ASPHER Technical Report on "Children and COVID: Closing or keep opening the schools: the consequences"
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1. BACKGROUND

Due to the alarming worldwide levels of COVID-19 transmission in March of 2020, the WHO characterised this disease as a global pandemic **[1]**. Given the absence of therapeutics or a vaccine at the pandemic's initial stages, the world has witnessed a global exponential growth transmission phase of the disease, which forced countries to implement various interventions at an unprecedented scale to prevent and control its dissemination. Therefore, governments decided to take aggressive measures by placing cities and nations under complete confinement (implementing physical distancing, banning large gatherings, closing schools, and stopping all but essential travel) to reduce the virus transmission rate and avoid overwhelming healthcare systems **[2]**.

Flaxman et al. **[3]** identified that lockdown measures might have averted 3.1 million deaths from COVID-19 across 12 European countries and have successfully reduced the R, the transmission rate, to an average of 0.66. On the other hand, emerging clinical evidence and epidemiological data show a low prevalence of COVID-19 in children experiencing asymptomatic to mild forms of the disease, hence not significantly contributing to the virus's spread. In fact, young people under 20 years old are 56% less likely to contract COVID-19, and only 2-4% of deaths could be prevented because of school closures **[4]**.

The COVID-19 crisis requires us to review critically the management of closing and reopening schools policies into future public health plans. It is vital to address the psycho-social and educational difficulties endured by children as a result of lockdowns to draw lessons for future pandemics and the education professionals. This idea is reinforced by the WHO's Statement on the 28th December 2020 **[5]**, noting that other pandemics could emerge in the future, calling for worldwide preparedness for much worse pandemics than COVID-19.

2. SARS-COV-2 TRANSMISSION

2.1. Uncertainty of SARS-COV-2 transmission at the beginning of the pandemic

It is crucial to identify and fully understand SARS-CoV-2 transmission mechanisms to make appropriate decisions regarding the schools' opening or closing. COVID-19 transmission has been detailed in ASPHER Mask Statement **[6]**. Even though both diseases have similarities, there are major differences regarding transmission mechanisms. Since children are important drivers of influenza transmission, it was suggested at the beginning of the COVID-19 pandemic that children were also

one of the main vectors for spreading the virus in congregate settings **[2]**. The fact that children were less affected by the COVID-19 than adults was demonstrated early by epidemiological data from China **[7]**; ever since, other countries such as the US **[8]** and Italy **[9]** confirmed that finding. The attack rate for the age group from 0-19 years old is very low compared to adults **[1; 7]**. It is estimated that children account for <2% of the total COVID-19 cases.

The mechanisms that could support the hypothesis of children's decreased susceptibility to COVID-19 remain unclear **[10]**. Several hypothesis emerged from the literature including the possible decreased expression of ACE2 receptor 26 in the respiratory tract and the immune response to SARS-CoV-2 that could be age-related. Additionally, children have a lower likelihood of being tested compared with adults because of mild symptoms.

2.2. Changes due to the spread of the variant SARS-CoV-2 VOC 202012/01

Viruses constantly change through mutation, and new variants of a virus are expected to develop over time. A new variant may emerge and disappear while others may persist and could be more contagious and lethal. Globally, since the beginning of the pandemic, multiple variants of the virus that causes COVID-19 have been documented. One has been particularly of interest - the British variant: on 14th December 2020, United Kingdom authorities reported the identification of a variant referred to as SARS-CoV-2 VOC 202012/01 to the WHO*. How and where SARS-CoV-2 VOC 202012/01 originated remains unclear. This variant was first detected in the UK in November 2020 and scientists suspected it could spread more easily in the children population and alter children and schools' role in spreading the virus. However, despite uncertainty about transmissibility, researchers stated how it is essential to keep the schools open and as safe as possible by implementing mitigation measures **[11]**. Strong mitigation measures were also being highlighted as a key point when schools reopened in the UK at the beginning of March 2021, especially due to increase in transmission with more infectious and possibly more virulent variants **[12**]. However, the Royal College of Paediatrics and Child Health in response to media emphasizing that admissions of children and young people with COVID-19 increased, declared on 2nd January 2021 that the new variant appeared to affect all ages and not specifically this young population **[13]**. †Stop press please see footnote.

* https://www.who.int/csr/don/31-december-2020-sars-cov2-variants/en/

† Most recently, there has been concern that schools are a major source of transmission of the Delta variant of SARS-COV2, in England and a close watch on the data is being maintained as the country seeks to go to full reduction of social control measures. https://www.bmj.com/content/373/bmj.n1445

2.3. Transmission in school-setting

Several reports showed that transmission from children to adults or other children was uncommon in the variants that affected Europe in the year 2020, whereas most acquired infections were from close contacts with adults and/or within families. There was one example of an infected child that attended three schools while symptomatic in the French Alps who did not transmit the virus to any of the people he was in close contact with **[8]**. Another follow-up in Ireland was done when three children and three adults contracted the virus and were still in contact with students in the school settings. Among the 1,025 child and adult contacts with these six patients, no cases were confirmed during the pre-symptomatic, symptomatic and follow-up period (14 days) **[14]**. An additional case report was identified in the UK about a paediatric patient who was in contact with many students, with no virus transmission to any of the pupils being reported **[15]**. In addition, findings show that the transmission of COVID-19 between students or staff in school settings does not pose a high risk in areas with low community transmission, which means that putting efforts on interventions aimed at children might have a relatively small impact on reducing COVID-19 transmission.

According to a meta-analysis published in the journal JAMA Pediatrics **[16]**, children and adolescents have lower susceptibility to COVID-19, with an odds ratio of 0.56 for being an infected contact compared with adults. It also seems important to distinguish between children aged between 6-10 years old (whose infections seem to be less frequent), and older children. While children under ten years old have been found to transmit SARS-CoV-2 at lower rates than adults, older children have been found to transmit the virus similarly to adults **[17]**. A study carried out in South Korea **[17]** found that one of the highest transmission rates occurs between school-aged children over ten years old and their household contacts. While uncommon, child to teacher transmission has also been documented, with teacher deaths reported in both the US and Israel and school-related outbreaks occurring worldwide **[18; 19]**. Therefore, while nurseries and elementary school educational facilities may be safe to reopen because of low transmission rates, reopening educational facilities for older children will be dependent on a community's ability to keep COVID-19 prevalence under a safe threshold. As observed in Denmark **[20]**, successful and safe school re-openings are possible with low community transmission and extensive social distancing measures. However, as seen in Israel and the US, without proper community containment, educational facilities with children over ten years old are at high risk of widespread viral transmission **[21]**. A study about infections in schools in England **[22]** (November 2020) confirmed the higher positive COVID-19 infection level in secondary schools than primary schools. From this finding, the authors concluded that closing schools would have only a temporary and small effect on the number of active COVID-19 cases. In France, in late April 2020, the institute Pasteur carried out a survey on 1,340 people linked to primary schools and

they concluded that the infected children not spread the virus to other children or to teachers or other school staff **[23].** Piloted by the same French team, a case-control study, covering the period from October 1, 2020 to January 31, 2021, included 3,426 cases and 1,713 control subjects matched by age, sex, region, population density, and period (curfew or lockdown). The analysis revealed that higher occupancy in households, particularly with children at nursery or school were associated with higher risk of SARS-CoV-2 infection during the curfew or partial lockdown **[24].**

A recent study modelled various safe protocols for reopening schools during the COVID-19 pandemic in France **[25]**. Under a scenario with stable epidemic activity, if schools were closed, it was found that reopening only pre-schools and primary schools would lead to up to 76% [67%, 84%] occupation of intensive care unit beds, with the other middle and high schools reopening later. If all schools from the pre-school to the high school level reopened immediately, there was a risk to overwhelm the ICU system.

According to the literature **[26]**, the SARS-CoV-2 transmission in the school setting is relatively rare. In relation to the most recent variants, as the Indian variant B.1.617.2, there may also be a relative increase among children and adolescents due to being more contagious **[27]**. It was verified for the first time the existence of super-spreading outbreaks in Schools in the UK even before the arrival of variant B.1.617.2 **[28]**. Recently, 164 cases of the new variant have been reported to be linked to school. But there is still a need to produce research that can clarify this issue.

Additionally, there are some cautions about this observation **[29]** for the identification of cases in the school settings: it does not include asymptomatic cases (due to incomplete testing cases that lead to difficulties in identifying asymptomatic cases), and the uncertainties about the location of transmission could also underreport the number cases in the school setting. Nonetheless, there is more scientific evidence that schools comprise a minority of settings for COVID-19 transmission. Several studies confirmed that outbreaks of COVID-19 in schools comprise a relatively low share of all COVID-19 outbreaks during periods when schools were open.

With regard to these findings, the best strategy was considered to be diminishing COVID-19 transmission levels in the broader society while keeping the school as open and safe as possible. Therefore, reopening schools as safely as possible, in compliance with each country's COVID-19 health response, is in the best interest of children, given that practical protective measures are taken to ensure the safety of students, staff, and their families.

3. DURATION OF THE SCHOOL CLOSING

Most European countries implemented school closures in March 2020 (the starting date of the pandemic in Europe), often until the summer. However, since September 2020, the school issue has been debated differently from one country to another according to various school cultures and decision-making processes. For the past year, all the European countries have been faced with the same dilemma in finding a balance between the population's health safety and the education and psychosocial damage caused by school closures. According to UNESCO and UNICEF **[30]**, the average length of school closures in Europe did not exceed ten weeks, while, for instance, reaching thirty-eight weeks in the United States and twenty-two weeks worldwide. The place/role given to schools is related to the country's history and symbols. In France, during the first wave, the Ministry of National Education has claimed to have one of the shortest school closures in Europe, from March 16th to May 11th 2020, stating: "National education is based on the principle that no child should be left behind". Sweden and its Nordic neighbours could also claim to be champions of school opening, as kindergartens, primary and secondary schools were never closed, even at the peak of the first wave, and only high schools, with students over 16 years old, provided distance learning. In comparison, Germany closed its schools for 23.6 weeks, the UK for 25.9 weeks and Italy for 30 weeks, while in the U.S. students went without face-to-face instruction for 43.1 weeks, and Canadians stayed home for 36.7 weeks.

4. THE IMPACT ON CHILDREN OF SCHOOL CLOSURES

4.1. Inequalities consequences for children

ASPHER **[31]** has recently reported the group of children and their families, among others, as a group of population particularly vulnerable to suffer from inequalities related to COVID-19. Lockdowns have been an action for controlling COVID-19 implemented in many countries leading to a shutdown of the schools, after-school programs, and other child-focused programming. While effective at controlling the pandemic, such containment measures have been recognized to have caused difficulties for children. Children are generally less infected by COVID-19 and spared from the worst complications from COVID-19, but they experience a high adverse consequences of the pandemic- in the form of interruption to education, lack of socialisation opportunities, and the widening of pre-existent inequities **[32]**.

The closure of schools and social services has further highlighted how low income, minority (ethnic, religious, culture, political, etc.), and disabled children are disproportionately affected by the

pandemic and uniquely experience the worst consequences of lockdowns compared to more privileged children **[33]**. The most vulnerable children have been more likely to experience financial hardship, nutritional deficits, social isolation, discrimination and domestic violence under lockdowns **[16; 33]**. To counter this, several nutrition programmes have been implemented in Europe. For example, a law has been recently adopted by the Spanish government **[34]** stating that families with children receiving school meals are entitled to financial aid or direct food supply during school closures.

Digital and equipment access

Many communities and countries are leaning towards moving all schooling into internet-based learning. With fears of transmission and outbreak, promoting total distance learning may assuage fears and allow faculty and students to better focus on learning and teaching. Unfortunately, existing gaps in access to the internet and devices for access to educational content make online learning far less equitable than in-person instruction. Indeed, the COVID-19 pandemic has highlighted that even in the wealthiest EU countries, digital inequalities exist **[35]**: some schools were well equipped with the necessary infrastructure, material and staff knowledge to support students and pupils, while others were unprepared to tackle the challenge of offering digital education. In addition, not all students and pupils had appropriated access to digital equipment and internet connection at home.

The European commission **[36]** carried out a study by interviewing around 150 key stakeholders coming from five Member States (Belgium, Estonia, Greece, Italy and Poland) to learn from schooling practices during the COVID-19 lockdown. They revealed how inequalities were emphasized in multidimensional ways when remote schooling. They reported various barriers in adherence of students' remote education as the age, lack of learning autonomy, lack of adequate place to learn, simultaneous use of digital technology, among other these barriers being also accumulate to existing inequalities especially among students with special needs, with low socioeconomic status or with migrant background. The lack of digital equipment and education are reported to be causes of inequalities in remote schooling. To combat this, the Digital Education Action Plan (2021-2027) sets out the vision of the European commission for inclusive and accessible digital education in Europe.

Some European governments **[34]** put in place measures to ensure support for the most disadvantaged families. For instance, the Dutch government has allocated several million euros to purchase laptops for students who do not have equipment at home. In Portugal, lessons were broadcast through a national TV channel, specifically targeting students who lacked appropriate digital equipment and internet connection.

Learning inequalities

Overall, schools closures **[37]** negatively affect children and adolescents' learning and their ability to develop critical thinking as well as social skills. This is worse for the most deprived those with cognitive and physical disabilities, refugees and migrants, and girls.

Even in Kindergarten, the closures of schools have affected the learning of children. Children from different socioeconomic status had different reading achievement during summer breaks **[38]**; the reading abilities gained increased for children living in a high socioeconomic status families compared to those living in families with low socio-economic status. With regard to these, Bao et al **[39]** are interested in whether these differences persist or increase during the period of COVID-19 school closures. Based on the US Early Childhood Longitudinal Study, Kindergarten Class of 2010–2011, their model predicted that the reading ability gain in kindergarten children will decrease 66% during COVID-19 school closures compared to what they would normally have in the business-as-usual scenario. However, they found that children from high socioeconomic families had a slower rate of reading ability gain compared to children from low socioeconomic background families; this finding appears in contraction with other studies conducted during summer breaks and the authors call for further investigation.

The parent and families' supports are also a key element in the children' success of learning at home **[40]**. High income and highly educated parents are more likely to gives access to teleworking and provides more available time for home learning; they also have more capabilities of providing academic support to their children.

In the Netherlands **[41]**, researchers have conducted a study aiming to quantify learning loss from COVID-19 on a representative sample of children aged 8 to 11 years. They assess standardized tests in math, spelling, and reading and a composite score of all three subjects. They demonstrated clearly that children are learning less during lockdown than in a typical year whatever the subject areas; in addition, they revealed that the loss of learning was 40% larger in the two lowest categories of parental education compared to the others.

Inequalities among minorities

In European Countries **[42]**, migrant children are also disproportionately affected by the closure of services and the move to online education given their existing vulnerabilities. It is particularly true for migrant families living in reception and accommodation centres. This long-term impact of the

pandemic **[43]** on the children population is more likely to be higher among the poor population and in communities of color.

4.2. The School as a place for raising Human Beings

The School is recognized to be more than a place of learning. The modern understanding of the School[‡] role is that it is a place for developing children and adolescents as Human Beings in a holistic process of humanistic development. Understanding and learning school contents are as important as learning how to behave with the other, the importance of respectful relationships, managing emotions, and understanding other's emotions. School also promotes collective learning and discovering the world when children and adolescents interact with their colleagues, working as a group to find solutions for problems. All these processes only have full development in interaction processes. Most of them require physical interaction: looking for expressions and body language of the Other and from that understanding which emotions are implied; in collective work, to know how to be listened to and approved; to develop correct physical body expression, and many others processes are only possible with physical proximity. This reading was synthesized into the four pillars of education proposed by a declaration of UNESCO **[44]**, as follows: (1) learning to know, (2) learning to do, (3) learning to live together and (4) learning to be.

When Schools are closed, the full set of knowledge processes described above are totally or partially lost, despite the fact that teaching could be continued digitally. By definition, all physical contact is reduced to zero. Emotional contact is restricted to standardized facial recognition, mostly in small sizes at screens. The sound contacts are reduced to one at a time and collective listening, with all the multichannel communication being lost and private communication, both so important to the children and adolescents' development. Almost all collective development is lost. This is a great threat to a correct and balanced development of the individual and to the group. The child's recognition and understanding of complex social conditions requires the strong support of the school as an institution.

Nobody knows what the exact impact of school closures will be. Only many years from now will it be possible to determine how much and where be the development scars. At least it is possible to anticipate two main areas: the school learning processes and personal development, which can be viewed in two dimensions - self-development and social development.

[‡] Due to the article focus, the School concept is restricted to the phase from the cradle to adulthood. The so important Long-Life Learning is out of scope.

Even if only restricting the content's knowledge, the smallest amount of school closure time has a deep impact on the learning process **[41]**. Comparing the learning processes and skills acquisitions of 350,000 students between school years (COVID-19 vs non-COVID-19 years), the time of school closure is similar to the learning processes' delay time.

The mental health impact, the social development and all other collective skills acquisitions needed at least five to ten years for having the first scientific based knowledge. Children and adolescents have a great set of recovery processes and certainly mobilize them, for which most of the problems identified at the moment will be overcome. However, "most" does not mean "all", especially among those that already have problems and fragilities (health, social vulnerabilities), for whom school closure could have a long impact on their lives.

A Public Health perspective must consider the pandemic risks on the one hand, and on the other hand the impacts on child and adolescent mental health, social development, learning damages, and other impacts on upbringing and development. ASPHER believes school closure is a defensive tool for fighting the pandemic that must be only used for the minimum time possible, especially among the youngest children. Schools must reopen as soon as possible with appropriate preventive measures. This entity represents a major part of Society in children's eyes, and Society cannot stop.

4.3. Mental health difficulties in children

The COVID-19 pandemic has resulted in European governments implementing lockdown measures such as school closures and physical distancing. Children and adolescents are experiencing a prolonged state of physical isolation from their peers, teachers, extended family and friends **[45]**. While we know that nobody is immune to the pandemic's stress, children appear to be at higher risk, with about 70% more acute cases being identified in paedo-psychiatric urgencies. It is also well documented that good mental health early in life is a key determinant to good mental health in adulthood. Mental health problems represent one of the largest burdens of disease among the youngest.

Few studies have been conducted to investigate the children population's mental health difficulties over the COVID-19 lockdowns. While scientific evidence on the impact of the outbreak on children's mental health remains limited, most studies have revealed increased mental health difficulties related to COVID-19.

Co-SPACE **[46]** (COVID-19 Supporting Parents, Adolescents, and Children in Epidemics) survey led by the University of Oxford questioned more than 10,000 parents. Most of them reported that their children's behaviour had got worse over time: an increase of temper tantrums, arguments, children not doing what they are asked, an increase of restlessness/fidgety behaviour levels and difficulties concentrating. That will probably turn in long term consequences **[47]**.

These behaviour changes were only observed among children younger than ten years old. The UK's leading children's charity **[48]** asked 4,000 children and young people aged between 8-24 years old across Great Britain how they had been feeling during the lockdown. At least a third stated having experienced increased mental health and well-being issues, including stress, loneliness and worry. Boredom (51%), worry (28%) and feeling trapped (26%) were the most frequently emotions reported by children and young people in lockdown. A survey of college students from Changzhi medical college in China showed an increase in anxiety. More precisely, from a sample of about 7,000 college students, the authors revealed that 0.9% of the respondents were experiencing severe anxiety, 2.7% moderate anxiety, and 21.3% mild anxiety **[49]**. These impacts of the pandemic on children's mental health were already recognised from previous emergencies. For example, an increase of anxiety, depression, and post-traumatic stress disorder for children due to confinement was reported during the 2003 SARS outbreak in Japan and Canada **[50]**.

There is also a risk that the outbreak will have a greater effect on children's mental health who have pre-existing vulnerability factors. In the UK, a study found that 83% of respondents under 25 years old with existing mental health problems reported that the pandemic had worsened their mental health status. As described in the literature, children living in poor socioeconomic conditions are also particularly at higher risk, knowing that there is a strong relationship between socioeconomic deprivation and mental ill-health, including during childhood. As the current COVID-19 pandemic is likely to increase financial and social insecurity, this will probably contribute to poor child mental health. Recently, authors explained that deterioration in children mental health appears clearest among families which are already struggling **[51]**. In a UK survey, they estimated that children with suspected mental health issues were more than twice as likely to live in households with late payment of bills than those living in families able to pay them **[52]**. Other factors such as poor parental mental health and exposure to stressful situations were also recognised to increase mental health difficulties.

An additional indicator has been used to indirectly measure the children's anxiety levels: the number of calls to helplines **[53]** from young people with anxiety symptoms. Stress is also a key factor for the onset of alcohol misuse, with an increase in alcohol sales having been reported among the youth.

For the new EU Strategy on the Rights of the Child 2021–2024 **[54]**, the European Commission, associated with five child rights organisations (ChildFund Alliance, Eurochild, Save the Children, UNICEF and World Vision), have decided to survey children living in Europe and beyond to share their views and influence how the strategy would be shaped and what topics it would prioritise. More than 10,000 children and teenagers have participated in the survey, and the main findings have been summarised in the recent report published in February 2021. The consultation took place during the COVID-19 pandemic. While some children recognised the benefits of increased family time and creative opportunity, items most frequently reported concerned the increase of anxiety, mental stress, feeling of loneliness, fear of falling behind and money issues. Girls, older children and those from minority groups were disproportionately affected.

These facts, widely demonstrated in the literature, do not invalidate that there are occasional gains in aspects related to greater contact between children and their families **[55]**. Even so, the recommendations of UNICEF must be highly considered, in general on the mental health of children and adolescents at the time of school closing and reopening **[56]**, and the specifications in these processes for children and young people with special educational needs **[57]**.

5. CONSEQUENCES FOR TEACHERS AND NON-TEACHING SCHOOL STAFF

Teachers and non-teaching school staff are responding to a great disruption to education systems. They have faced significant stressors concerning their work. Due to the pandemic, the teachers and non-teaching school staff have to shift suddenly to remote learning to ensure continuity of teaching and learning. In many education systems, they had to teach online and manage with the online contact with students; they are not all prepared for that according to their age (youngest versus oldest), their level of education, the academic discipline taught (quantitative versus qualitative) and the workplace. In addition, similarly to every adult, teachers and education professionals are faced with the health consequences of the pandemic.

5.1. Determinants of the use of the information and communications technology

The Teaching and Learning International Survey (TALIS) **[58]**, established in 2008, has collected information in 2018 on reasons why some teachers may be more likely than others to undertake professional development activities, including information and communications technology (ICT)

skills for teaching. While the survey has been conducted before the pandemic, it constitutes a good starting point for assessing how education professionals were prepared for a school interruption and how easy they could change their teaching modalities. The study found various determinants favouring the TIC use as the initial training of the teachers themselves and the school environments that could play an important role in promoting innovative teaching practices. A recent study summarised **[59]** the main findings about the determinants of the readiness for online teaching and learning (OTL) in higher education. They identified in previous research in OTL that gender, academic disciplines, previous OTL experiences and perception of institutional support constitute potential sources of individual differences. They also revealed that cultural and innovation differences across countries are positively associated with new teaching methods at a contextual level. In addition, this study investigated the existence of profiles of higher education teachers 'readiness for online teaching and learning (OTL) at the time of the COVID-19 pandemic. Their results suggest that teachers in high education do not constitute a homogeneous group regarding their readiness for OTL. They identified three profiles of teachers: (1) low, (2) inconsistent and (3) high readiness for OTL. Unlike profiles 1 and 2, the teachers in profile 3 have reported prior online teaching experience and reported good support from their institutions in general and at the time of the COVID-19 pandemic. In Europe, teacher competence related to ICT challenges was already described in the European Digital Competence Framework for Educators. As stated in this framework: "Teaching strategies need to change and so do the competences teachers need to develop so as to empower 21st-century learners". In the federal state of North Rhine-Westphalia, in Germany **[60]** schools, teachers, and universities are expected to adopt this framework for ICT integration into the curriculum that pushes the transformation of learning; systematic implementation is in progress. A Survey of early career teachers conducted in Germany in May and June 2020 confirmed that information and communication technologies (ICT) tools, particularly digital teacher competence and teacher education opportunities to learn digital competence, are key factors in adapting to online teaching during COVID-19 school closures.

5.2. Risk of severe COVID-19

By multiplying the number of contacts, the teachers and other education staff are seen as a potential group at higher COVID-19 risk than other occupations **[61]**. A population-based nested case-control study has been conducted in Scotland **[62]** to compare the risk of hospitalisation with COVID-19 and severe COVID-19 among teachers and their household members with healthcare workers and the general working-age population. Adjusted on age, sex, general practice, deprivation, underlying conditions and number of adults in the household, the relative risk in teachers of hospitalisation with severe COVID-19 is lower than the general population. After the schools re-opening, the analysis by

the teaching sector revealed a lower risk of hospitalisation in the category of the primary teacher than in secondary and other teachers (even if the large confidence intervals did not allow to conclude to significant results). Conducted **[63]** in the US, a survey of child-care providers did not reveal a significant association between exposure to child care and risk of COVID-19 after adjustment on age, sex, race, access to personal protective equipment, household income and community rates of infection. In the UK, the Office for National Statistics examined deaths from COVID-19 from the 9th of March to the 28th of December 2020. They found that teaching and educational staff had lower age-standardised mortality than "all residents of England and Wales aged 20 to 64 years old".

5.3. School staff stress, burnout and mental health

Professional stress results from the interaction combinations of personal characteristics and the reading that makes the "stressful situation" a condition that is very easy to generate during a pandemic. Burnout (exhaustion) is the most aggressive form of stress with a professional origin and has varying degrees of severity. Among predominant determinant factors (among others) are the existence of a threat and the capacity for autonomy to contain that threat.

Working in a school is a source of significant stress and burnout, recognised for a long time in the literature **[64; 65]**. In a meta-analysis, those working in secondary education were the most affected **[66]**. Before the pandemic, there were levels of burnout among teachers, from 7.5% **[67]** to 30% **[68]**, expressed by three main characteristics **[69]**: exhaustion, depersonalisation and loss of accomplishment. Other school workers are still essentially to be studied.

In the COVID-19 pandemic, the threat is by definition global and expressed in millions of infection cases and deaths. Control capacity is reduced, essentially linked to non-pharmaceutical measures **[6;70;71]** and more recently to vaccination. A tool was developed to carry out the evaluation **[72]** induced by COVID-19.

The levels of stress and burnout increased through the generation of anxiogenic sources in the various dimensions of the teachers' work **[73]** and their inability to respond appropriately as they would like to the difficulties and new challenges they are exposed to **[74]**.

The lack of resources to deal with the situation is also a source of professional stress for teachers **[75]** and school leaders **[76]**, to the point of admitting risks of school disruption if there are successive pandemic waves **[75;76]**.

The dynamics that created stress and burnout, firstly generated by school closures and its replacement by digital teaching, promotes “digital monologues” **[77]** and implies the loss of visual contact (students' webcams disconnected), physical interaction, loss of the emotional relationship **[78]**, among other aspects. Another new phenomenon is the sensation of loss of private space, represented by the issuance of classes from the teacher's home **[79]**. Work is almost always done using personal digital media. For example, in a study carried out in Brazil, only 11.4% of teachers had received financial support to equip themselves to teach classes **[79]**, in addition to the lack of preparation in digital teaching techniques and digital skills mainly affecting older teachers.

Studies show that most teachers experience burnout at light levels but have not lost functional capacity and commitment to the School **[80]**, with the feeling that they receive support from their school leaders and school administration being fundamental **[80].** Variables such as gender (more intense stress in women than in men), age (higher stress in older individuals than in younger ones), professional stability (higher stress in those with instability), among others, impact as predictors of the degree of stress and burnout **[81]**.

The studies found on this subject in bibliographic research are always about either teachers or school leaders. No study was found in the last ten years, where stress and burnout are studied in any other profession of the school staff.

5.4. Non-teaching School Staff

School staff who are not teachers or school leaders are diverse and with few studies being available in the literature about them. This group encompasses cleaning employees, assistants in educational activities, canteen staff such as cooks, waitresses, guards, administrative staff and others to a lesser extent such as computer workers, maintenance of facilities, nurses, psychologists, special teaching therapists, among others. Each of these professions corresponds to a school degree determined by the laws of their countries and regions and a specific degree of professional preparation ranging from zero specific professional preparation for teaching (e.g., maintenance of facilities, cook, etc.) to high preparation (e.g., school administration).

There is almost a complete absence of studies that characterise and integrate school staff in their intervening role in Health in the school community and necessary adaptations to the COVID-19 context. However, due to school staff functions, individuals from this segment have potentially greater risk exposure due to physical proximity; for example, employees who physically deal with

students with Special Teaching Needs or employees who now clean more frequently and with more demanding chemicals, among others.

Most of the employees mentioned above have much lower salaries (sometimes also with lesser job stability, although this depends on countries) than teachers, which exposes them to more social vulnerabilities, such as the risk of unemployment in school closures, poverty, digital exclusion, vulnerabilities associated with migration, living in overcrowded multi-generation households just to name the most frequent and common realities in the various European countries.

The relationship of these professionals with COVID-19 is essentially unknown. However, there are some facts to keep in mind, even if they are only epiphenomena verified in studies applied to specific contexts. For example, in a study carried out in New York **[82]**, school staff had a higher incidence of COVID-19 than the community to which they belonged, but it was not demonstrated that transmission was produced in a school context. In another study conducted in the UK **[83]**, the presence of SARS-CoV-2 antigens among the staff ranged from 12.6% to 15.7% and among the students was between 0.94-0.99% in primary schools and 1.22-1.64% in secondary schools. In both studies, the staff encompassed both employees and teachers, so it was not possible to isolate only non-teaching staff. In another study carried out in the USA **[84]**, it was found that 42-51% of school employees fit the CDC classification of risk of contracting severe COVID-19.

We express our concern about the lack of scientific research on this vast social group and call for a strong investigation into the specific risks that arise from the particularities and diversity that coexist in it.

5.5. School nursing staff

School nurses have been at the forefront during the epidemic in many countries **[85]**. As community nurses with public health training they are involved in individual health and wellbeing assessments of children and young people and also, in few countries, at class-based teaching, health promotion and peer education and whole school health policy support. When available, these professionals in schools have used e-clinics and virtual health promotion for staff and students and have found that many young people have preferred this approach particularly for exploring more sensitive issues **[85]**. However, building trusting relationships may still need to be developed in face-to-face interactions. We defend the huge importance of nurses in schools as a general and permanent form of health promotion. ASPHER recommends the development of school nursing in the many European countries where they are not yet present.

6. MEASURES TO REDUCE COVID-19 TRANSMISSION AT SCHOOL

6.1. Reinforcement of Non-Pharmaceutical Measures

Since the beginning of the COVID-19 pandemic, most European countries have introduced measures to reduce the disease transmission, such as reducing pupils' class groups, physical and social distancing, ventilating the classroom according to the country's climate, moving sports activities outdoors, regular cleaning of surfaces, and improving hand hygiene. The use of masks is also highly recommended for children, even for those younger than ten years old, as initially recommended by ASPHER **[71]**. A literature review **[86]** highlighted that safety measures for reopening schools should be based on a low level of COVID-19 infection and strictly defined thresholds above which an immediate reaction could be done to any additional COVID cases and to avoid clusters. This review revealed that respecting physical distancing by reducing the class sizes, avoiding the mixing among children, and gradual, phased school reopening appeared as effective strategies to limit the spread of the pandemic combined with large-scale testing, contact tracing and isolation measures.

6.2. Population screening in school setting

Testing for COVID-19 was described by OECD [§] as one crucial measure stated in May 2020 as "a way to lift confinement restrictions". Different approaches of COVID-19 testing have already been rolled out since the beginning of the pandemic, such as: symptomatic only testing, testing people who had had contact with a confirmed case regardless of symptoms, household testing, mass testing or testing of travelers. Indeed, testing must always be considered as part of the range of public health, non-pharmaceutical measures available to respond to the current pandemic, as emphasized in the ASPHER statement on the COVID-19 testing **[87]**.

Recently, in the face of uncertainties of COVID-19 transmission among/by children, a question has emerged about the possibility of mass testing in this population group. It is being advocated as a means to slow down the spread of the epidemic, but there remain concerns about its effectiveness and its cost-effectiveness. It also presents a complicated logistical challenge. It is necessary to organise the campaign for a very broad number of children to ensure enough health care staff to conduct the test while considering the very young age of many children who will be tested regularly. In addition, the prevalence of the infection and the test used have to take into account to decision

[§] https://www.oecd.org/coronavirus/policy-responses/testing-for-covid-19-a-way-to-lift-confinement-restrictions-89756248/

making and planning of testing strategies as the proportion of false results, and therefore the effectiveness of testing, depends on these.

The US Department of Health and Human Services conducted a survey in Los Angeles County from November 25th to December 9th 2020 to examined the performance of antigen tests among asymptomatic school age children **[88]**. They examine on a sample of more than 700 children < 18 years the positive and negative concordance between the BinaxNOW™ rapid SARS-CoV-2 antigen assay and an RT-PCR test among children at a community-based Covid-19 testing site. Among the 226 children tested positive on RT-PCR, 56.2% (95% CI: 49.5% to 62.8%) of these also tested positive on the rapid antigen test, with positive concordance increasing among symptomatic children (64.4%; 95% CI: 53.4% to 74.4%) compared to asymptomatic children (51.1%; 95% CI: 42.5% to 59.7%). However, this comparison might be flawed as RT-PCR tests may test positive for several weeks, detecting residual virus, however it is known that most of the individuals are no longer infectious 10 days after the onset of symptoms. They also found that 98.4% (95% CI: 96.9% to 99.2%) of children tested negative on RT-PCR was also negative on the rapid antigen test, the highest concordance being observed among asymptomatic children. In the light of this, the American Association of Pediatrics concluded that one role of pediatricians is to educate families about the meaning of a negative test result **[89]**. They have to explain that a negative antigen test result represents a decrease of the risk of infection spreading but it does not mean that it is fully safe to return to activities and that it eliminates the respect of the non-pharmaceuticals measures as the use of the mask and the physical distancing. Inversely, in a recent paper published in the BMJ, a researcher questioned the proportion of false positive Lateral flow tests results **[90]**. When the level of prevalence is low (about 0.5%) around half of positive tests could be false ones, and led to half of the children, teachers, families, and their social bubbles being unnecessarily isolated. This will depend on the prevalence of the infection and test accuracy. However, no test will work well in low prevalence settings. As the prevalence decreases also the positive predictive value decreases, i.e. the number of true positives among the positives, and the societal costs of unnecessary isolation of the children and their family must be taken in account and strategies, such as parallel testing might be worthwhile.

In this regard, the analysis by Moghadas et al, is particularly relevant as they estimated that health benefit would be observed in the community even with moderate families' adherence to the testing programmes that could be implemented in schools. More precisely, based on age-structured model, Moghadas and al, investigated the additional value of frequent testing of schoolchildren in reducing community transmission rates **[91]**. One key message based on their simulation modelling is that identifying 10% to 20% of silent infections among children within 3 days after infection would bring

attack rates below 5% if only adults were vaccinated. They also point out that without any improvement in detection of silent infection among children, a very high vaccination coverage would be expected of this age group in addition to vaccination of adults, in order to reach comparable decrease of attack rate.

Despite this uncertain context, many countries have already engaged in mass-testing programmes, using Antigen or PCR tests, in school for several months, as presented in the following examples. For example, in Austria **[92],** a national-level school population testing programme has been introduced, and only children who participate are allowed to attend face-to-face teaching. This program complements the NPIs measures already in place, including testing for all school children aged 6-18 years old, teachers, and any maintenance personnel present in school every two days. The results of the self-administered anterior-nasal (AN) Ag tests are available in 15 minutes, having defined protocol measures to be activated in positive COVID-19 cases. The last available national data from the week between the 26th February to 4th March 2021 reported a positive test result rate of 0.08% (from more than 990,000 students and about 1.3 million tests). During the same week, 0.29% of teaching and maintenance personnel received a positive test. The United Kingdom **[93]** rolled out a screening plan to reopen schools on 8th March 2021, aiming to identify pupils with COVID-19 positive results as early as possible, especially those asymptomatic. Each family with children will receive two tests per person, per week, to be taken at home. The UK government did not include primary school pupils in this programme as they contribute to "a low level of transmission" declared by the UK government. Since the 22nd February 2021, in Belgium **[94]**, schools experimented with a testing plan over six weeks targeting approximately 2,500 teachers and school staff. It appeared that 24 COVID-19 positive cases (0.3%) had been identified out of 6,636 samples and two clusters: one in Wallonia and another in Brussels. The experiment will not be extended to all Belgian schools. This would create logistical issues as it would require the delivery of materials to all schools, the deployment of health professionals and the involvement of already overburdened school directors. In Spain, school screening measures vary according to region and school. Catalonia is a region particularly affected by the COVID-19 pandemic that did not wait to roll out screening plans in schools. Since September 2020, the region has assigned 400 staff personnel to monitor the number of COVID-19 cases in schools and 100 nurses to test pupils and staff. In France, the Haute Autorité de Santé authorised[**] on the 11th February started the rollout of the COVID-19 testing, based on RT-PCR saliva test, on a large scale in schools, piloting the experiment in several schools.

[**] https://www.has-sante.fr/jcms/p_3237053/fr/tests-rt-pcr-salivaires-la-has-etend-leur-utilisation-et-definit-les-modalites-pratiques-de-realisation

The number of tests needed to perform to identify a true positive will vary according to the prevalence of the infection at local and school level. While tests are crucial to curb the epidemic, they must be used wisely. “One test does not fit all” and testing strategies should be flexible and vary according to the evolution of the pandemic.

In this context, ASPHER does not recommend the systematic implementation of mass testing programmes in school settings, among children and adolescents. Although testing is a valuable tool to curb the epidemic, several parameters must be considered to rollout a mass testing programme in order not to strain children to perform tests that are not even highly necessary: namely, the local situation, including the overall prevalence and incidence and/or the school situation as the presence of an outbreak or a cluster of cases within a class, for example.

ASPHER recommends to put the main effort on backward and forward contact tracing, while keeping measures such as hand hygiene, use of mask, and social distance, in place when possible. Mass testing programmes in schools should be reserved for highly demanding periods within higher incidence contexts or during an outbreak in a school (whether to test a class or a school should be discussed).

6.3. Vaccination for children

For the past months, the worldwide vaccination of the adults’ population has rolled out. Given that older populations experience the highest-burden of severe disease, hospitalisation, and death related to COVID-19, they also benefit the most from vaccination. Conversely, the low rates of severe disease related to COVID-19 among young populations suggest that they should not be prioritised for vaccination. With an increasing number of at-risk adults becoming vaccinated, health leaders and researchers have now turned their attention to children. Unfortunately, children are not included in many vaccine trials, a mandatory component before mass vaccination can roll out in any sub-population.

In Israel **[95]**, the Health Ministry recently recommended the vaccination of children over 12 years old who suffer from specific conditions that sets them among the most vulnerable to COVID-19. Early findings among a sample of 600 children aged between 12–16 years old are encouraging, as they reveal no serious side effects. On 11th May 2021, vaccination for children and adolescent aged 12-16 years old has been authorized in US and Canada.

Several trials are underway to examine the safety and efficacy of COVID-19 vaccines in children **[96]**:

- On 31st March, Pfizer-BioNTech announced 100% efficacy and robust antibody responses in a phase 3 trial of adolescents between the ages of 12 and 15 years old.
- Moderna is currently conducting a trial in Canada on a sample of children aged 5 -11 years.
- Johnson & Johnson engaged the phase 2 trial including children between 12 and 17 years.
- AstraZeneca paused their trial including children aged 6-17 years old pending a safety review of blood clot cases occurred in adults
- The results of Sinovac trial, phase I and II on children aged 3-17 years are expected soon
- Novavax lauched a pediatric expansion in adolescents to its phase III.

According to the WHO webinar **[96]**, pending the results of these trials, the only recommendation is to reinforce and promote non-pharmaceutical measures to limit the spread of the infection in school setting. ASPHER agrees with this position pending additional findings supporting possible recommendations in favor of vaccination for children.

7. IMPLEMENTATION OF FOOD PROGRAMS

Children are known to be a vulnerable population to many environmental stressors and living conditions, including nutrition's services. Schools play an important role in the feeding of children **[97]**. Indeed, not only do schools offer education, but they also provide social protection, nutrition, health and emotional support for children **[98]**. This corresponds to the four pillars of education proposed by a declaration of UNESCO **[99]** learning to know, learning to do, learning to live together and learning to be. The restriction COVID-19 related that led to the school's closure and the canteen impact obviously the feeding of children, more specifically those living in the most deprived family **[100]**.

Worldwide, UNICEF **[100]** estimated that in 2019, there were 144 million stunted growth children under five years. In addition, UNICEF has estimated that about 39 billion in-school meals were missed during school closures last year. Food insecurity among children is known for a long time to have dramatic consequences for children health. In 2020, the European Commission **[101]** estimated that the development and growth of 75 million children in 2019 were impaired due to food insecurity. School and nutrition are highly related as a virtual circle. When food is provided to children, the opportunity should be used to improve the quality of their daily nutrition and train them about nutritional quality, as when children eat food with adequate nutritional quality they will be healthier and also improve learning. Inversely, when children receive a quality education, they are less likely to be sick. This inter-relationship between learning, nutrition and health calls for a more integrated approach and coordinated policies, programmes and actions to optimise benefits towards children.

In this context of the pandemic, the World Food Programme (WFP) and UNICEF **[102]** joined a response to the COVID-19 crisis. Instead of school meals, governments and WFP are now recommended to provide take-home rations, vouchers or cash transfers to children; this has been implemented in 68 countries worldwide. Here below, several examples of initiatives. For instance, in France, Paris announced in April 2020 that "exceptional aid" will be granted to families with the lowest canteen fees. In Meurthe et Moselle (France), a local authority has chosen to help low-income families by providing meals at home to schoolchildren who usually benefit from the lowest canteen rate as well as their brothers and sisters. In UK **[103]**, a National initiative has been implemented; it concerns all the children who usually are eligible for free school meals. They received a weekly voucher allowing them to continue to access meals whilst staying at home; they may spend them at any supermarkets while schools are closed due to coronavirus. In Ireland **[104]**, about 250,000 children and teens are concerned by free meals at school. For many of them, the meal at school is seen as a vital source of nutrition per day. Therefore, from the beginning of April 2020, the Government announced that schools might replace the meals children receive in school with weekly food packages. In Lisbon, assembly lines for food kits were created in school canteens for take-away for students belonging to families with economic difficulties. These lines worked even during the school closing periods. The increase in unemployment and the cessation of economic activities forced the coverage of about 4000 more students than usual **[105]**.

However, even if one has to recognise the benefit of this program in the short term, UNICEF **[102]** explained that priority should be given to reopening schools safely; these are not long-term solutions. They also argued that evidence exists of the positive impact of school feeding programmes on increasing enrolment and attendance, especially among the most vulnerable children, most specifically the girl and the disadvantaged children.

In sum, the pandemic has highlighted the central point of school meals in the daily children life worldwide and Europe. The reason is not only to prevent child hunger but equally important to ensure that families have access to healthy food. Emergency measures implemented during the pandemic that strengthen and improve school meals programs must continue and should be extended even after the crisis to ensure that all children have enough nutritious food.

8. PROMOTE NEW AND BETTER PUBLIC POLICIES

The current pandemic constitutes an unprecedented opportunity to rethink Public Health Policies (PHP), redesign prevention programs, and better promote health and well-being for all. It has also

highlighted how critical it is to prioritise children's and adolescent health and well-being and build stronger foundations to prepare the next generation.

The pandemic revealed how unequal we are previously and the consequences to deal with the current crisis. It is a call for a long-term PHP reform to ensure that health and well-being programs and PHP prioritise health for all and social equity to reduce disparities; the main goal is to create healthier childcare setting, schools and communities to guarantee that all children can thrive in the future.

It is also important that young people and their parents/carers are involved in decision making about how schools should operate during a pandemic. Many prefer the hybrid mode **[106]** of teaching and learning. Ultimately strong partnerships are needed between whole school communities that include parents, young people, educators and health care professionals and school nurses are key to promoting public health and providing these linkages for schools **[107].**

Health in All Policies (HiAP), a matrix approach that crosses Public Health Policies with all the other Public Policies, namely those related to children and adolescents, defined by WHO in its 8Th Global Conference of Health Promotion in 2013[††], could constitute the overall framework to consider children's and adolescents health and well-being issue into decision-making across sectors and policy areas including school and educational policies. Recently was proposed a broader view of HiAP, but narrowing the spectrum of a Place-based approach, Health in All Places (HiAPl) **[108]**, already accepted in ASPHER COVID Task Force documents **[109]**.

Therefore, children's HiaP/HiaPl should:

(1) Document why the children's health issue is important by describing the risk factors and the causes;
(2) Quantify the magnitude of the children's health vulnerability;
(3) Identify policy efforts/opportunities that could be implemented to improve children's health and well-being;
(4) Identify promising evidence-informed policy solutions to improve the home, school and community environments
(5) Assess the potential impacts/benefits of the PHP solutions.

[††] https://www.who.int/healthpromotion/conferences/8gchp/statement_2013/en/

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