to provide a cleaner and safer learning environment, it is essential to exercise caution when implementing these measures and adapt them to the specific circumstances of each school.

1. Introduction

The first COVID-19 case in Brazil was identified on February 26, 2020, in the state of São Paulo, located in the southeast region of the country (de Melo et al., 2020). Shortly after, the country became a global COVID-19 hotspot within weeks (WHO, 2022a). In an attempt to contain the spread of the virus, Brazil closed schools starting on March 12, 2020, one day after the World Health Organization (WHO) declared the outbreak of COVID-19 a pandemic. Two weeks later, all schools in the country were closed, of which 90.1 % remained without face-to-face activities for the remainder of 2020 (UNICEF, 2021).

Originally intended as a short-term response to control the new coronavirus, Brazil's national school closure persisted for 555 days (UNESCO, 2022). The government's failure to coordinate an effective and fast public health response to COVID-19, including a delayed and slow-peace vaccination campaign coupled with the spread of misinformation regarding disease prevention measures, led to the 11th longest school closure among Latin American and Caribbean countries and the 20th longest school closure globally (UNESCO, 2022). Statistics from the

Brazilian National Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios – PNAD*) indicated that in November 2020, 5 million school-aged children (6–17 years old) were not enrolled or involved in school activities, an increase of 3.9 million compared to pre-COVID-19 (UNICEF, 2021). Moreover, approximately 43 % of schools in Brazil had to rearrange the academic calendar in 2020 due to the complications associated with the pandemic (INEP, 2021a). The *Exame Nacional do Ensino Médio* (ENEM) from 2020, which is the national admission test for enrollment in universities in Brazil (which usually takes place in November), was postponed to January 2021 (MEC, 2020a), also delaying the academic calendar of universities. Giving these circumstances, the Brazilian government allowed schools to remain temporarily closed while offering remote activities until December 2021 (Brazil, 2020a).

To aid schools during the reopening phases, the Brazilian Ministry of Education (*Ministério da Educação – MEC*) released a non-compulsory guide of protocols for returning to face-to-face activities (MEC, 2020b). Following the federal government's lead, all 27 Federative Units (26 states plus the Federal District), municipalities, independent school

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<https://doi.org/10.1016/j.ijheh.2024.114325>

Received 21 November 2023; Received in revised form 4 January 2024; Accepted 25 January 2024

Available online 7 February 2024

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unions, and schools began developing their own reopening policies. Schools in Brazil can be either private or government-owned and administrated by the municipality (public municipal school), state (public state school) or the Federal Government (or public federal school) (INEP, 2021b). The final decision on when and how to reopen schools relied on their administrative owner and the legal framework of the institution's location. For instance, municipal schools followed municipal and state laws. On that note, as schools across Brazil had diverse closure dates, the reopening process and the measures implemented similarly varied nationwide.

As of July 27, 2023, all schools have resumed normal operations, and the WHO no longer considers COVID-19 a global public health emergency (WHO, 2023a). Despite declining cases and facilities, it's vital to remember that COVID-19 persists, and future pandemics may occur. In that regard, school pandemic preparedness for future outbreaks relies on identifying successful reopening strategies for the "new normal". Post-COVID-19 pandemic preparedness in schools must address the immune gap in children due to delayed vaccination and reduced pathogen exposure (Messacar et al., 2022). Children who stayed at home during the pandemic will be exposed for the first time to pediatric infections at older ages. On that note, non-pharmaceutical and behavioural approaches such as water, sanitation and hygiene (WASH) interventions have a significant potential to prevent and reduce the magnitude of future outbreaks of endemic viral illnesses in children (Messacar et al., 2022).

WASH is a critical prerequisite for infection prevention and control (IPC), defined by the WHO as a scientific and practical approach to preventing infection-related harm to patients and health workers (UNICEF, 2020a). In schools, IPC encompasses all the measures that can contribute to limiting exposure to diseases and reducing the probability of their transmission among the school community (UNICEF, 2020a). Examples of school IPC measures include hand hygiene and environmental cleaning, practices that can only be implemented when the provision of water for hand washing, regular cleaning and disinfection purposes, handwashing facilities and soap or hand sanitizers are met (UNICEF, 2020b).

Whereas eyes were kept on the novel coronavirus, outbreaks of reemerging infectious diseases like cholera, Lassa and Rift Valley fever, Ebola and Marburg virus disease (EVD and MVD), measles, malaria and dengue, alongside emerging infectious diseases (such as mpox and acute hepatitis of unknown origin in children) were reported worldwide amidst the COVID-19 pandemic (WHO, 2023b). At present, the WHO lists 12 priority diseases with epidemic potential, namely: COVID-19, Middle East respiratory syndrome coronavirus (MERS-CoV), Severe Acute Respiratory Syndrome (SARS), Crimean-Congo hemorrhagic fever, EBV, MVD, Lassa fever, Rift Valley fever, Nipah virus and henipaviral diseases, Zika, and the enigmatic "Disease X" (WHO, 2023c). Apart from Lassa Fever, Zika and "Disease X", all remaining illnesses listed by the WHO as having the potential to be the next pandemic can be transmitted by direct (human-to-human or animal-to-human) or indirect contact (through contaminated surfaces) with secretions and body fluids (WHO, 2023d, 2023e, 2023f, 2022b, 2022c, 2022d, 2021, 2019, 2018, 2017). In that sense, cleaning both surfaces and hands is paramount to preventing the spread of these diseases. Moreover, ensuring proper WASH conditions, including appropriate waste management, reduces rodent infestations and breeding sites for insects, thereby preventing the transmission of vector-borne diseases such as Lassa fever, Rift Valley fever and Zika (Aloke et al., 2023; Gardini et al., 2023; Le Goff et al., 2014). As for Nipah virus, providing improved drinking water is fundamental to prevent transmission through ingesting contaminated food and drinking products (WHO, 2018).

The relevance of WASH in reducing the risk of transmission in outbreak contexts has been evidenced in former outbreaks of water-borne illnesses (cholera, acute watery diarrhoea, hepatitis A and E, dysentery and typhoid), EVD and influenza (Gozdziewska et al., 2022; Saunders-Hastings et al., 2017; Yates et al., 2018). However, beyond

disease prevention, pandemic preparedness and response planning in schools must consider the provision of WASH because of its established educational benefits and potential to reduce inequalities. Promoting WASH in schools is also a way of (i) improving students' performance (Bergenfeld et al., 2021; Freeman et al., 2012; Jasper et al., 2012; Sharma et al., 2022), (ii) decreasing the gender gap in absenteeism (Chatterley et al., 2014; Mbatha, 2011; Montgomery et al., 2016), (iii) contributing to the social belonging of children and young people with disabilities or limited mobility (Azupogo et al., 2023; Erhard et al., 2013; Zaunda et al., 2018), (iv) helping children to develop their self-esteem and confidence (Kwan et al., 2005; Singolyo and Ngussa, 2019; Ssekamate et al., 2022), (iv) and encouraging positive WASH behaviour change in the school, household and community level (Assefa and Kumie, 2014; Lang, 2012; McMichael, 2019; Shehmolo et al., 2021). Hence, building WASH-friendly schools is, ultimately, an approach to cultivating resilience in young children and adolescents. In the face of future pandemics, well-prepared schools can avoid prolonged closures, extending the known benefits and minimizing disruptions. However, long-term school pandemic preparedness hinges not only on providing WASH in schools but also on doing so following recognized principles and standards for WASH and IPC, including the Human Rights to Water and Sanitation (HRtWS) (United Nations, 2015), the Joint Monitoring Program (JMP) definitions (UNICEF, 2022), alongside WHO and UNICEF known established guidelines (UNICEF, 2020a, 2020b, 2011).

The current study aimed to compile and analyze the main policies released during the COVID-19 pandemic for the safe reopening of schools in Brazil, seeking to answer the following questions.

1. What were the proposed WASH solutions in schools in Brazil during the COVID-19 pandemic, and where, how and for whom should they have been implemented?
2. Post-COVID-19, which of these measures should be maintained to strengthen schools' capacity to stay operational - either by staying open or quickly resuming its activities - in the face of a new pandemic or outbreak?

2. Materials and methods

2.1. Policy inventory

Guidelines, frameworks and safety protocols for the safe reopening of schools were searched for all 27 Brazilian federative units (26 states plus the Federal District) and their capitals. Searches were conducted on July 2023 on the official website and official journals of the states' and municipalities' governments and in Google News. The search terms in Portuguese included "protocols", "guidelines", "biosafety", "sanitary", "COVID-19, "back to school", and "school reopening", along with specific state and municipality names. Wayback Machine (Internet Archive, 2023) was used to retrieve no longer available documents. In that case, the document was retrieved from the closest date available. In the absence of documentation, the authors contacted municipalities and governments via email or other contact channels provided on their official websites for the required information. All types of schools (state, federal, municipal and private) and public policy documents (protocols, guidelines, frameworks, technical notes and decrees) were considered. When more than one document version was available, the last one was selected. National guidelines that provided guidelines for the whole country were also included.

2.2. Content analysis

Atlas Ti software (ATLAS.ti Scientific Software Development GmbH Berlin, Germany, version 22.2.4) was utilized to organize and code the documents. Each document, regardless of location, government affiliation and type of school, was analyzed separately. The codebook to guide the content analysis (Table 1) was established following a mixture of

Table 1

Codebook utilized in the content analysis of the school reopening policies and regulations in Brazil focused on WASH solutions.

Thematic	Code group	Code	Definition	Examples
WASH	Drinking water	Drinking water	Solutions that address the access to drinking water inside schools	"If water is provided in gallons, purifiers or filters, priority should be given to the use of disposable cups." (Paraíba, n.d.)
	Sanitation	Sanitation	Solutions that address changes in the sanitary infrastructure, including the availability of self-cleaning materials (e.g. toilet paper), behavioural change and toilet etiquette	"Instruct students to lower the lid of the toilet before flushing to avoid aerosols and contamination of surfaces." (Ceará, 2022)
	Hygiene	Environmental cleaning	Solutions that address the availability of materials for disinfection and cleaning, routine and frequency of disinfection and cleaning activities	"Make disinfection mats (wet with bleach) available at all entrance routes to the educational environment." (Rio Grande do Norte, 2020)
		Hand washing	Solutions that address changes in the infrastructure of handwashing facilities, including the availability of cleaning and drying materials (e.g., soap and towels) and behavioural change	"Create and display posters on the walls with messages encouraging good hygiene practices." (Paraná, 2020)
		Handrub	Solutions that address the availability of hand sanitizers for hand hygiene and actions to reinforce their use	"Make 70 % alcohol hand sanitizer gel available near all drinking fountains to enable hand cleaning before and after use." (Manaus, 2020)
Solid Waste	Solid Waste	Solutions that address solid waste management and disposal in schools	"To install, if possible, touchless trash cans with pedal operation." (Fiocruz, 2020)	
Population	Youngest Children	Youngest Children	Solutions that target children in daycare and preschool (0–6 years old)	"Install sinks with soap and water, especially for children under five years old." (Ceará, 2022)
	Disabilities or limited mobility ^a	Disabilities or limited mobility	Solutions that target people with disabilities or limited mobility	"Children and young people with disabilities who have difficulty or are unable to perform adequate hand hygiene must receive support." (Santa Catarina, n.d.)
	High-risk groups	High-risk groups	Solutions that target people at higher risk of contracting COVID-19, such as immunocompromised people with comorbidities and elderlies	"Students and professionals from the school staff who fall into the risk groups (described in the document) can attend the school, but it is recommended that they are more rigorous in adopting hygiene and distancing procedures." (Manaus, 2020)
	Boarding schools	Boarding schools	Solutions that are distinguished for all-day schools	"Limit the use of common areas such as the cafeteria, changing rooms, washrooms, and showers, among others, scheduling their use to avoid crowds. Intensify the cleaning routine of these areas." (Santa Catarina, n.d.)
	Traditional communities	Traditional communities	Solutions that are distinguished for traditional communities such as indigenous communities and remnant <i>quilombo</i> community's lands	"Evaluate the availability of personnel, infrastructure and resources to comply with hygiene and health safety measures." (MEC, 2020b)

^a Disabilities and limited mobility were not previously defined but rather coded when the literal term was employed in policies.

deductive and inductive coding approaches. Categories (i) Drinking Water, (ii) Sanitation, (iii) Solid Waste and population groups, (i) Youngest children, (ii) Disabilities or limited mobility, and (iii) High-risk groups were pre-defined before the screening. During the process of screening, categories (iv) Hygiene subdivided into environmental cleaning, handwashing and handrub, along with population groups (iv) boarding schools and (vii) traditional communities were added according to the content identified. For all categories, both "software" and "hardware" interventions were considered. "Hardware" pertains to infrastructure or physical goods that improve WASH access while "Software" interventions focus on human behaviour and interaction (Anderson et al., 2022).

2.3. Solutions post-COVID-19

While many factors, including political decisions, play a role in pandemic response, the current study was developed based on one premise: schools that are better equipped in terms of WASH are more likely to be able to remain operational during a pandemic or outbreak - either by staying open or quickly resuming its activities - without posing a risk to its community and to some extent, their families. To accomplish this premise and answer the second research question, identified solutions were discussed in the light of four frameworks, namely.

- i) **The core principles of Human Rights and the Human Rights to Water and Sanitation (HRTWS):** solutions should adhere to

the normative contents of the HRTWS (availability; accessibility; affordability; quality and safety; acceptability, privacy and dignity) (Albuquerque, 2014; Léo Heller, 2016; United Nations, 2015) and the core principles of all Human Rights (accountability; equality and non-discrimination; participation). For the HRTWS, two additional principles are relevant to the realization of the rights and the categories that define its normative content: access to information and sustainability (Albuquerque, 2014; Léo Heller, 2016; WHO, 2022e). The definition of each principle is provided in the Supplementary Materials;

- ii) **The Joint Monitoring Program (JMP) service ladder for WASH in schools:** Following the JMP service ladder for WASH in schools (UNICEF, 2022), schools should aim to be classified as having basic drinking water, sanitation and hygiene services. Service ladder and concepts adopted by the JMP are provided in detail in the Supplementary Material;
- iii) **The Sphere Project:** Amid humanitarian crises, people are entitled to receive protection, assistance and maintain their dignity (Sphere, 2023). To ensure these rights, the Humanitarian Standards Partnership (HSP) works towards entailing the minimum humanitarian standards to be applied in humanitarian response (Sphere, 2023). Given that the COVID-19 pandemic was a humanitarian crisis, solutions should be aligned with The Sphere standards (Sphere Project, 2018) and, more specifically for schools, the Child Protection Minimum Standard handbook

(The Alliance for Child Protection in Humanitarian Action, 2019) and the Minimum Standards for Education (INEE, 2010).

- iv) **WHO and UNICEF guidelines:** Last, solutions were checked against the WHO/UNICEF guidelines for WASH and IPC in schools (UNICEF, 2020a) and public spaces (UNICEF, 2020b), the WHO checklist for schools re-opening for COVID-19 resurgences or similar public health crises (WHO, 2020a), and the UNICEF guidebook on WASH for schoolchildren in emergencies (UNICEF, 2011).

3. Results

3.1. General description

In total, 66 documents were gathered (41 state policies, 23 capital policies and two federal policies). The inventory of policies can be found in more detail in the Supplementary Material. No documentation was found for the states of *Roraima* and *Pará* (and its capital *Belém*), both located in the North Region of the country, and the capitals of *Acre* (*Rio*

Branco), *Mato Grosso* (*Cuiabá*), *Espírito Santo* (*Vitória*), *Paraíba* (*João Pessoa*), and *Piauí* (*Teresina*) (Fig. 1). The state of *Roraima* was the only one where policies were found at the municipal level but not at state jurisdiction. As for the state of *Maranhão*, public policies targeting only private schools were identified at the state level.

Moreover, from all states and capitals where documents were not identified and, therefore, were reached out, only the authorities of the municipality of *São Luís* (capital of *Maranhão*) returned our initial contact, supplying their respective guidelines. It was unclear if there were no public policies for these locations or that, instead, they are no longer available. Proportion of measures identified in each state and capital city by domain target are summarized in Figs. 2 and 3 and further described in more detail in the following sections.

3.2. WASH solutions in schools – what, where and how?

3.2.1. Drinking water

Measures and interventions related to drinking water in schools mainly revolve around changing the infrastructure of drinking water

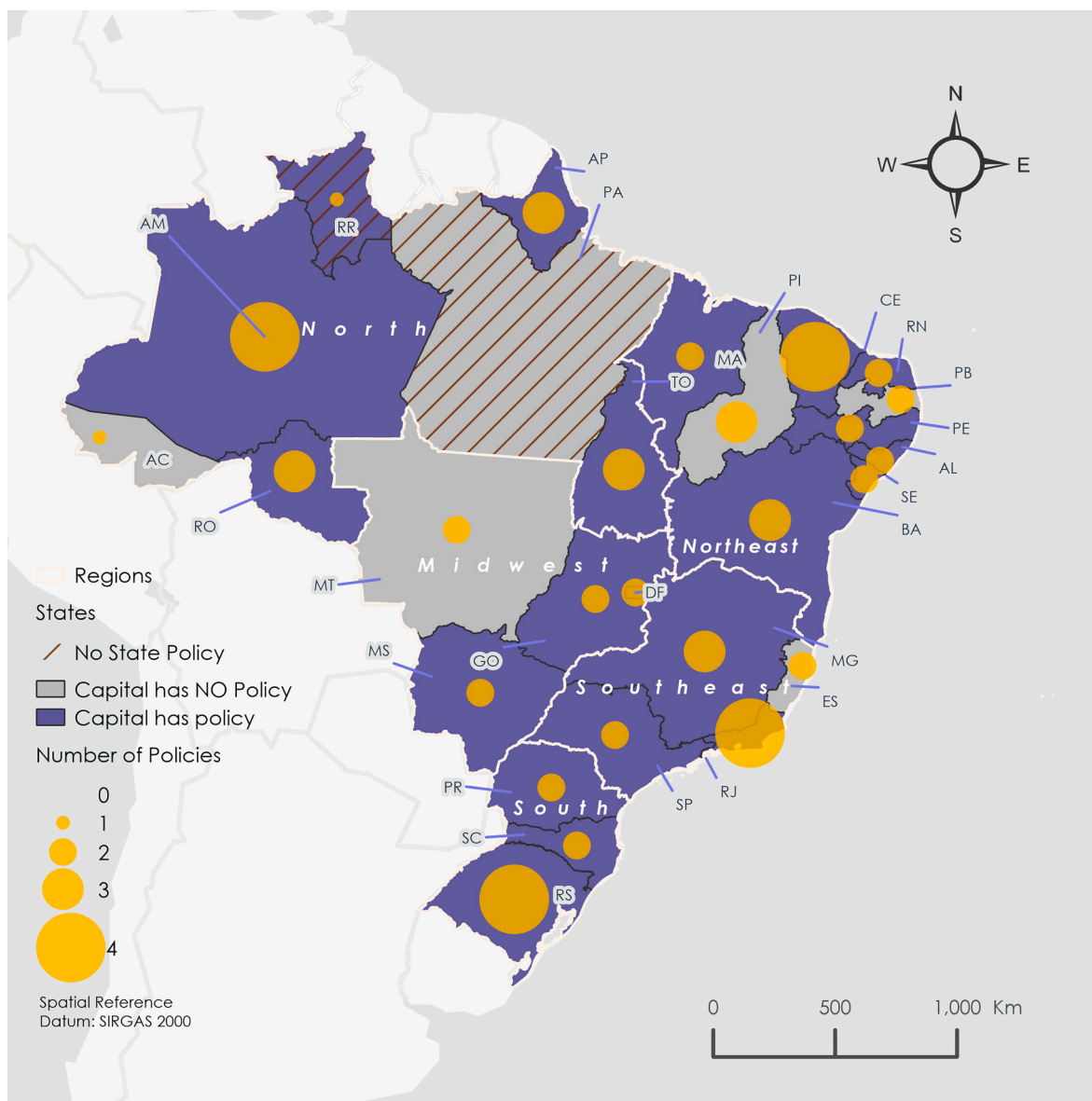


Fig. 1. Number of identified and included public policies for the safe reopening of schools during the COVID-19 pandemic at the state and municipal (capital) level (n = 66).

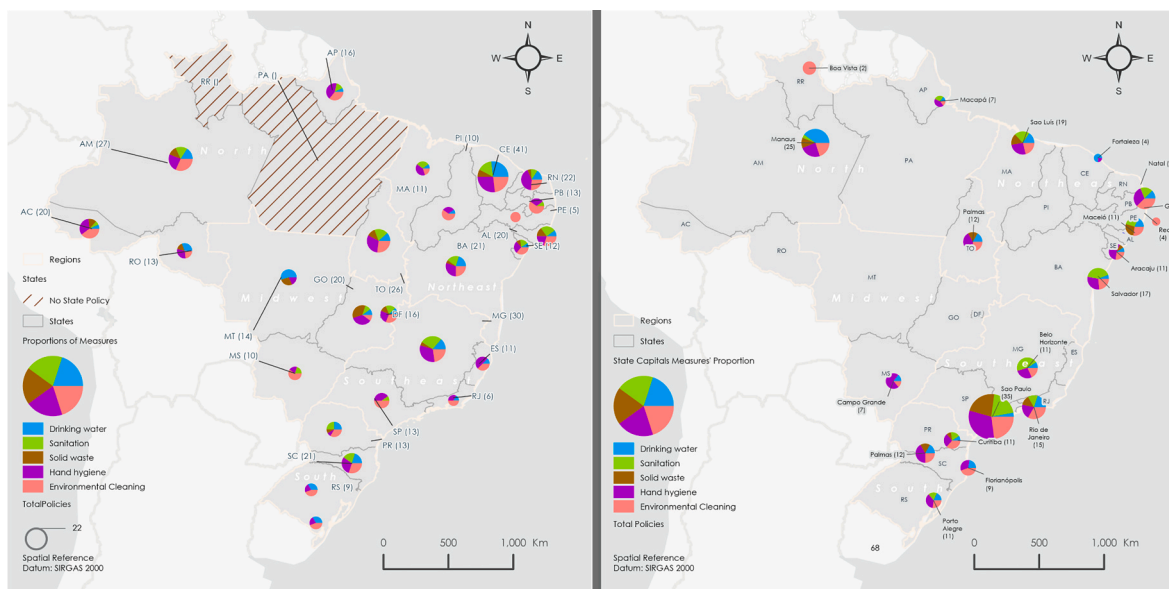


Fig. 2. Proportion of measures by thematic identified in the inventory of public policies for the safe reopening of schools during COVID-19 at the (a) State Level and (b) Capital city level.

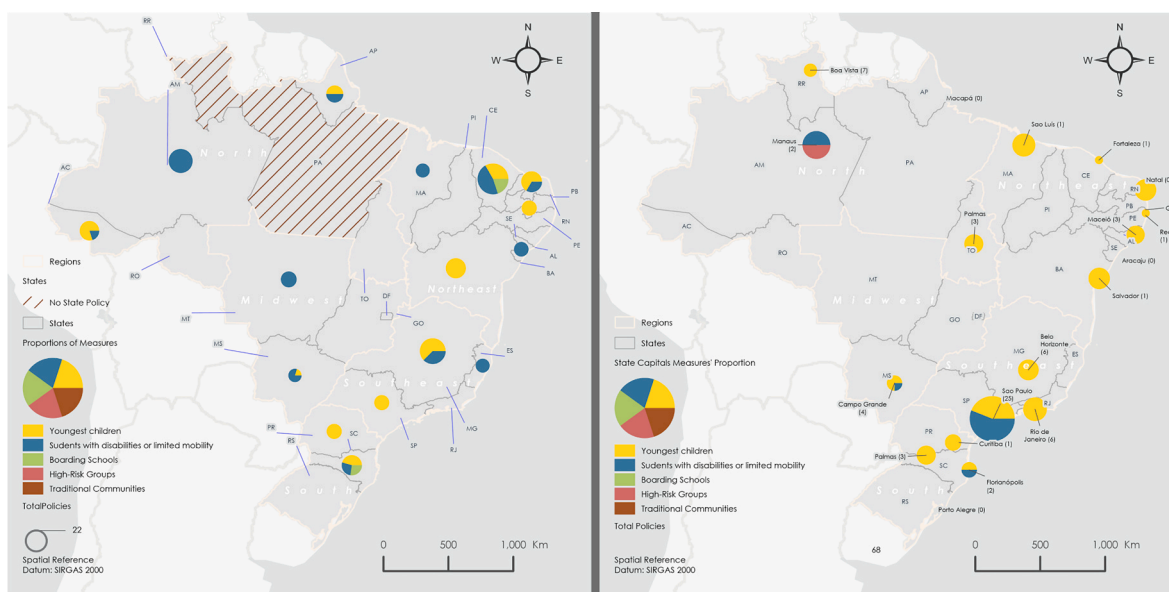


Fig. 3. Proportion of measures by population identified in the inventory of public policies for the safe reopening of schools during COVID-19 at the (a) State Level and (b) Capital city level.

fountains in schools, keeping it regularly clean and implementing safe procedures for water collection. On a minor scale, recommendations associated with the assessment of the current drinking water infrastructure of the school, and interventions related to the improvement of water availability, accessibility, quality and safety were mentioned in few guidelines. A summary of all measures is presented in Table 2, while the visualization of measures by locations can be found in the Supplementary Material.

During the pandemic, there was a consensus that water fountains allowing direct consumption from the stream should be prohibited in schools. Existing drinking water fountains needed to be adapted or replaced with taps, facilitating water consumption solely via cups or bottles. Until the fountain is adapted, it must be deactivated, and during that time, the school is responsible for providing temporary solutions, such as bottled water (Rio de Janeiro, 2022a). Drinking fountains should

be installed in places far away from sources of contamination, such as washrooms and areas with excessive movement of people (Ficruz, 2020; Goiás, 2022; Tocantins, 2020).

During their time at school, both students and school staff are required to bring their own cups or bottles for fetching water (Bahia, 2021; Goiânia, 2021; Mato Grosso, n.d.; Rio Grande do Norte, 2020; SINEPE - MA, 2020). The school should supply disposable cups for those unable to bring their own (Ceará, 2022; Minas Gerais, 2021a; Piauí, 2022; Piauí, 2021a). Additionally, schools might consider offering individual water bottles to students (Rio Grande do Norte, 2020). It is suggested that individual cups are identified with the first and last name of the student (Campo Grande, 2020; Ceará, 2022; Paraná, 2020; Rio Grande do Sul, 2021a). Preferably, the portion of the bottle that touches the lips should be protected by a lid, as the models in which this portion is unprotected are more susceptible to contamination (Ceará, 2022;

Table 2

Summary of measures and interventions related to drinking water in schools, according to guidelines for the safe reopening of schools in Brazil during the COVID-19 pandemic.

What	Where	How	Federative Unit and capital
Prohibition of water fountains allowing direct consumption from the stream	The entire school. Drinking fountains should be installed in places far away from sources of contamination, such as washrooms and areas with excessive movement of people	1. Replacing or adapting existing drinking fountains	<i>Acre, Amazonas, Ceará, Rio Grande do Norte, Espírito Santo, Rio de Janeiro (and its capital Rio de Janeiro), Santa Catarina (and its capital Florianópolis), Porto Alegre (capital of Rio Grande do Sul), Goiás, Mato Grosso, Distrito Federal (Brasília) Rondônia (and its capital Porto Velho), Maceió (capital of Alagoas), Bahia (and its capital Salvador), Ceará, Aracaju (capital or Sergipe) São Luís (Capital of Maranhão), Rio de Janeiro (capital of Rio de Janeiro), Minas Gerais (and its Belo Horizonte), Santa Catarina (and its capital Florianópolis), Paraná (and its capital Curitiba), Rio Grande do Sul (and its capital Porto Alegre), Goiás (and its capital Goiânia), Mato Grosso, Brazil</i>
		2. Deactivating drinking fountains while adjustments are made, with the provision of temporary solutions such as bottle water	<i>Bahia, Ceará, Maranhão (and its capital São Luís), Rio Grande do Norte, Paraná, Rio Grande do Sul, Goiânia (capital of Goiás) Mato Grosso</i>
Restriction of water consumption solely via cups or bottle	The entire school	3. Bringing their own cups or bottles (with lids) identified with the first and last name of the student or professional, responsibility of students and school staff	<i>Ceará, Piauí, Rio Grande do Norte, Minas Gerais</i>
		4. Supplying disposable cups (and possibly water bottles), responsibility of schools	<i>Tocantins (and its capital Palmas), Bahia, Mato Grosso, Campo Grande (capital of Mato Grosso do Sul)</i>
		5. Not sharing containers and not making direct contact with the tap when collecting water	<i>Amapá (and its capital Macapá), Amazonas, Rondônia</i>
		6. Fixating posters in strategic points of the school containing	

Table 2 (continued)

What	Where	How	Federative Unit and capital
Respecting social and physical distancing	The entire school	7. Encouraging students to bring their bottle (one or more) filled with water from home	<i>Manaus (capital of Amazonas), Maceió (capital of Alagoas), Rondônia, Tocantins, Paraná Bahia</i>
		8. Allowing only one student (or a number proportional to the available fountains in the different school units) to leave at a time to fetch water	<i>Manaus (capital of Amazonas)</i>
		9. Marking a distance of 0.90 m (90 cm) around the water fountains	<i>Minas Gerais</i>
		10. Suspending the simultaneous use of “escovódromos” (collective tooth brushing stations, typical in some locations of the country) by students	
Regular cleaning and disinfection	The entire school	11. Cleaning and disinfecting drinking fountains: (i) after every use, (ii) before the start of classes and at the end of the day, (iii) during breaks of each period, (iv) whenever necessary, preferably every 3 h,	<i>Amazonas (and its capital Manaus), Alagoas, Salvador (capital of Bahia), Ceará, São Luís (capital of Maranhão), Sergipe, São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro)</i>
		12. Performing hand sanitization before changing bottles in the water dispense followed by cleaning the bottle’s surface with soap and water, 70 % alcohol or products listed by ANVISA	<i>Tocantins, Brazil</i>
Ensuring the availability and accessibility of drinking water	The entire school	13. Evaluating the current situation, identify and take appropriate actions to increase the availability of drinking water in schools	<i>Rondônia, Fortaleza (capital of Ceará), Distrito Federal (Brasília)</i>
		14. Assessing if the quantity of drinking fountains is enough for the number of students and staff	<i>Fortaleza (capital of Ceará)</i>
		15. Guarantying that drinking fountains are	<i>Fortaleza (capital of Ceará)</i>

(continued on next page)

Table 2 (continued)

What	Where	How	Federative Unit and capital
Water quality control and monitoring	The entire school	accessible to their students	
		16. Replacing filters in the drinking fountains	Ceará, Rio Grande do Sul, Brazil
		17. Checking the school's hydraulic network to prevent water shortages	Manaus (capital of Amazonas)
		18. Verifying the physical integrity of the distribution network's physical components, including pipes and connections	Manaus (capital of Amazonas)
		19. Assessing the structural state of the water storage system	Manaus (capital of Amazonas)
		20. Checking the structural conditions of the underground collection system	Manaus (capital of Amazonas)
		21. Assuring that schools are connected to the public network. In cases of alternative water sources such as wells or boreholes, it is necessary to verify their potability and install a water treatment system (chlorine doser) at the point of entry	Manaus (capital of Amazonas)
		22. Suspending classes in case of lack of water	Palmas (capital of Tocantins)
		23. Ensuring that students remain well-hydrated and to foster the habit of consistent water consumption through educational initiatives	Amazonas, Ceará
		24. Revising, maintaining and cleaning hydraulic installations	Manaus (capital of Amazonas)
25. Carrying out regular cleaning of the water tanks, with physical/chemical and microbiological analyses and to maintain records of it	Mato Grosso		
26. Cleaning the water reservoir every six months or in the event of an incident that may compromise water safety. This evaluation should precede school reopening	Alagoas, Mato Grosso		

Table 2 (continued)

What	Where	How	Federative Unit and capital
		27. Guarantying that water for handwashing are potable following the national drinking-water quality standards and undergo periodic quality controls	Manaus (capital of Amazonas)

Manaus, 2020; Paraná, 2020). Students must never share their containers (Bahia, 2021; Campo Grande, 2020; Mato Grosso, n.d.; Palmas, 2021), and while fetching water, the container should not make direct contact with the tap (Campo Grande, 2020; Distrito Federal, 2022). That said, students should be oriented through campaigns and fixation of posters in strategic points of the school (Amapá, 2021a; Ceará, n.d.; Macapá, 2021; Rondônia, 2021). Students should also be encouraged, whenever possible, to bring (one or more) bottle(s) filled with water from home to reduce queues for the drinking fountains (Manaus, 2020; Paraná, 2020; Rondônia, n. d.; Tocantins, 2020).

3.2.2. Sanitation

Recommendations related to sanitation in schools included measures and interventions that aimed to promote hygiene practices, minimize contact with fomites and maintain social and physical distancing inside sanitary facilities (Table 3). Visualization of measures by locations can be found in the Supplementary Material.

Guidelines recommended that all washrooms must be equipped with a continuous supply of running water, soap (in bar or liquid form), paper towels, toilet paper, 70 % alcohol hand sanitizer (available as foam, gel, or spray) and garbage bins (Bahia, 2021; Campo Grande, 2020; Ceará, 2022; Distrito Federal, 2022; Florianópolis, 2022; Goiás, 2022; Minas Gerais, 2021a; Palmas, 2021; Porto Alegre, 2020; Rio Grande do Sul, 2021b, 2021a; Salvador, 2021; Santa Catarina, n.d.; São Paulo, 2021; SINEPE- DF, 2020; SINEPE-ES, n.d.; Tocantins, 2020, n. d.). Cloth hand towels and electric dryers are prohibited (Bahia, 2021; Ceará, 2022; Minas Gerais, 2021b; Salvador, 2021).

Showers should be prohibited (SINEPE- DF, 2020; Tocantins, 2020) or restricted to avoid agglomerations (Belo Horizonte, 2021; Santa Catarina, n.d.). Access to washrooms should be controlled, and the maximum limit of people for simultaneous use should be determined according to physical distancing thresholds and the size of the facility (Amapá, 2021a, 2021b; Amazonas, 2020a; Goiânia, 2021; Macapá, 2021; Minas Gerais, 2021a; Natal, 2021; Salvador, 2022, 2021; São Paulo, 2021). Alternatively, only one student should be allowed to leave the classroom to use the washroom (or an estimated number proportional to the number of washrooms available in the different school units) (Bahia, 2021), or stagger breaks can be implemented to avoid high amount of students using the washroom at the same time (Paraná, 2020). Floor marking tape can be used to indicate the safe distancing limits during queues for the washroom and inside the facility (Amazonas, 2020a; Fiocruz, 2020; Goiás, 2022; Mato Grosso, n.d.; Sergipe, 2021; SINEPE- DF, 2020; Tocantins, 2020). It is recommended to implement physical barriers such as plastic shields between the sinks or, if not possible, to intercalate the use of the accessory (Ceará, 2022; Fiocruz, 2020; SINEPE-CE, 2020).

The washroom doors should be propped open to minimize hand contact with door handles (Alagoas, 2020; Maceió, 2022; SINEPE- DF, 2020; Tocantins, 2020). Locks should be deactivated to facilitate door opening with the elbows; if locks are kept, the door handles should be clean (Salvador, 2021). When replacing, prefer touchless faucets (Maceió, 2022; São Paulo, 2021). The accessory must be sanitised prior

Table 3

Summary of measures and interventions related to sanitation in schools, according to guidelines for the safe reopening of schools in Brazil during the COVID-19 pandemic.

What	Where	How	Federative unit and Capital
Providing conditions for hygiene practices and minimizing contact with surfaces	Entire school	1. Providing a continuous supply of running water, soap, paper towels, toilet paper, 70 % alcohol hand sanitizer and garbage bins	<i>Tocantins, Bahia (and its capital Salvador), Ceará, São Luís (capital of Maranhão), Espírito Santo, Minas Gerais, São Paulo (capital of São Paulo), Santa Catarina (Florianópolis), Rio Grande do Sul (Porto Alegre), Goiás, Campo Grande (capital of Mato Grosso do Sul), Distrito Federal (Brasília)</i>
		2. Keeping the doors open	<i>Tocantins, Alagoas (and its capital Maceió), Maranhão</i>
		3. Deactivating the locks in the doors	<i>Salvador (capital of Bahia)</i>
		4. Replacing manual faucets with touchless faucets	<i>São Paulo (capital of São Paulo), Maceió (capital of Alagoas)</i>
		5. Sanitizing manual faucets before handwashing	<i>São Luís (capital of Maranhão), Minas Gerais</i>
		6. Fixating educational materials (e.g., posters) containing instructions on hand hygiene inside facilities	<i>Bahia (and its capital Salvador), Alagoas, Ceará, Maranhão (and its capital São Luís), Minas Gerais</i>
		7. Educating students on toilet etiquette (closing the lid before flushing and sanitizing the toilet seat before using it)	<i>Tocantins, Ceará, São Paulo (capital of São Paulo), Paraná (Curitiba), Goiás</i>
		8. Prohibiting the use of cloth hand towels and electric dryers	<i>Bahia (and its capital Salvador), Ceará, Minas Gerais</i>
		9. Providing student to toilet ratio of 40:1 (male students) and 25:1 (female students)	<i>Belo Horizonte (capital of Minas Gerais)</i>
		10. Replacing half of the urinals for basins	<i>Belo Horizonte (capital of Minas Gerais)</i>
Respecting social and physical distancing	Entire school (Male washrooms)	11. Restricting access to washrooms	<i>Amapá (and its capital Macapá), Amazonas, Alagoas (and its capital Maceió), Salvador (capital of Bahia), São Luís (Capital of Maranhão), Natal (capital of Rio Grande do Norte), Minas Gerais, São Paulo (capital of São Paulo), Goiânia (capital of Goiás)</i>
	Entire school		

Table 3 (continued)

What	Where	How	Federative unit and Capital
		12. Prohibiting the use of showers or restricting its use	<i>Tocantins, Belo Horizonte (capital of Minas Gerais), Santa Catarina, Distrito Federal (Brasília)</i>
		13. Limiting the number of people that can use washrooms at the same time, taking into account physical distancing thresholds and the size of the facility	<i>Amapá (and its capital Macapá), Amazonas, Alagoas, Salvador (capital of Bahia), São Luís (capital of Maranhão), Natal (capital of Rio Grande do Norte), Minas Gerais, São Paulo (capital of São Paulo), Goiânia (capital of Goiás) Bahia</i>
		14. Allowing only one student (or a number proportional to the number of washrooms available in the different school units) to leave the classroom to use the washroom	
		15. Implementing stagger breaks	<i>Paraná</i>
		16. Marking safe distancing boundaries during queues for the washroom and inside the facility with floor tape	<i>Amazonas, Tocantins, Sergipe, Goiás, Mato Grosso, Distrito Federal (Brasília), Brazil</i>
		17. Implementing physical barriers such as plastic shields between the sinks or, if not possible, intercalating the use of the accessory	<i>Ceará, Brazil</i>
	Entire school (Male washrooms)	18. Establishing a length of 1 m as a unit measure in collective urinals to dimension the total capacity of the bathroom	<i>Belo Horizonte (capital of Minas Gerais)</i>
	Entire school (Male washrooms)	19. Implementing divisions between individual urinals at eye level	<i>Belo Horizonte (capital of Minas Gerais)</i>
Regular cleaning and disinfection	Entire school	20. Cleaning and disinfecting facilities: (i) at the end of every turn of classes, (ii) at least four times a day, (iii) before and after schools close and at least every 3 h, (iv) every hour or 2 h, (v) regularly after use, (vi) or once every week.	<i>Acre, Porto Velho (capital of Rondônia), Alagoas (and its capital Maceió), Salvador (capital of Bahia), Maranhão (and its capital São Luís), Paraíba, Rio Grande do Norte, Minas Gerais, São Paulo (and its capital São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Paraná (Curitiba), Porto Alegre (capital of Rio Grande do</i>

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Table 3 (continued)

What	Where	How	Federative unit and Capital
			Sul), Goiânia (capital of Goiás), Mato Grosso do Sul, Distrito Federal (Brasília), Brazil
		21. Intensifying cleaning of faucets, toilets, flush buttons, and any other frequently touched surfaces	Manaus (capital of Amazonas), Tocantins, Salvador (capital of Bahia), Sergipe, Rio Grande do Norte, São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Santa Catarina, Porto Alegre (capital of Rio Grande do Sul)
		22. Performing a deep cleaning during weekends or periods when students are absent	São Paulo (capital of São Paulo)
		23. Washrooms cannot be cleaned during class breaks	Amazonas
		24. Intensifying cleaning of the door handles in facilities where locks were kept	Salvador (capital of Bahia)

to handwashing for the remaining types of faucets (that manually open and close) (Minas Gerais, 2021b; São Luís, 2022).

Instructions on how to properly handwash, including the right way to close manual faucets, and other educational materials - preferably in visual language - be affixed within washroom facilities (Minas Gerais, 2021a; Salvador, 2022, 2021; SINEPE - MA, 2020; SINEPE-CE, 2020). Students should receive guidance on proper toilet etiquette, including closing the lid before flushing and sanitizing the toilet seat before using it (Ceará, 2022; Curitiba, n.d.; Goiás, 2022; Paraná, 2020; São Paulo, 2021; Tocantins, 2020).

3.2.3. Solid waste

Policy documents included recommendations that addressed the school waste management chain, encompassing the necessary infrastructure and practices for waste handling, storage, collection (within the school) and disposal. Measures were restricted to the area of the school building and the vehicles used for school transportation. Table 4 briefly describes all suggested solutions, whereas the visualization of measures by locations can be found in the Supplementary Material.

According to guidelines, handwashing stations (Manaus, 2020; Rio Grande do Norte, 2020; Rondônia, 2021; Sergipe, 2021), washrooms (Bahia, 2021; Goiás, 2022; Rio de Janeiro, 2022a) and drinking fountains (in case of use of disposable cups) (Maranhão, 2021; Tocantins, 2020; n. d.), and areas of food production (Maceió, 2022) must be equipped with trash cans with lids and with foot pedal or any similar mechanism that allows its opening without the use of hands. Schools also need to provide a separate garbage bin for the disposal of masks and other personal protective equipment (PPE) (Acre, 2021; Amazonas, 2020a; Aracaju, 2020; Fundação de Vigilância em Saúde do Amazonas, 2022; Manaus, 2020; Mato Grosso, n.d.; SINEPE- DF, 2020). Moreover, it is essential to ensure that all vehicles used for school transportation are equipped with garbage bins, which should undergo daily emptying and cleaning (São Paulo, 2021).

There was no consensus about the frequency of waste collection, varying from: i) once to four times a day (Amazonas, 2020a; Ceará,

2022; Minas Gerais, 2021a; São Paulo, 2021); ii) after each turn of classes (Maceió, 2022; Mato Grosso, n.d.; Palmas, 2021; São Paulo, 2021); iii) before the container reaches two-thirds of its capacity (Acre, 2021; Ceará, 2022; Goiás, 2022; São Luís, 2022); iv) or as long as it is necessary (Alagoas, 2020; Curitiba, n.d.; Paraná, 2020; Rio de Janeiro, 2022a; São Paulo, 2021). Special attention should be given to the management and disposal of residues generated in the school's designated isolation area for confirmed or suspected cases of COVID-19 (Fiocruz, 2020; Goiás, 2022; Tocantins, 2020). It is advised to employ double trash bags for containing such materials or any other type of waste whenever the integrity of the trash bags is compromised or if its material indicates a lack of resistance (Goiás, 2022). While certain guidelines recommend disposing the materials as healthcare waste (Fiocruz, 2020; São Luís, 2022), other policy documents suggested that this waste could be discarded in the regular urban collection system (Goiás, 2022). Instructions for the disposal of used masks and waste containing PPE were unclear. It is advised, however, that this material should not be donated to waste collectors or included in recyclable materials (Ceará, 2022). Guidelines, however, also suggest that this waste could be discarded in the regular collection system as inorganic, non-recyclable waste (Ceará, 2022).

3.2.4. Hand hygiene (handwashing and handrub)

Schools were advised to set up facilities or structures dedicated to hand hygiene (sink with water and soap or hand sanitizer dispenser) in strategic points of the school, such as at the entrance of the building and classrooms, canteen or refectories, washrooms, among others (Table 5). A summary of solutions by state and capital are provided in the Supplementary Material. Whenever possible, installation of handwashing stations should always be preferable over hand sanitizer dispensers, with the exception of: i) in vehicles used for school transportation (Amapá, 2021a, 2021b; Amazonas, 2020a; Aracaju, 2020; Ceará, n.d.; Curitiba, n. d.; Macapá, 2021; Mato Grosso do Sul, 2022; Minas Gerais, 2021a; Porto Velho, 2020; Rio de Janeiro, 2022a; São Paulo, 2022); ii) on the side of drinking fountains (Amazonas, 2020a; Bahia, 2021; Belo Horizonte, 2021; Ceará, 2022; Florianópolis, 2022; Fundação de Vigilância em Saúde do Amazonas, 2022; Goiás, 2022; Minas Gerais, 2021b; Salvador, 2022, 2021; Santa Catarina, n.d.); iii) and at the entrance of washrooms (Bahia, 2021; Salvador, 2021, 2022). Furthermore, hand rub is recommended over handwashing when there is no visible dirt on the hands (Aracaju, 2020; Manaus, 2020).

The number of hand hygiene stations to be installed at the entrance of the school should be estimated following a student-to-tap ratio of 500 to 1 (considering only students from each period, i.e., morning, afternoon and evening) (Belo Horizonte, 2021). Schools with more than 500 students require at least two devices (Rio Grande do Norte, 2020). Inside the institutions, this number should either maintain a 1-to-3 class ratio (Macapá, 2021), be determined taking into account the area of the school (Salvador, 2021, 2022), or according to the number of classrooms (Amapá, 2021b). In canteens and refectories, there must always be two handwashing stations for each school, one adapted for people with disabilities (Rio Grande do Norte, 2020). Only gel hand sanitizer can be provided inside vehicles used for school transportation (no liquid alcohol) (São Paulo, 2021). Moreover, due to its inflammable nature, it is prohibited to use alcohol products in the area of food production (Paraíba, n.d.) and in remaining areas they must be kept far away from equipment and sources of heat (Rio Grande do Norte, 2020). There must be handwashing stations in sufficient numbers and in strategic locations in the area of preparation, distribution and consumption of meals. These facilities should not be shared with students (exclusive use for professionals who work with school feeding) (Boa Vista, n.d.; Mato Grosso, n.d.). Installing hand hygiene stations in open areas is recommended to minimize the reliance on washroom facilities for practising hand hygiene (Sergipe, 2021; Tocantins, 2020).

Posters containing instructions on how to wash hands or handrub should be fixed beside handwashing stations and hand sanitizer

Table 4

Summary of measures and interventions related to solid waste management in schools, according to guidelines for the safe reopening of schools in Brazil during the COVID-19 pandemic.

What	Where	How	Federative Unit and Capital		
Ensuring proper conditions for:	Waste handling	Handwashing stations, washrooms, drinking fountains (in case of use of disposable cups) and in areas of food production	1. Equipping facilities with trash cans with lids and with foot pedals or any similar mechanism that allows its opening without the use of hands	<i>Manaus (capital of Amazonas), Rondônia, Tocantins, Alagoas (and its capital Maceió), Bahia, São Luís (capital of Maranhão) Sergipe, Rio Grande do Norte, Rio de Janeiro (capital of Rio de Janeiro), Goiás Acre, Amazonas (and its capital Manaus), Aracaju (capital of Sergipe), Mato Grosso, Distrito Federal (Brasília) São Paulo (capital of São Paulo)</i>	
		The entire school	2. Providing a separate garbage bin for the disposal of masks and other personal protective equipment (PPE)		
		Vehicles used for school transportation	3. Equipping all vehicles used for school transportation with garbage bins		
	Storage	The entire school	4. Employing double trash bags whenever the integrity of the trash bags is compromised or if its material indicates a lack of resistance		<i>Goiás</i>
		The entire school	5. Using gloves when handling solid waste		<i>Tocantins, Maceió (capital of Alagoas), São Paulo (capital of São Paulo), Goiás</i>
		Isolation area for confirmed or suspected cases of COVID-19	6. Employing double trash bags		<i>Goiás</i>
	Collection	Only in schools with waste segregation	7. Storing the waste up to 72 h prior to collection by the designated provider		<i>São Paulo (capital of São Paulo)</i>
		The entire school	8. Closing garbage bags with one or two knots		<i>Tocantins, São Paulo (capital of São Paulo), Goiás Amazonas, Rondônia</i>
		Vehicles used for school transportation	9. Collecting any waste or items left behind by students in the vehicles while wearing gloves		
		Vehicles used for school transportation	10. Emptying trash cans every day		<i>São Paulo (capital of São Paulo)</i>
Disposal	The entire school	11. Collecting the waste: (i) once to four times a day	<i>Acre, Amazonas, Palmas (capital of Tocantins), Alagoas (and its capital Maceió), Ceará, Minas Gerais, São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Paraná (Curitiba), Goiás, Mato Grosso</i>		
	The entire school	(ii) after each turn of classes;			
	The entire school	(iii) before the containers reach two-thirds of its capacity;			
	The entire school	(iv) or as long as it is necessary			
	The entire school	12. Waste containing masks and PPE must not be donated to waste collectors or included in recyclable materials		<i>Brazil</i>	
Regular cleaning and disinfection	Isolation area for confirmed or suspected cases of COVID-20	13. Waste containing masks and PPE can be discarded in the regular collection system as inorganic, non-recyclable waste	<i>Ceará</i>		
	The entire school	14. Disposing of the materials as health-care waste or in the regular urban system collection	<i>São Luís (Capital of Maranhão), Goiás, Brazil</i>		
	Vehicles used for school transportation	15. Cleaning and disinfecting trash cans inside the school once, twice a day, or every time the solid waste is collected	<i>Manaus (capital of Amazonas), Palmas (capital of Tocantins), Alagoas, São Paulo (capital of São Paulo), Mato Grosso, Distrito Federal (Brasília)</i>		
		16. Washing trash cans every day	<i>São Paulo (capital of São Paulo)</i>		

dispensers, respectively (Bahia, 2021; Espírito Santo, 2021; Manaus, 2020; Salvador, 2022, 2021; São Paulo, 2021). Furthermore, it is recommended to display posters depicting various COVID-19 preventive measures, including hygiene practices, within the school premises at multiple visible spots for students to see (Acre, 2021; Ceará, 2022; n. d.; Curitiba, n.d.; Fundação de Vigilância em Saúde do Amazonas, 2022; Goiás, 2022; Minas Gerais, 2021a; Piauí, 2022; Porto Alegre, 2020; Porto Velho, 2020; Rio de Janeiro, 2022b, 2021; Rio Grande do Norte, 2020; São Paulo, 2021). Hand hygiene practices should be reinforced through playful activities (music, drawings, videos, puppets) compatible with the group age of students (Aracaju, 2020; Rio de Janeiro, 2022a; São Paulo, 2021). Basic health and disease prevention concepts should be introduced to students during classes and/or breaks (Ceará, 2022; São Luís, 2022). All school employees need to be trained on the necessary hygiene practices and procedures to be followed inside the institution (Acre, 2021; Amazonas, 2020b; Ceará, n.d.; Salvador, 2021).

3.2.5. Environmental cleaning

Frequency, materials, and procedures for cleaning and disinfecting schools are described in Table 6. A summary of solutions by location (capital, state and federal level) are provided in the Supplementary Material. Guidelines vary based on which areas of the school should be cleaned and the frequency of cleaning. Whereas the entire institution should be regularly cleaned, special attention should be given to disinfecting i) **canteen or refectory** (Acre, 2021; Amapá, 2021a; Amazonas, 2020b, 2020a; Bahia, 2021; Florianópolis, 2022; Goiânia, 2021;

Macapá, 2021; Mato Grosso do Sul, 2022; MEC, 2020b; Minas Gerais, 2021a; Paraíba, n.d.; Piauí, 2022; Rio de Janeiro, 2022a; Rio Grande do Sul, 2022; São Paulo, 2022; 2021; Tocantins, 2020), ii) **classrooms** (Acre, 2021; Amapá, 2021a; Aracaju, 2020; Bahia, 2021; Belo Horizonte, 2021; Boa Vista, n.d.; Ceará, 2022; Fiocruz, 2020; Goiânia, 2021; Goiás, 2022; Manaus, 2020; MEC, 2020b; Minas Gerais, 2021a; Palmas, 2021; Paraíba, n.d.; Paraná, 2020; Pernambuco, n.d.; Piauí, 2022; Piauí, 2021b, 2021a; Porto Alegre, 2020; Rio Grande do Norte, 2020; Rio Grande do Sul, 2022; Salvador, 2022, 2021; São Paulo, 2022; 2021; SINEPE - MA, 2020; SINEPE- DF, 2020; Tocantins, 2020), iii) **wash-rooms, showers and changing rooms** (Acre, 2021; Amapá, 2021a; Amazonas, 2020a, 2020b; Bahia, 2021; Ceará, 2022; Fiocruz, 2020; Florianópolis, 2022; Fundação de Vigilância em Saúde do Amazonas, 2022; Goiânia, 2021; Manaus, 2020; MEC, 2020b; Minas Gerais, 2021b; Paraíba, n.d.; Paraná, 2020; Pernambuco, n.d.; Piauí, 2022; Piauí, 2021b, 2021a; Porto Velho, 2020; Recife, 2021; Rio de Janeiro, 2022a; Rio Grande do Norte, 2020; Rio Grande do Sul, 2022; Salvador, 2022, 2021; São Paulo, 2022; 2021; Tocantins, 2020) iv) and **objects, furniture, floors and surfaces** that are frequently touched (Acre, 2021; Amapá, 2021b; Amazonas, 2020a, 2020b; Boa Vista, n.d.; Ceará, 2022; Goiânia, 2021; Manaus, 2020; MEC, 2020b; Paraíba, n.d.; Paraná, 2020; Piauí, 2022; Piauí, 2021a; Recife, 2021; Rio de Janeiro, 2022a; São Paulo, 2022; 2021; Sergipe, 2021; SINEPE- DF, 2020; SINEPE-CE, 2020).

While multiple guidelines (Amazonas, 2020a, 2020b; Aracaju, 2020; Goiânia, 2021; Palmas, 2021; Pernambuco, n.d.; Piauí, 2021b; Porto Velho, 2020; Recife, 2021; Rio de Janeiro, 2021; Rio Grande do Norte,

Table 5

Summary of measures and interventions related to hand hygiene in schools, according to guidelines for the safe reopening of schools in Brazil during the COVID-19 pandemic.

What	Where	How	Federative Unit and Capital
Ensuring physical conditions for hand hygiene	Entrance or reception of the school	1. Following a student-to-tap ratio of 500 to 1 (considering only students from each period, i.e., morning, afternoon and evening); For schools with more than 500 students, at least two devices are required	Amapá, Amazonas, Rondônia (and its capital Porto Velho), Tocantins (and its capital Palmas), Alagoas, Fortaleza (capital of Ceará), Maranhão (and its capital São Luís), Piauí, Sergipe, Rio Grande do Norte, Minas Gerais (and its capital Belo Horizonte), Rio de Janeiro (capital of Rio de Janeiro), Rui Grande do Sul, Goiás (and its capital Goiânia), Distrito Federal (Brasília), Brazil
	At the entrance or inside classrooms	2. -	Amapá, Rondônia, Tocantins, Alagoas, Bahia, Maranhão (and its capital São Luís), Sergipe, Rio Grande do Norte, Espírito Santo, Minas Gerais, São Paulo (capital of São Paulo), Goiânia (capital of Goiás), Porto Alegre (capital of Rio Grande do Sul), Campo Grande (Capital of Mato Grosso do Sul), Distrito Federal (Brasília), Brazil
	Canteen or refectory	3. Installing two handwashing stations for each school, one of which is adapted for people with disabilities	Amapá, Amazonas (and its capital Manaus), Rondônia, Tocantins (and its capital Palmas), Alagoas, Aracaju (capital of Sergipe), Espírito Santo, Minas Gerais, São Paulo (capital of São Paulo), Goiás (and its capital Goiânia), Campo Grande (Capital of Mato Grosso do Sul), Rondônia, Tocantins (Palmas), Maranhão (and its capital São Luís), Aracaju (capital of Sergipe), Minas Gerais, São Paulo (capital of São Paulo), Curitiba (capital of Paraná), Goiás
	Halls	4. -	São Paulo (capital of São Paulo), Distrito Federal (Brasília)
	Stairs	5. -	Salvador (capital of Bahia), Espírito Santo
	Elevators	6. -	

Table 5 (continued)

What	Where	How	Federative Unit and Capital
	Change rooms/showers	8. -	Minas Gerais (capital of Belo Horizonte)
	Entrance of washrooms	9. -	Bahia, Maranhão, São Paulo (capital of São Paulo), Goiás
	Inside staff rooms	10. -	Tocantins, Rio Grande do Norte, Rio de Janeiro, Campo Grande (capital of Mato Grosso do Sul)
	Near swimming pools, courts and areas of physical activity	11. -	Manaus (capital of Amazonas), Ceará, Goiânia (capital of Goiás), Campo Grande (capital of Mato Grosso do Sul), Distrito Federal (Brasília)
	Entire school	12. Setting up hand hygiene devices: (i) Maintaining a 1-to-3 class ratio; (ii) Taking into account the area of the school, following the proportion of one station for schools with less than 70m ² , two devices for schools with a total area up to 150m ² with an additional one station for every 70m ² (for schools with more than 150m ²); (iii) Installing one handwashing stations for schools with up to 2 classrooms; 3 handwashing stations for schools with up to 4 classrooms; 4 handwashing stations for schools with up to 6 classrooms; 5 handwashing stations for schools with up to 9 classrooms; 6 handwashing stations for schools with 10 or more classrooms; one hand sanitizer dispenser for every 3 classrooms.	Amapá (and its capital Macapá), Salvador (capital of Bahia)
	Area or preparation, distribution and consumption of meals	13. Installing handwashing stations that should not be shared with students	Acre, Amazonas, Salvador (capital of Bahia), Sergipe
	Open areas	14. Installing hand hygiene stations to reduce reliance on washrooms	Tocantins, Sergipe
	School vehicles, on the side of drinking fountains, at the	15. Preferring the use of hand sanitizers over hand washing	Amapá (and its capital Macapá), Amazonas, Porto Velho (capital of

(continued on next page)

Table 5 (continued)

What	Where	How	Federative Unit and Capital
	entrance of washrooms		Rondonia, Bahia (and its capital Salvador), Ceara, Aracaju (capital of Sergipe), Minas Gerais (and its capital Belo Horizonte), São Paulo, Santa Catarina (Florianópolis), Curitiba (capital of Paraná), Goiás, Mato Grosso do Sul São Paulo (capital of São Paulo) Rio Grande do Norte
	School vehicles	16. Prohibiting the use of liquid alcohol 17. Keeping alcohol products far away from equipment and sources of heat	
	Food production area	18. Prohibiting the use of alcohol products	Paraíba
Promoting hand hygiene with behavioural change	Entire school	19. (Students and school staff) practising hand hygiene: (i) before entering and leaving the school; (ii) after physical activity; (iii) before and after meals; (iv) before and after using any type of transportation (either public or school transportation); (v) before and after using washrooms; (vi) before and after using drinking fountains; (vii) before and after going to the playground; (viii) when entering and leaving the library, and before and after touching their collection (books, magazines, etc.); (ix) before and after touching or changing the mask; (x) after coughing or sneezing; (xi) after handling money or cards; (xii) after music classes in case instruments are shared (except for wind instruments, which are prohibited).	Acre, Amapá (and its capital Macapá), Amazonas (and its capital Manaus), Rondonia (and its capital Porto Velho), Tocantins (and its capital Palmas), Bahia (and its capital Salvador), Ceara, Maranhão (São Luís), Paraíba, Piauí, Sergipe (and its capital Aracaju), Rio Grande do Norte, Minas Gerais (and its capital Belo Horizonte), São Paulo (and its capital São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Santa Catarina (and its capital Florianópolis), Paraná, Rio Grande do Sul (and its capital Porto Alegre), Goiás (and its capital Goiânia), Mato Grosso, Campo Grande (capital of Mato Grosso do Sul), Distrito Federal (Brasília), Brazil
	Entire school	20. (School staff) practising hand hygiene: (i) after cleaning or disinfecting any material or surface;	Acre, Palmas (capital of Tocantins), Salvador (capital of Bahia), Paraíba, Rio Grande do Norte,

Table 5 (continued)

What	Where	How	Federative Unit and Capital
		(ii) after taking the garbage out; (iii) prepare and handle food.	São Paulo (and its capital São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Florianópolis (capital of Santa Catarina), Goiás (and its capital Goiânia), Mato Grosso, Distrito Federal (Brasília)
	Entire school	21. Practicing hand rub when there is no visible dirt	Manaus (capital of Amazonas), Aracaju (capital of Sergipe)
	Hand hygiene stations and devices	22. Fixing posters on how to do hand hygiene	Manaus (capital of Amazonas), Alagoas, Bahia (Salvador), Espírito Santo, São Paulo (capital of São Paulo)
	Entire school	23. Fixing posters educating on preventive hygiene measures against COVID-19	Acre, Amazonas, Porto Velho (capital of Rondonia), Ceara, Piauí, Rio Grande do Norte, Minas Gerais, São Paulo (capital of São Paulo), Rio de Janeiro, Santa Catarina, Curitiba (capital of Paraná), Porto Alegre (capital of Rio Grande do Sul), Goiás
	Entire school	24. Reinforcing hygiene activities through playful activities compatible with the age group of students	Aracaju (capital of Sergipe), São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro)
	Entire school	25. Introducing basic concepts of health and disease prevention during classes and/or breaks	Ceara, São Luís (capital of Maranhão)
	Entire school	26. Training school staff on the new hygiene procedures	Acre, Amazonas, Salvador (capital of Bahia), Ceara

2020; Salvador, 2021; Sergipe, 2021; SINEPE- DF, 2020; SINEPE-CE, 2020; SINEPE-ES, n.d.; Tocantins, n.d.) suggested the placement of disinfectant mats at school entrances, doubts were raised about the actual impact of this measure (Flocruz, 2020; Manaus, 2020). As the effectiveness of this measure has not yet been scientifically proven, its adoption might cause a false impression of safety, to the detriment of already established preventive measures (Flocruz, 2020; Manaus, 2020). However, disinfectant mats could be established by applying a sanitizing solution (created using a ratio of 3 spoons of bleach per liter of water) across the entire mat surface until it becomes thoroughly damp (Rio Grande do Norte, 2020).

It is advisable to clean surfaces by employing the damp wiping technique, involving the use of a moist cloth, as opposed to dry cleaning, in order to mitigate the potential dissemination of microorganisms (Amazonas, 2020a, 2020b; Belo Horizonte, 2021; Curitiba, n.d.; Distrito Federal, 2022; Tocantins, 2020). All sanitizing products should be stored in a safe place inside the school, out of reach of children (São Paulo, 2021; Sergipe, 2021; SINEPE-CE, 2020). Employees responsible for cleaning chores need to go through specific training to become familiar

Table 6

Summary of measures and interventions related to environmental cleaning, according to guidelines for the safe reopening of schools in Brazil during the COVID-19 pandemic.

What	Where	How	Federative Unit and Capital
Regular cleaning and disinfection	Canteens or refectories	1. -	<i>Acre, Amapá (and its capital Macapá), Amazonas, Tocantins, Maceió (capital of Alagoas), Bahia, São Luís (capital of Maranhão), Paraíba, Piauí, Minas Gerais, São Paulo (and its capital São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Florianópolis (capital of Santa Catarina), Rio Grande do Sul, Goiânia (capital of Goiás), Mato Grosso do Sul, Brazil</i>
	Classrooms	2. -	<i>Acre, Amapá, Manaus (capital of Amazonas), Boa Vista (capital of Roraima), Tocantins (and its capital Palmas), Bahia (and its capital Salvador), Ceará, Maranhão, Paraíba, Piauí, Pernambuco, Aracaju (capital of Sergipe), Rio Grande do Norte, Minas Gerais (Belo Horizonte), São Paulo (São Paulo), Paraná, Rio Grande do Sul (Porto Alegre), Goiás (Goiânia), Distrito Federal (Brasília), Brazil</i>
	Washrooms, showers and changing rooms	3. -	<i>Acre, Amapá, Amazonas (and its capital Manaus), Porto velho (capital of Rondônia), Tocantins, Alagoas, Bahia (and its capital Salvador), Ceará, São Luís (capital of Maranhão), Paraíba, Piauí, Pernambuco (and its capital Recife), Rio Grande do Norte, Minas Gerais, São Paulo (and its capital São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Florianópolis</i>

Table 6 (continued)

What	Where	How	Federative Unit and Capital
			<i>(capital of Santa Catarina), Paraná, Rio Grande do Sul, Goiânia (capital of Goiás), Brazil</i>
	Objects, furniture, floors and surfaces that are frequently touched	4. -	<i>Acre, Amapá, Amazonas (and its capital Manaus), Boa Vista (capital of Roraima), Alagoas, Ceará, Paraíba, Piauí, Recife (capital of Pernambuco), Sergipe, São Paulo (and its capital São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Paraná, Goiânia (capital of Goiás), Distrito Federal (Brasília), Brazil</i>
	Entire school	5. Cleaning the school building: (i) before the school opens and after it closes, (ii) after every turn or change of students, (iii) every two or 3 h, (iv) once during the day.	<i>Acre, Amazonas (and its capital Manaus), Porto Velho (capital of Rondônia), Tocantins (and its capital Palmas), Alagoas (and its capital Maceió), Bahia, São Luís (capital of Maranhão), Paraíba, Pernambuco (and its capital Recife), Sergipe, Rio Grande do Norte, Espírito Santo, Minas Gerais, São Paulo (and its capital São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Paraná (and its capital Curitiba), Rio Grande do Sul (and its capital Porto Alegre), Mato Grosso do Sul (and its capital Campo Grande), Distrito Federal (Brasília), Brazil</i>
	Walls, windows, furniture, kitchen and floors	6. Performing a deep cleaning during weekends or periods when students are absent	<i>São Paulo (capital of São Paulo)</i>
	Entrance of schools	7. Placing sanitizing mats	<i>Amazonas, Porto Velho (capital of Rondônia), Tocantins (and its capital Palmas), Alagoas (and its capital, Salvador (capital of Bahia), Ceará, Piauí, Pernambuco (and its capital Recife), Sergipe (and its</i>

(continued on next page)

Table 6 (continued)

What	Where	How	Federative Unit and Capital
	Entire school	8. Cleaning surfaces by employing the damp wiping technique	capital Aracaju), Rio Grande do Norte, Espírito Santo, Rio de Janeiro, Goiânia (capital of Goiás), Distrito Federal (Brasília) Amazonas, Tocantins, Belo Horizonte (capital of Minas Gerais), Curitiba (capital of Paraná), Distrito Federal (Brasília)
	Vehicles used for school transportation	9. Cleaning the vehicle: (i) in the presence of noticeable dirt, (ii) at the end of every work shift, (iii) following each journey, (iv) once or twice a day.	Amapá, Amazonas, Rondônia, Alagoas, Paraíba, Pernambuco, Aracaju (Capital of Sergipe), Rio de Janeiro (and its capital Rio de Janeiro), Santa Catarina, Mato Grosso do Sul, Brazil Rondônia
	Vehicles used for school transportation	10. Performing a deep cleaning at least once every week	
	Entire school	11. Cleaning and disinfection should be performed using sanitizing products approved by ANVISA, or alternatively: (i) Alcohol 70 %; (ii) Water and soap; (iii) Neutral detergent; (iv) Bleach (careful, as it may cause corrosion on certain surfaces); (v) Sodium hypochlorite 0.1 %; (vi) Sodium and calcium hypochlorite; (vii) Sodium dichloroisocyanurate (1000 ppm concentration of active chlorine); (viii) Povidone-iodine solution (1 %); (ix) 0.5 % hydrogen peroxide; (x) 0.5 % peracetic acid; (xi) Quaternary ammonium compounds, such as Benzalkonium Chloride; (xii) Phenolic compounds; (xiii) Disinfectants with virucidal activity	Acre, Amazonas, Rondônia, Palmas (capital of Tocantins), Alagoas, Bahia, Ceará, Maranhão (and its capital São Luís), Piauí, Recife (capital of Pernambuco), Espírito Santo, Minas Gerais, São Paulo (capital of São Paulo), Rio de Janeiro, Santa Catarina (and its capital Florianópolis), Curitiba (capital of Paraná), Goiás (and its capital Goiânia), Brazil
Facilitating cleaning	Entire school	12. Covering books and educational materials with adhesive plastic cover	Amapá, Amazonas, Tocantins, Curitiba (capital of Paraná), Brazil Ceará, Sergipe, São Paulo (capital of São Paulo)
Storing cleaning and disinfecting	Entire school	13. Storing sanitizing products in a place out of reach of children	

Table 6 (continued)

What	Where	How	Federative Unit and Capital
products in a safe place	Entire school	14. Training employees on the new cleaning and sanitizing procedures	Manaus (capital of Amazonas), Salvador (capital of Bahia), Rio Grande do Norte, Santa Catarina (and its capital Florianópolis), Brazil
Providing training to employees			

with the new cleaning and sanitizing procedures (Florianópolis, 2022; Manaus, 2020; MEC, 2020b; Rio Grande do Norte, 2020; Salvador, 2021; Santa Catarina, n.d.).

3.3. WASH solutions in schools – for whom?

3.3.1. Youngest children

Measures and interventions applicable to schools offering education to children up to 6 years old (daycare and preschool) are presented in Table 7. Visualization of solutions by location can be found in the Supplementary Material. On that note, schools must ensure that all WASH facilities (handwashing stations, washrooms and drinking fountains) are accessible to the youngest children (Ceará, 2022; CEDDH, 2021). When installing sinks, hand sanitizer dispensers and drinking fountains, the height of the infrastructure should be adequate and reachable to children from that age group (CEDDH, 2021; Minas Gerais, 2021a; São Paulo, 2021). Alcohol-based sanitizers should only be used as a last resource if soap and water are not readily available, and under the supervision of an adult to avoid children’s intoxication through ingestion and contact with their eyes (Boa Vista, n.d.; Ceará, 2022; Goiânia, 2021; Minas Gerais, 2021a; Rio de Janeiro, 2022a; Rio Grande do Norte, 2020; São Paulo, 2021). That said, the use of alcohol products with added essences, scents, perfumes or equivalent is also contraindicated, considering that they may favour accidents related to intoxication (Minas Gerais, 2021a). Moreover, children should be supervised during handwashing and while going to the washroom (Belo Horizonte, 2021; Ceará, 2022; Florianópolis, 2022; Santa Catarina, n.d.; SINEPE-DF, 2020). Children should be taught how to properly wash their hands and familiarize themselves with all hygiene protocols implemented within the school environment through recreational strategies compatible with their age (Rio de Janeiro, 2022a; São Paulo, 2021).

Washrooms designed for children undergoing toilet training should have restricted access to one group at a time (Belo Horizonte, 2021; Rio de Janeiro, 2022a). For the remaining age groups, access to washrooms should be limited to their capacity, and during its use, children should respect all physical distancing measures, taking turns for toilets and sinks (Belo Horizonte, 2021; São Paulo, 2021). For infants aged up to 11 months, it is recommended that baby changing facilities with showers, bath tubs and sink, to be located inside or near the classroom, restricting the access of this zone to that age group and authorized school personnel (Belo Horizonte, 2021). In institutions with multiple washrooms available, it is advisable to designate certain facilities exclusively for the youngest children (Santa Catarina, n.d.). These washrooms should not be shared with children from different levels of education and age (Santa Catarina, n.d.). For children in daycare (0–3 years old), it is essential to have one device for hand hygiene (either a sink with water and soap or hand sanitizer dispenser) in each classroom (Belo Horizonte, 2021).

3.3.2. Students with disabilities or limited mobility

Taking into account that for students with disabilities or limited mobility, physical contact with surfaces is indispensable for their

Table 7
Summary of measures and interventions applicable to schools with daycare and preschool (with students up to 6 years old), according to guidelines for the safe reopening of schools in Brazil during the COVID-19 pandemic.

What	Where	How	Federative Unit and Capital
Ensuring that handwashing stations, washrooms and drinking fountains are accessible to youngest children	Handwashing stations, alcohol dispensers, washrooms	1. Making sure the height of the infrastructure is adequate and reachable to children aged 0–6 years old	<i>Ceará (and its capital Fortaleza), Minas Gerais, São Paulo (capital of São Paulo)</i>
Reduce the risk of children's intoxication and make sure children are sanitizing their hands	Entire school	2. Using alcohol-based sanitizers as the last resource (only when handwashing cannot be performed)	<i>Boa Vista (capital of Roraima), Ceará, Rio Grande do Norte, Minas Gerais, São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Goiânia (capital of Goiás)</i>
	Handwashing stations, alcohol dispensers, washrooms	3. Supervising the children while they are washing or rubbing their hands and when they go to the washroom	<i>Boa Vista (capital of Roraima), Ceará, Rio Grande do Norte, Minas Gerais, São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro), Goiânia (capital of Goiás)</i>
	Entire school	4. Prohibiting alcohol products with added essences, scents, perfumes or equivalent	<i>Minas Gerais</i>
Practising personal hygiene etiquette	Classroom (daycare)	5. Installing one device for hand hygiene in each classroom	<i>Belo Horizonte (capital of Minas Gerais)</i>
	Entire school	6. Teaching children how to wash their hands properly and all new hygiene measure	<i>São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro)</i>
	Entire school	7. Not sharing personal toiletries, bottles, cups and pacifiers	<i>São Paulo (capital of São Paulo), Campo Grande (capital of Mato Grosso do Sul)</i>
Regular cleaning and disinfecting	Entire school	8. Identifying items or personal use with the name of the student	<i>São Paulo (capital of São Paulo), Campo Grande (capital of Mato Grosso do Sul)</i>
		9. Cleaning bottles, cups and pacifiers after every use: (i) by employing a brush after boiling and antiseptic solution; (ii) using sodium hypochlorite; (iii) hot water and a neutral detergent; (iv) or with	<i>Acre, Boa Vista (capital of Roraima), Paraíba, Belo Horizonte (capital of Minas Gerais), São Paulo</i>

Table 7 (continued)

What	Where	How	Federative Unit and Capital
Respecting social and physical distancing	Washrooms	rinsing water and soap.	<i>Santa Catarina</i>
		10. Cleaning and disinfection bottles that are chare using a chlorine solution or boiling for 10 min	
		11. Cleaning items or furniture used by the children: (i) after every use; (ii) and before the beginning of every turn of classes.	<i>Acre, Boa Vista (capital of Roraima), Maceió (capital of Alagoas), Bahia, Ceará, Paraíba, São Paulo, Rio de Janeiro (capital of Rio de Janeiro), Santa Catarina, Mato Grosso do Sul</i>
		12. Providing a sufficient number of toys and discouraging children from bringing their own to school	<i>Boa Vista (capital of Roraima), Maceió (capital of Alagoas), Paraná</i>
		13. Removing toys that are difficult to clean	<i>Amapá, Palmas (capital of Tocantins), Maceió (capital of Alagoas), Ceará, São Luís (capital of Maranhão), São Paulo (capital of São Paulo), Santa Catarina (and its capital Florianópolis), Curitiba (capital of Paraná), Campo Grande (Capital of Mato Grosso do Sul), Brazil</i>
		14. Disinfecting toys that are brought by students	<i>Acre</i>
		15. Restricting access to washrooms for children undergoing toilet training for one group at a time	<i>Belo Horizonte (capital of Minas Gerais), Rio de Janeiro (capital of Rio de Janeiro)</i>
		16. Limiting access to washrooms to their capacity	<i>Belo Horizonte (capital of Minas Gerais), São Paulo (capital of São Paulo)</i>
		17. Adopting physical distancing measures inside the facilities (taking turns for toilets and sinks)	<i>Belo Horizonte (capital of Minas Gerais), São Paulo (capital of São Paulo)</i>
		18. Designating washrooms for the exclusive use of youngest children	<i>Santa Catarina</i>
		19. Setting baby changing facilities (for infants aged up to 11 months)	<i>Belo Horizonte (capital of Belo Horizonte)</i>

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Table 7 (continued)

What	Where	How	Federative Unit and Capital
Adopting hygiene practices	Entire school	inside or near the classroom 20. Practicing frequent handwashing and after interacting with each child, especially before and after changing diapers, preparing and serving food, and assisting children in washroom activities	<i>Acre, Boa Vista (capital of Roraima), Palmas (capital of Tocantins), Paraíba, Recife (capital of Pernambuco), São Paulo (and its capital São Paulo), Santa Catarina</i>
	Baby changing facilities	21. Fixing instructions on how to change diapers near the bench where the activity is performed	<i>Boa Vista (capital of Roraima)</i>
Reducing potential contamination with faeces	Washrooms and baby-changing facilities	22. Disposing diapers	<i>Palmas (capital of Tocantins), Salvador (capital of Bahia), Minas Gerais, São Paulo (capital of São Paulo), Rio de Janeiro (capital of Rio de Janeiro)</i>

effective communication (in the case of students with visual impairments) and mobility assistance (for students with physical impairments), hygiene measures (including hand hygiene, disinfection of the environment, and sanitization of assistive devices) need to be intensified (Table 8). A summary of solutions by location (capital, state and federal level) can be found in the Supplementary Material.

For that purpose, schools must include special education professionals in their teams (Mato Grosso do Sul, 2022; MEC, 2020b). These professionals should receive comprehensive training on the recommended hygiene protocols and be provided with appropriate personal protective equipment (PPE) (Mato Grosso do Sul, 2022; MEC, 2020b). Interpreters should wear transparent masks and gloves, change the gloves after each use, and wash their hands with soap and water, or 70 % alcohol every time they assist a new student (Ceará, 2022; Minas Gerais, 2021a). Special education professionals should assist children with handwashing, cleaning, and disinfecting their assistive devices (Campo Grande, 2020; Ceará, 2022; Espírito Santo, 2021; Mato Grosso, n.d.; Mato Grosso do Sul, 2022; MEC, 2020b; Santa Catarina, n.d.; São Paulo, 2021; Sergipe, 2021).

Mobility devices such as wheelchairs, canes and walkers should be cleaned before and after attending school and always after use, especially when used outdoors (Acre, 2021; Amazonas, 2020a, 2020b; Ceará, 2022; Florianópolis, 2022; Minas Gerais, 2021a; Santa Catarina, n.d.; São Paulo, 2021). Students with visual impairment and who use wheelchairs should adhere to frequent handwashing, and the latter have the option to use disposable gloves or antiseptic wet wipes (Amapá, 2021a; Espírito Santo, 2021; Mato Grosso, n.d.; MEC, 2020b; São Paulo, 2021). Elevator access should be restricted for individuals with disabilities or limited mobility, and the structure should undergo regular disinfection (Ceará, 2022; São Paulo, 2021). Schools are advised to constantly disinfect the floor and handrails (São Paulo, 2021; SINE-PE-ES, n.d.).

Cleaning and disinfection procedures should be performed throughout and more frequently when serving students with physical disabilities due to spinal cord injury or chronic encephalopathies (e.g.,

cerebral palsy, hemiplegia, paraplegia and quadriplegia, etc.), as well as for students who are susceptible to contamination by the use of probes, collection bags, and diapers (Ceará, 2022). Students with multiple disabilities should receive greater attention from education professionals in all the aforementioned health measures (Ceará, 2022). A detailed description of how to clean and disinfect assistive devices (wheelchairs, canes, walkers or mobility devices, glasses, orthoses, colostomy, gastrostomy, nasal probe and vial, equipment and syringe) are provided in the guidelines and summarized in Table 8.

3.3.3. Boarding schools, high-risk groups and traditional communities

Only two documents presented measures targeted at boarding schools, including: i) intensifying daily cleaning procedures of the environment with disinfectants, coupled with regular changing and laundering of bed linen, towels and other clothing; ii) restricting the use of common areas such as cafeteria, changing rooms, washrooms, showers, etc., with scheduled usage to mitigate crowding; iii) and under no circumstances sharing bed linens or towels (Ceará, 2022; Santa Catarina, n.d.). Students and professionals from the school who were considered in the high-risk groups were recommended to be more rigorous in adopting hygiene procedures (Amazonas, 2020b). As for schools with students from traditional communities, the national guidelines advise evaluating the availability of personnel, infrastructure and resources to comply with hygiene and health safety measures, always involving the families of students and community leaders in the decision-making process (MEC, 2020b).

4. Discussion

The current study had two main goals. First, to identify what were the proposed WASH solutions in schools in Brazil during the COVID-19 pandemic and where, how and for whom these solutions targeted. Second, to discuss which of the recommended solutions should be kept as part of the “new normal” of schools in order to enhance the school’s capability to remain operational during a new pandemic or outbreak. To our knowledge, whereas there is an ongoing but not yet published scoping review of WASH interventions in schools for effective pandemic response (Chepkorir Seroney et al., 2023), this is the first study to explore WASH solutions in schools during the COVID-19 pandemic from national guidelines, and, more specifically, from Brazil. To that purpose, 66 public policies were gathered, from which 159 measures and actions, divided into five themes (drinking water, sanitation, solid waste, hand hygiene and environmental cleaning), targeting five different population groups (youngest children, children with disabilities or limited mobility, boarding schools, high-risk groups and traditional communities).

Since 2010, access to safe drinking water and sanitation has been formally recognized by the United Nations General Assembly as a fundamental human right to be ensured not only at the household level but also in non-household settings, including schools, and guided by five key principles, namely: i) availability; ii) accessibility; iii) affordability; iv) quality and safety; v) acceptability, privacy and dignity (United Nations, 2015). Nevertheless, we observed that some of the suggested solutions from the set of 66 public policies violate the normative contents of HRTWS. Assigning students the duty of supplying their own water, or merely their water container (bottles and cups) from home, although common practice in various countries across Latin America (Jordanova et al., 2015), Asia (Mirassou-Wolf et al., 2017), and Africa (Egbinola and Amanambu, 2015; Ekpo et al., 2008; Mbatha, 2011; Mohammed and Larsen-Reindorf, 2020; Wichaidit et al., 2019), is a violation of the principles of availability and affordability. As precluded by the WHO and Sphere standards (Adams et al., 2010; INEE, 2010; Sphere Project, 2018; The Alliance for Child Protection in Humanitarian Action, 2019), sufficient safe drinking water must be readily available at all times for direct consumption, personal hygiene, food preparation, cleaning and laundry. While during humanitarian crises, the water need

Table 8

Summary of measures and interventions for schools serving students with disabilities or limited mobility, according to guidelines for the safe reopening of schools in Brazil during the COVID-19 pandemic.

What	Where	Whose responsibility	How	Federative Unit and Capital
Ensuring proper conditions for hygiene practices and practising frequent hand hygiene	Canteens and refectories	School	1. Installing a handwashing station adapted for people with disabilities and limited mobility	Rio Grande do Norte
	Entire school	Students who use wheelchairs	2. Using disposable gloves or antiseptic wet wipes for hand hygiene	Amapá, Espírito Santo, São Paulo (capital of São Paulo), Mato Grosso, Brazil
	Entire school	School (interpreters)	3. Wearing transparent masks and gloves, changing the gloves after each use, and washing their hands with soap and water or 70 % alcohol every time they assist a new student	Ceará, Minas Gerais
	Entire school	School (special education professionals)	4. Assisting children with handwashing, cleaning, and disinfecting their assistive devices	Ceará, Sergipe, Espírito Santo, São Paulo (capital of São Paulo), Santa Catarina, Mato Grosso, Mato Grosso do Sul (and its capital Campo Grande), Brazil
Respecting social and physical distancing	Classroom	School	5. Setting a separate space in the classroom for the storage of their books and braille machine	Santa Catarina
	Classroom	Students with visual impairment	6. Not sharing braille materials	Espírito Santo
	Entire school	School	7. Restricting access to elevators for individuals with disabilities or limited mobility	Ceará, São Paulo (capital of São Paulo)
Regular cleaning and disinfection	Entire school	School and students	8. Cleaning mobility devices such as wheelchairs, canes and walkers before and after attending school and always after use, especially when used outdoors	Acre, Amazonas, Ceará, Minas Gerais, São Paulo (capital of São Paulo), Santa Catarina (and its capital Florianópolis)
	Entire school	School	9. Intensifying cleaning and disinfection procedures when serving students with physical disabilities due to spinal cord injury or chronic encephalopathies (e.g., cerebral palsy, hemiplegia, paraplegia and quadriplegia, etc.), and students who are susceptible to contamination by the use of probes, collection bags, and diaper	Ceará
	Entire school	School and students	10. Cleaning the paws of guide dogs every time after going outside	São Paulo (capital of São Paulo)
	Elevators, floors and handrails	School	11.-	Ceará, São Paulo (capital of São Paulo)
	Entire school	School	12. Laminating materials with film paper to enable easy sanitization after each use (in case materials are shared)	Mato Grosso
	Entire school	School and students	13. Cleaning of wheelchairs: (i) First, disassembling as many chair components as possible; (ii) Wipe the entire structure with a dry cloth to remove any dust or other dirt left behind. When necessary, wipe the entire surface with a slightly wet cloth; (iii) Place the foam and the outer protection of the pillows in the air to cool or until they dry completely after cleaning. (iv) The device can also be cleaned with water and soap or 70 % alcohol;	Amazonas (and its capital Manaus), Ceará São Luís (capital of Maranhão), Minas Gerais, São Paulo (capital of São Paulo)
	Entire school	School and students	14. Cleaning of canes, walkers or other mobility devices: (i) Storing away from heat, light and humidity when not in use; (ii) Cleaning with alcohol or neutral soap and a soft cloth. Abrasive products must not be used; (iii) After cleaning, let it dry; (iv) Devices can also be cleaned with water and soap or 70 % alcohol.	São Paulo (capital of São Paulo), São Luís (capital of Maranhão)
	Entire school	School and students	15. Cleaning glasses: (i) Cleaning the spectacles and lenses; (ii) Avoid using alcohol as it can damage the lenses; (iii) It is recommended to wash with water and neutral detergent and then wash your hands.	São Paulo (capital of São Paulo)
	Entire school	School and students	16. Cleaning orthoses: (i) Performing routine cleaning; (ii) Plastic/thermoplastic orthoses can be washed with cold water and neutral soap; (iii) Where there is coating material, wipe it with a wet cloth; (iv) Let it dry in the shade, in an airy place.	São Paulo (capital of São Paulo)
	Entire school	School and students	17. Cleaning colostomy: (i) Always keep the surrounding skin clean; (ii) The skin around the colostomy should be cleaned with water and mild soap; (iii) Do not rub hard, and do not use rough sponges.	São Paulo (capital of São Paulo)
Entire school	School and students	18. Cleaning gastrostomy: (i) Wash your hands with soap and water before and after touching the area; (ii) Use warm water, a clean gauze pad, and pH-neutral	São Paulo (capital of São Paulo)	

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Table 8 (continued)

What	Where	Whose responsibility	How	Federative Unit and Capital
			soap to clean around the site 2–3 times a day or as needed.	
	Entire school	School and students	19. Cleaning nasal probe: (i) At the end of the diet, using a syringe, pass 20–40 ml of mineral water through the probe to clean the food residues (leftovers); (ii) After cleaning, the probe must be closed.	São Paulo (capital of São Paulo)
	Entire school	School and students	20. Cleaning vial, equipment and syringe: (i) It is recommended to change the vial, equipment and syringe after each administration of the diet.	São Paulo (capital of São Paulo)
Providing disability support	Entire school	School	21. Including special educational professionals as part of the school staff	Mato Grosso do Sul, Brazil
	Entire school	School	22. Training special educational professionals on the new hygiene procedures	Mato Grosso do Sul, Brazil
	Entire school	School	23. Providing personal protective equipment for special education professionals	Mato Grosso do Sul, Brazil
	Entire school	School (special education professionals)	24. Providing greater assistance to students with multiple disabilities	Ceará

in schools is estimated to be around 3 L per pupil per day for drinking and hand washing (not including the use for toilets), in normal conditions, this rate should be equivalent to 5 L per person per day at regular schools, increasing to 20 L per person per day at boarding schools. Schools should be careful when advocating the idea that children should bear the responsibility of fetching water and think about what other alternatives can be provided instead ([The Alliance for Child Protection in Humanitarian Action, 2019](#)). Asking students to bring their own water or water recipients from home hampers schoolchildren from accomplishing the recommended water threshold, putting them at risk of dehydration. In addition, in the case of water bottles and cups, it also might generate shame and embarrassment from those who are not able to supply them themselves. Schools, as the providers of water containers, can ensure standardization and hygiene compliance, such as using containers that include a lid and are labelled with the names of the students. Moreover, from the perspective of disease prevention, it may also encourage the practice of sharing water recipients between students ([Borges-Pedro et al., 2018](#); [Pereira and Sorlini, 2019](#)), a high-risk behaviour for the transmission of pediatric illnesses that involve the exchange of body fluids, such as Mononucleosis, Cytomegalovirus (CMV) Infection ([Aronson and Shope, 2020](#)) and COVID-19. Furthermore, assuming universal access to water at home when requesting students to bring their own water can be challenging, especially for black, indigenous, and schoolchildren living in the North and Northeast regions of the country, as the highest rates of household drinking water and sanitation deprivation¹ among the young population in Brazil are reported in those ethnicities and locations ([UNICEF, 2023](#)).

Concerning sanitation, keeping the doors of the washrooms open and without lockers, as advised in the guidelines, is not only a violation of the principles of safety, privacy and dignity, but it also contradicts the JMP service ladder, the WHO, UNICEF and Sphere recommendations ([INEE, 2010](#); [Sphere Project, 2018](#); [The Alliance for Child Protection in Humanitarian Action, 2019](#); [UNICEF, 2011](#); [WHO, 2020](#)). This might cause insecurity, especially among female students, who will not feel comfortable or safe using the sanitary facilities for menstrual hygiene management purposes ([Bulto, 2021](#); [Chinyama et al., 2019](#); [Miuro et al., 2018](#)) and thus choose to be absent of the school during their period ([Shallo et al., 2020](#)), but also for children with disabilities and limited

mobility ([Zaunda et al., 2018](#)) and transgender and gender non-conforming students ([Davies et al., 2019](#)). Among the young population, girls, children with disabilities, those dealing with incontinence, and those who identify as lesbian, gay, bisexual, transgender or intersex are considered to have the greatest level of crisis-related risks in humanitarian crises ([The Alliance for Child Protection in Humanitarian Action, 2019](#)). Therefore, WASH interventions must be preceded by consultations with children and their caregivers, with emphasis on these specific groups. When feeling unsafe or uncomfortable, children may resort to risky alternatives, such as open defecation in isolated areas or reducing food and fluid intake to minimize the need to use the washroom ([The Alliance for Child Protection in Humanitarian Action, 2019](#); [Zaunda et al., 2018](#)).

Rather than proposing measures to avoid or minimize hand contact with surfaces, which is inevitable within washrooms, schools should focus on providing the necessary conditions and promoting hand and personal hygiene after such contact occurs. On that note, considering the absence of funding for schools in LMICs and that even when available, WASH might not be a priority for resource allocation, some of the proposed solutions are unreasonable and unsustainable. Despite its potential to provide a cleaner and safer learning environment, measures such as sanitizing washrooms and drinking water fountains after every use and assigning one professional to keep track of the number of students using the water and sanitary facilities would require either hiring additional staff or deviation to the employee's original duties. Those solutions, thereby, do not contribute to the principle of sustainability. Likewise, recommended measures that consist of infrastructural interventions (e.g., replacing and adapting drinking water fountains, replacing manual faucets for touchless devices, installing hand hygiene devices and implementing divisions inside washrooms) need to be put into practice according to the reality of each school. That said, "software" interventions, including the dissemination of information through posters or other media, educating schoolchildren on toilet etiquette, and incorporating hygiene practices into recreational activities, require fewer resources compared to "hardware" interventions and, therefore, are more easily adapted to the context of schools. However, the guidelines did not specify how to clean the toilet seats before use. Students should avoid this practice without proper supplies and procedures, as it may lead to increased contamination and disease transmission, especially when hand hygiene is not performed afterwards. Wherever schoolchildren are responsible for cleaning the facilities, along with fetching water, this task should not be assigned to a single or specific group of children, should not interfere with the child's education, and should not be assigned as a punishment ([The Alliance for Child Protection in Humanitarian Action, 2019](#)). Complying with the human rights principle of access to information, the final decision on whether

¹ Household water deprivation defined as: i) houses with only on-premises piped water; ii) houses with intermittent water supplied by wells or surface water; iii) houses without piped water; iv) houses with intermittent water supplied by rainwater or with unknown origin. Household sanitation deprivation defines as: i) houses with shared washroom or with cesspit; ii) houses without washroom or with open pit.

they want to perform the task or not should always be up to the student after being informed about what the task consists of and how to perform it (The Alliance for Child Protection in Humanitarian Action, 2019).

In certain areas, the use of cloth towels and electric dryers for hand drying was strictly forbidden, despite the WHO recommendation to use either paper towels or warm air dryers following hand rub or hand washing (WHO, 2022f). While warm air dryers are touchless devices which can minimize the risk of cross-contamination associated with multiple people touching the same surfaces, such as paper towel dispensers, schools should exercise caution when choosing this drying method. It is important to position the devices far away from garbage bins to avoid further spreading pathogens through the dispersion of solid waste via the airflow generated or by aerosol liberation (Gammon and Hunt, 2019; Vardoulakis et al., 2022). Alternatively, when opting for paper towels, schools ought to regularly clean the front of the paper towel dispenser, empty garbage bins before they reach their capacity and ensure a continuous supply of paper towels (Vardoulakis et al., 2022). Using continuous cloth roller towels is discouraged as once contaminated, it would be a source of pathogen transfer to clean hands (Gammon and Hunt, 2019; Huang et al., 2012).

Public policies did not reach a consensus regarding several topics, including the quantity and locations of hand hygiene stations to be installed in schools, sanitizer mats, and how to dispose of solid waste. Whereas the ratio of handwashing stations to students may vary, the WHO recommends one handwashing station per classroom, located near every toilet-bathroom door, dormitories, cafeteria-dining entrance, main school entrance and halls (UNICEF, 2020a). In institutions where washrooms are already equipped with handwashing stations and all the necessary hygiene supplies (water, soap, paper towels or warm air dryers and trash cans with lids), it is more reasonable to set handwashing stations at the entrance of schools, cafeterias and refectories. In contrast, the manual for School Building Performance elaborated by the Brazilian Ministry of Education suggests one handwashing station for every 30 students (Brazil, 2005). With concern to sanitizing mats, hitherto, there is no scientific evidence indicating that disinfectant mats are effective in reducing the transmission of COVID-19 or other diseases. This measure, therefore, should not be advised. As highlighted in the guidelines from Manaus (the capital of Amazonas state) (Manaus, 2020), the use of sanitizing mats not only can create a misleading sense of security but also involves the allocation of resources that could have been better used for other established protective measures.

A wide range of sanitizing products was listed in the inventory of public policies. Whereas many disinfectants are active against COVID-19, and it is outside of the scope of this study to evaluate the efficiency of these products, for schools, it is recommended to first use commercial detergent with water to remove dirt, followed by commercial chlorine-based disinfectants, ensuring a concentration equivalent to 0.1 % of active chlorine for surfaces and 70 % of ethyl alcohol (UNICEF, 2020a). In addition, High-Test Hypochlorite (HTH), such as sodium and calcium hypochlorite, as suggested in some of the public policies, should be substituted for commercial liquid disinfectants to mitigate storage concerns and minimize the risk of children's exposure (UNICEF, 2020a).

Last, whereas guidelines were divided about the final disposition of solid waste generated in schools, the WHO recommendations comply with landfill disposal of all residues, including potentially contaminated materials (UNICEF, 2020a; WHO, 2020b). Ideally, infectious waste, such as from the isolation area for confirmed or suspected cases of COVID-19, masks and PPE should be segregated and treated as health-care waste (e.g., high temperature, dual chamber incineration or autoclaving) and then safely disposed of. However, this practice becomes challenging as the size of the school grows, and different types of solid waste begin to mix together. Moreover, beyond COVID-19, considering the multitude of diseases with varying modes of transmission within the school environment, it is difficult to distinguish infectious from non-infectious waste. In places where collection by municipal waste services is not available, the reality of 30 % of schools in Brazil (Poague et al., 2023),

the WHO suggests controlled burning of the solid waste with the aid of fuel drops such as kerosene as an alternative (UNICEF, 2020a). However, this measure should be considered only as a temporary solution, as it will lead to additional environmental and health consequences.

Whereas the HRTWS do not address solid waste management, and one might not include under the term WASH, Brazil's Basic Sanitation Regulatory Framework defines basic sanitation as the set of four services: i) water supply; ii) sewage collection and treatment; iii) waste collection and disposal; iv) and drainage and management of rainwater (Brazil, 2020b). Among the principles of universalization of access, equity, and economic efficiency and sustainability, Brazil's basic sanitation regulatory framework entails that the maximum effectiveness of each of the four services will be only achieved when integrated with the others (also known as the concept of integrality) (Brazil, 2020b). That said, despite having fewer measures and interventions compared to other WASH domains (drinking water, sanitation and hand hygiene), solid waste management in schools must not be neglected, as its improvement also contributes to the enhancement of the other services.

On the other hand, installing hand hygiene stations in open areas of the schools (outside washrooms) is a highly recommended suggestion, as it will not only reduce students' reliance on washrooms for handwashing but also for drinking water in institutions without drinking fountains. In addition to the replacement or adaptation of drinking water fountains for those that only allow consumption via cups or bottles, water stations could also be equipped with pedal-operated tapes and devices or, in the case of water dispensers, with sensors to minimize hand contact and reduce the risk of infection (UNICEF, 2020a). If infrastructural changes are not viable, paper towels can be provided for students to use when opening and closing taps (UNICEF, 2020a). The same measure extends to washrooms, eliminating the need for students to disinfect manual facets before washing their hands, as suggested in some of the documents. To achieve this goal, educational initiatives will be necessary to familiarize students with the practice and integrate it into their daily routines.

Although schools in the North and Northeast regions of the country have been reported as having the lowest rates of access to drinking water and improved sanitation (Poague et al., 2023), it is noteworthy that guidelines from only three states and their respective capitals of these regions included measures to enhance the availability, accessibility and quality of water, with no corresponding measures addressing the promotion of improved sanitation. Similarly, despite 15 % of schools in the North region not having washrooms (Poague et al., 2023), this aspect was not addressed in the policies implemented by the states and capitals within that region. Whereas proposed solutions strive to guarantee basic drinking water and hygiene services at schools, sanitation was sidelined. Moreover, states where public policies could not be identified were limited to the country's North region. Even though COVID-19 no longer constitutes a health emergency, complying with the human rights principles of accountability and access to information, public bodies (such as the municipalities, states and the federal government) and other duty-bearers (in this case, independent school unions) are obliged to publish and disseminate information and to respond requests. Furthermore, this is of special concern as among the young population (0–17 years old), the North region is the location with the highest rates of education deprivation (schoolchildren without access to education, delayed school entry or illiterate) and also the most underserved in terms of household drinking water and sanitation in Brazil (UNICEF, 2023). As their household environments lack the necessary infrastructure for WASH practices, those children's acquisition of WASH (and most importantly, hygiene) habits during childhood will rely on their school's WASH infrastructure. Not having access to those recourses in both environments (at home and at schools) would completely hamper the process of learning WASH practices of paramount importance for protecting their health, such as handwashing, oral hygiene and menstrual hygiene management. For that purpose, besides WASH infrastructure, it is also fundamental that schools integrate WASH and

principles of health in their school books and educational curricula (Anthonj et al., 2021). Instead of incorporating brief lessons on the topic, as suggested in two of the guidelines, this content should be integrated as an essential component of the children's education. Nevertheless, introducing short WASH messages for children during the day (e.g., during class breaks, school assemblies, school mealtime, or after-class registration) is fundamental to establishing a WASH routine (UNICEF, 2011). As young children are easily distracted and often forget what they have learned, messages have to be short, regularly reinforced, and preferably through recreational activities (for instance, song, puppets, drama) to encourage lasting behaviour change (UNICEF, 2011).

While actions and measures to safely reopen schools during COVID-19 encompass the entire school community, the WHO and UNICEF emphasize the critical importance of prioritizing the most vulnerable and marginalized children (WHO, 2020a). This includes, but is not limited to, minorities, adolescent girls, children living with disabilities, in institutional care, in poverty, in informal settlements and out-of-school children (WHO, 2020a). Nevertheless, whereas youngest children and children with disabilities or limited mobility were extensively addressed on guidelines, remaining known marginalized groups in Brazil such as indigenous and remnant *quilombo* community's, were rarely mentioned. Solutions provided by the federal guidelines for those traditional communities, representative of 0.83 % and 0.65 % of the country's population (together, almost 3 million inhabitants) (IBGE, 2023a, 2023b), were vague and lacked explanations on how they could be achieved. In addition, no distinctions were made among schools located in urban, rural areas and informal settlements, despite existing literature highlighting disparities in resource access and infrastructure (Poague et al., 2023; UNICEF, 2022). This is not a limitation of public policies for schools, but rather, of policy response in all settings in Brazil. As highlighted by David and Heller (Victral and Heller, 2021) Brazilian states' policy response to the COVID-19 pandemic failed to incorporate affirmative actions for vulnerable populations, disregarding the human rights principles of equality and non-discrimination. Nonetheless, while the principle of participation was clearly evoked when designing solutions for traditional communities, the same was not valid for the remaining groups. Children, who are typically the most marginalized in participatory processes (Albuquerque, 2014; WHO, 2022e), were notably absent from the decision-making regarding WASH solutions and, more significantly, in the broader context of school reopening solutions. This is evident as, despite COVID-19 not being a disease with a gender-specific bias (i.e., with a higher impact in one gender), only one public policy addressed the different sanitary needs (student to toilet ratio) of girls and boys (Belo Horizonte, 2021), without any mention to menstrual hygiene management. Participation of students is paramount to designing solutions that are culturally appropriate and acceptable, but beyond that, to promote ownership, empowerment, and sustainability in the school (Albuquerque, 2014; UNICEF, 2011; WHO, 2022e). Some of the strategies to involve children in WASH activities in the school include delegating children to describe the WASH infrastructure of the school (letting children act as "eyes and ears"), creating WASH-focused clubs and class-based committees, nominating children as WASH ambassadors or champions, awarding certificates for WASH achievements, displaying WASH art and keeping WASH achievement merit or star charts (UNICEF, 2011). In order to become a WASH-friendly school, however, the participation of teachers and the wider school community (such as parents) is also paramount (UNICEF, 2011). For parents, this involvement could be in planning and running WASH events in the school, volunteer supervision of health clubs and committees, and reinforcing WASH habits acquired in the school at the house environment (UNICEF, 2011). On the other hand, teachers should supervise children while performing WASH practices (e.g., washing hands after meals). They can integrate show-and-tell WASH activities within mainstream subjects such as math, language and science (UNICEF, 2011).

Keeping in mind that less than half of the educational institutions in

the country are equipped with bathrooms for people with disabilities or limited mobility (rising to 60 % for bathrooms designed for young children) and the need for sanitary facilities tailored to the specific requirements of these groups, an important additional measure would be installing dedicated washrooms exclusively for these minorities. This approach would be preferable to setting aside some of the existing facilities in institutions where multiple regular washrooms are available, as suggested in some of the guidelines.

4.1. Strengths and limitations

During the COVID-19 pandemic, municipalities and schools in Brazil had the autonomy to establish their own guidelines for resuming face-to-face activities. Despite the wide number of documents available, the authors focused solely on federal, state and capital city public policies. While expanding the analysis to encompass additional public policies would have provided more context-specific measures and interventions, we have compiled a set of measures that can be applied not only in schools across all regions of Brazil but also outside the country as well. Moreover, it is noteworthy that, as all public policies included in this study do not have legal power, suggested measures and interventions are facultative. Moreover, although there are disparities in access to WASH in schools according to the management model (private x public), no distinction was made during the analysis. Most of the guidelines (n = 28, 42 %) outlined measures and interventions applicable to both public and private schools, while 8 out of the initial set of 66 (12 %) documents did not restrict their measures to any type of school, making it challenging to compare measures based on the type of institution. In addition, no documentation was identified for two states and six capitals. Incorporating these documents would have enhanced the quality of the study, as both states and 4 out of the six capitals are situated in the North and Northeast regions of the country, which are known for having the most precarious schools in terms of WASH. Furthermore, while IPC in schools encompasses various aspects beyond WASH, the authors decided to restrict the scope of this study to the WASH domain. Consequently, other IPC measures, such as ventilation and air-related measures, were not considered.

Post-COVID-19, it is essential to reconsider strategies to prepare schools for future pandemics better, minimizing prolonged closures. On that note, the strength of this study lies in providing a set of diverse measures by different domains (drinking water, sanitation, solid waste, environmental cleaning and hand hygiene) and for different populations (youngest children, people with disabilities or limited mobility, boarding schools, high-risk groups and traditional communities) from the perspective of a country where prolonged school closures were unavoidable. This study, thereby, reflects lessons learned in the Brazilian context but with applicability beyond the Brazilian territory.

5. Conclusion

One hundred and fifty-nine solutions for the reopening of schools in Brazil amidst the COVID-19 pandemic, divided into 5 WASH domains and five population groups, were extracted from an inventory of 66 public policies released at the federal, state and capital city level. While most of the suggested measures had the potential to provide a cleaner and safer environment and, thereby, enhance the school's resilience, some recommendations did not comply with the principles of the HRTWS, the JMP service ladder and definitions, international guidelines for WASH and IPC in schools, and the Sphere minimum standards for humanitarian aid. Moreover, some of the suggested measures, including the use of sanitizing mats and prohibiting electric dryers, were scientifically incorrect. In order to truly provide long-term school pandemic preparedness, public policies must be developed following a comprehensive and holistic preventive approach. Rather than responding reactively to a specific disease (in this case, COVID-19) during an ongoing pandemic, the focus should be on implementing solutions that

could tackle several diseases altogether. By doing so, resources will be saved (as hardware interventions would only take place once), and the student's routine will not be disrupted several times as the implemented measures will be applicable across different scenarios. While every school has a different context, and measures should be adapted, solutions must cohesively adhere to well-established scientific guidelines.

Moving on from COVID-19 and following the proposed solutions, policymakers and schools can follow three different paths and outcomes: i) To not proceed with any further intervention and, most likely, to have schools closed during the next pandemic; ii) To implement the measures that violate the frameworks or were scientifically incorrect, and, most likely, to have schools open with a false impression of safety; iii) To implement a combination of hardware and software measures, in accordance with the four proposed frameworks, and hence, have schools open or closed for a short period of time when the world is thrown again in another pandemic. Based on the results of this study, we also recommend that further research should be conducted to: i) assess the suitability of proposed solutions from the perspective of different school stakeholders (school principals, teachers, students, etc.); ii) investigate how WASH, IPC, and environmental health has been incorporated into the Brazilians school curricula; iii) explore adaptability and replication of solutions implemented in other LMICs in schools in Brazil; iv) explore how spatial proximity and political orientation of states and municipalities affected type and number of solutions implemented.

CRedit authorship contribution statement

Kassandra I.H.M. Poague: Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization. **Justine I. Blanford:** Writing – review & editing, Supervision. **Javier A. Martínez:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Carmen Anthonj:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijheh.2024.114325>.

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