



Effects of School Closures During the COVID-19 Pandemic on Achievement Gaps and Learning Inequalities

Literature Review



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Policy Bench

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Executive Summary

Issue: How have school closures throughout the COVID-19 pandemic affected academic achievement and learning inequalities among children and youth?

Background: The unprecedented nature of the COVID-19 pandemic and resulting school closures caused significant disruption to children's education and learning. The full extent of the consequences of school closures along with the loss of other school-based resources and supports is not yet known. However, insights from research prior to the pandemic suggest that long absences from schools and interruptions in instruction time have adverse effects on academic achievement with greater consequences for students from disadvantaged backgrounds, resulting in a widening of SES-based achievement gaps.

Methods: A review of the literature was carried out to identify and synthesize evidence on academic achievement gaps and learning loss in relation to school closures, including emerging studies on the short- and long-term effects of current school closures on achievement gaps in the context of the COVID-19 pandemic.

Findings: Most of the evidence on the impact of pandemic-related school closures comes from the US and Europe, with limited evidence from Canada. Modelling studies conducted early in the pandemic predicted substantial learning losses that will increase achievement gaps in the short term, with potential long-term consequences on educational attainment and employment outcomes. Emerging evidence from studies that have measured the initial impact of school closures on academic performance indicate that as predicted, the pandemic has contributed to learning losses that are greater than what would have occurred during a regular school year and have exacerbated educational inequalities. The available evidence consistently shows that learning losses are greater among socially disadvantaged students, who have lower access to learning resources and opportunities during school closures.

Conclusion: Available evidence shows that school closures due to the COVID-19 pandemic could have lasting effects on educational outcomes and widen achievement gaps, unless innovative solutions and remedial strategies are implemented to help students recover from the loss of instructional time. However, more research is needed to determine the extent of learning losses and identify which students are more at risk, including a need for enhanced efforts to measure and evaluate student achievement levels following school closures.

Effects of School Closures During the COVID-19 Pandemic on Achievement Gaps and Learning Inequalities: Literature Review

1.0 Overview

The shift to online/remote schooling due to the COVID-19 pandemic school closures was unprecedented and more than one year into the pandemic, many children continue to attend school virtually rather than in-person – either due to ongoing local school closure policies or parents' concerns about safety. This major disruption to children's education and learning along with the loss of many other school-based resources and supports throughout the pandemic has had significant consequences for children and their families. The extent of these consequences is not yet fully known.

Research about the impact of other previous school closures (e.g. due to teaching strikes, weather or natural disasters, and annual summer breaks) have raised concerns among parents, educators and researchers about the possible extent of learning losses from pandemic-related school shutdowns. This question is particularly crucial given the well documented pre-existing achievement gaps between those children from economically advantaged vs. disadvantaged families. These existing achievement gaps contribute to disparities in educational attainment and subsequent labour market earnings (Bailey et al., 2021).

This review examines the issue of how school closures during the COVID-19 pandemic have affected or will likely affect children's academic achievement and learning inequalities, as well as implications for addressing the potential consequences for children's educational outcomes moving forward.

2.0 Background

2.1 School closures during the COVID-19 pandemic: Global and Canadian context

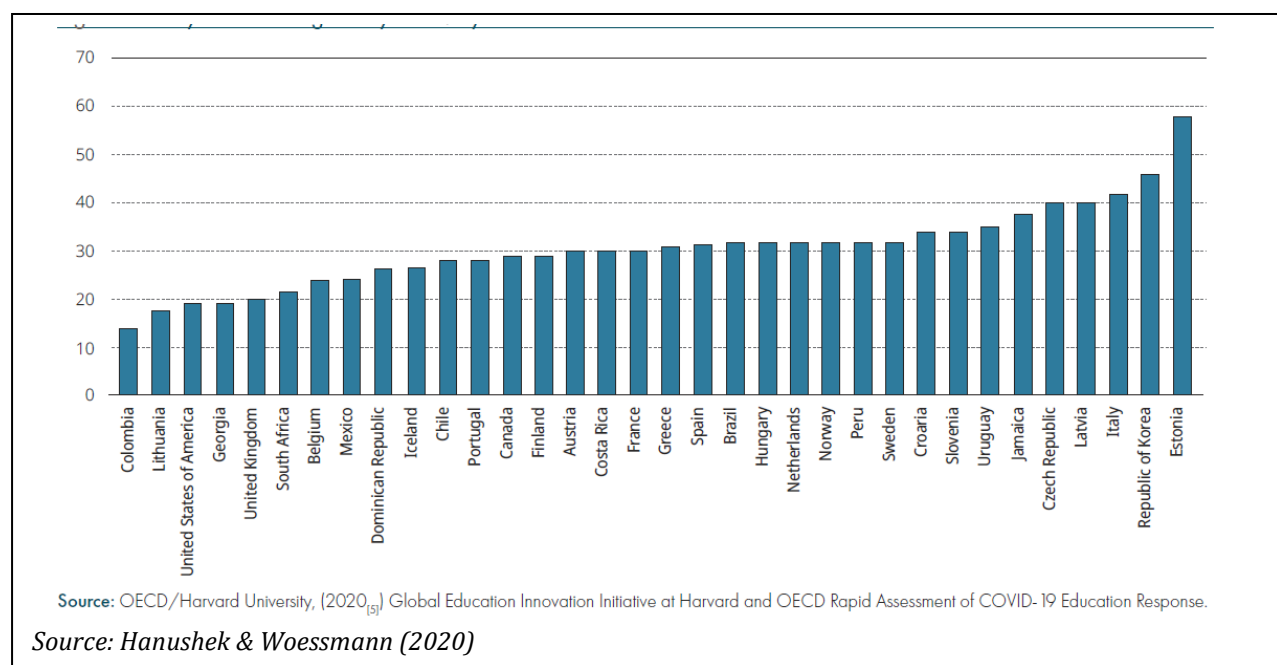
The COVID-19 crisis forced governments and education systems to act quickly to adjust to rapidly evolving public health guidance by establishing new systems to meet the needs of students and families – often with few resources and a lack of available evidence on the potential impact of these choices on children's academic outcomes (Kuhfield et al., 2020a). In order to help curb the spread of the COVID-19 virus, governments around the world moved to close schools for in-person learning. This unprecedented school closure was the largest in history, affecting over 5.7 million children and youth in Canada and 1.5 billion worldwide, or about 95% of the world's student population (United Nations, 2020; Engzell, Frey & Verhagen, 2021; Statistics Canada, 2021). In Canada, publicly funded schools¹ were closed beginning in March 2020, and most remained closed for the rest of the 2019-20 school year, re-opening in most areas in September 2020. However, even one year into the

¹ This report does not consider policy responses for privately funded schools, which account for a minority of the student population (e.g. 6% in Ontario; Gallagher-Mackay et al., 2021)

pandemic, many students in Canada and other countries were still affected by either partial or full school closures as subsequent waves of the pandemic were experienced, and governments decided to close schools for in-person learning again. In Ontario, schools were closed for a total of 26 weeks between March 14, 2020 and June 29, 2021 – longer than any other Canadian province/territory (Gallagher-Mackay et al., 2021).²

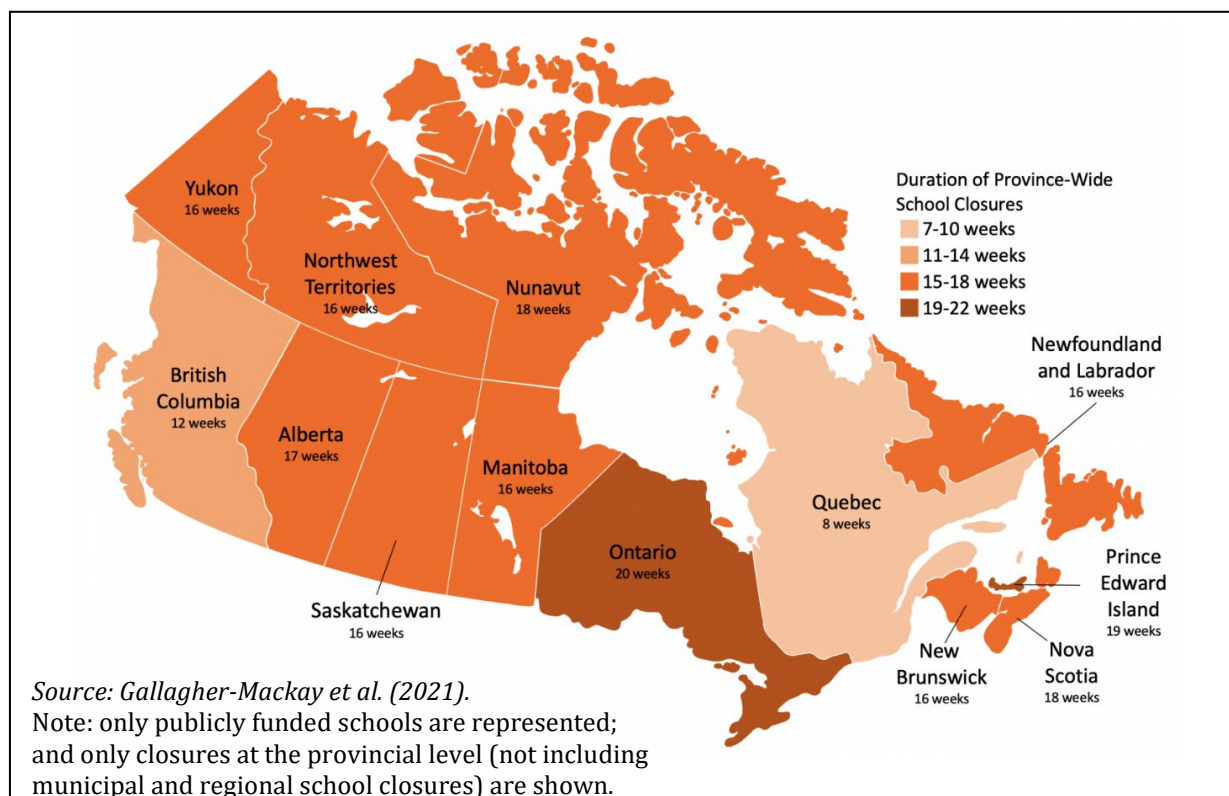
Figure 1 shows early estimates of the number of instructional days lost to school closures across countries as of mid-May 2020 (Hanushek & Woessman, 2020). By the end of 2020, these totals grew to over 100 days in some countries, although the extent of school closures varied greatly across and within countries (e.g. between levels of education and at sub-national levels) (OECD, 2021). Figure 2 shows the total number of weeks of school closures across Canada approximately one year later (as of mid-May 2021).

Figure 1: Number of days were schools were closed for in-person instruction as of May 2020, by country



² For a detailed overview and timeline of school closures and policies since March 2020 in Ontario, see Gallagher-Mackay et al. (2021)

Figure 2: Provincial and Territorial-Level Elementary School Closures in Canada, from March 14, 2020, to May 15, 2021



Equity Spotlight: The “Digital Divide”

In response to the cancellation of in-person instruction, many schools offered some form of remote or distance learning to students; however, the models of educational delivery varied greatly across jurisdictions and provinces (i.e. fully remote, fully in-person, and blended models combining both), resulting in differential schooling experiences across student groups (Gallagher-Mackay et al., 2021). At the global level, less than one-third of low-income countries had introduced a national distance learning program by April 2020, meaning that many children had no learning opportunities for at least some part of the year (United Nations, 2020). In Canada, school boards were tasked with ensuring students had access to devices with internet connectivity by providing these resources to any student in need; however, gaps remained and not all families have the necessary digital literacy skills to engage in virtual learning methods (Gallagher-Mackay et al., 2021).

- For example, prior to the pandemic, 1.2% of households with children in Canada (and up to 12% of all people in Ontario) did not have adequate internet access at home, and 58% of Canadian households had less than one internet-enabled device per person (Statistics Canada, 2021; Gallagher-Mackay et al., 2021).
- These figures are even higher for lower-income households, highlighting the importance of the ‘digital divide’ – which refers to socioeconomic gaps in access to technological resources, educational supports and opportunities between households and families.

2.2 What is the achievement gap?

Educational policymakers have become increasingly interested in quantifying and monitoring inequalities in educational outcomes among different population subgroups and determining associated factors with inequalities (Willms, 2018). Closely related to the learning gap and opportunity gap, the term achievement gap refers to any significant and persistent disparity in academic performance or educational attainment between different groups of students (Great Schools Partnership, 2019) or the unequal or inequitable distribution of educational results and benefits.

Associated terms:

- *Socioeconomic achievement gap*: the disparity in academic achievement between students from high- and low-socioeconomic status (SES) backgrounds (Chmielewski, 2019).
- *Opportunity gap*: refers to the unequal or inequitable distribution of resources and opportunities—inputs. In the context of educational resources, this is also referred to as *educational inequality* (Edley et al., 2019). An example of opportunity gaps is differential access to technology and internet, known as the “digital divide” (see pg. 3). Disparities can also exist in access to rigorous curriculum and academic breadth, access to high quality supports, and access to non-segregated learning environments.
- *Learning gap*: refers to relative performance of individual students—i.e., the disparity between what students have actually learned and what they were expected to learn at a particular age or grade level.
- *Learning loss*: refers to a specific or general loss of knowledge or skills, or a reversal in students’ academic progress due to extended gaps or breaks in instruction. Typically learning loss has been measured by performance on standardized tests; however, this method is controversial within the education field as standardized tests tend to focus on certain subject areas and may not capture other aspects of learning (Zhao, 2021).
- *Academic achievement*: the extent to which a student or institution has achieved either short or long-term educational goals. Academic achievement can be categorized as academic performance (class grades, standardized tests, and graduation rates); education behaviour (attendance, dropout rates, and behavioural problems at schools); and students’ cognitive skills and attitudes (concentration, memory, and mood) (National Center for Chronic Disease Prevention and Health Promotion, 2014).

2.2.1 Importance of schools for student achievement

Past studies have consistently identified a positive relationship between learning time and student achievement, along with other positive educational outcomes (Bonai & Gonzalez, 2020). For example, international data from the Programme for International Student Assessment (PISA) provides strong evidence that additional instruction time in school significantly increases student achievement. Lavy (2015) reported that on average, a one-hour increase per week in instructional time for mathematics, science or language raises

test scores by 0.06 of a standard deviation. However, the benefits of additional instruction time depend on its quality and quantity. For example, greater benefits were found for higher quality classroom environments (i.e. better student behaviour and student-teacher interactions); schools with well-defined accountability measures; and schools with more autonomy in decisions about budgets and teacher hiring (Rivkin & Schiman, 2015; Lavy, 2015).

3.0 School closures prior to COVID-19

Prior to the COVID-19 pandemic, there have been studies conducted on the impact of the loss of learning time due to planned and unplanned school closures (typically measured as either the incidence of a school closure vs. no closure; or as the number of days of lost instruction) on academic achievement (typically measured by grade point average or test scores). A review of this research was undertaken to better understand the possible effects of pandemic-related school closures and to inform how the negative effects of school closures can be ameliorated.

Overall, while not directly comparable to the extent of the school disruptions caused by the COVID-19 pandemic, evidence indicates that school interruptions and reductions in instruction time even at this smaller scale can have short and long-term consequences on students' academic achievement, particularly for students who are socioeconomically disadvantaged (Bonal & Gonzalez, 2020). Findings on the impact of various types of school closures are summarized below, with any available Canadian evidence highlighted.

3.1 Teacher strikes

Strikes by teachers can result in an unanticipated loss of instruction time during the school year. In Ontario, there were over 100 strikes between 1975-2005 (Baker, 2013). Studies on the impact of teacher strikes have shown mixed results, with some studies showing no impact on student achievement while others have found a negative impact on student achievement. For example, in the US, Zwerling (2008) found no relationship between teacher strikes (as measured by either strike incidence or duration³) and student achievement in math and reading (as measured by assessment test scores) in Pennsylvania school districts between 1992-2007. However, more recent studies have demonstrated a negative impact – particularly on math scores.

Evidence from Belgium supports that teacher strikes have long-term consequences on educational attainment. Belot & Webbink (2010) examined educational outcomes among students ten years after teacher strikes that severely disrupted schooling in the French community of Belgium in 1990⁴, compared to students in the Flemish community – which

³ Three variables measuring strikes were included in the models, and none were associated with negative academic outcomes. The measures were: a) 2-year strike incidence – whether at least one strike occurred in the school district in the test year or preceding year; b) multiyear strike incidence – whether a strike occurred in any of the five years the tested grade cohort was in grades 1 to 5; c) 2-year strike duration – total length of strikes in the test year and preceding year

⁴ The strikes were intermittent for May, June, and September (after summer vacation in July and August), ending with a 6-week period of uninterrupted strikes in October-November 1990; therefore, the strike period seriously disrupted 5 months of schooling in total, and affected both primary and secondary students.

had a very similar educational system and size and was separated only by political division of the country, but where strikes did not occur. Results showed that the cohort affected by strikes had lower educational attainment (years of schooling); increased class repetition (having to repeat a year of schooling); and were more likely to graduate from higher vocational education rather than university studies. However, the estimates in this study are somewhat imprecise, as they were based on aggregate data from subsequent surveys and could not rule out the effects of the strikes from other effects over this period.

Evidence from Canada:

- In Ontario, Johnson (2009) found significant negative impacts of teacher strikes between 1998-99 and 2002-03 on student achievement in grade 6 (measured by pass rates on the standardized provincial Education Quality Accountability Office (EQAQO) assessments administered in grade 6). Effects were stronger for students in grade 6 than grade 3; and for math scores compared to reading and writing. Further analyses also suggested that the impact of strikes was greater for more disadvantaged schools (based on social and economic characteristics of residents in the surrounding area) (Johnson, 2011).
- Using an improved longitudinal study design that controlled for unobserved factors (i.e. fixed student characteristics at the school/cohort level) to examine strikes in Ontario over the same time period, Baker (2013) found a larger impact of strikes that occurred in grades 5 or 6 on test score growth between grades 3 and 6 among student cohorts.⁵ Results showed a significant negative effect on student performance in reading and math (measured as the cohort's average EQAQO scores) in school cohorts that experienced long strikes⁶ (lasting at least 10 instructional days), compared to school cohorts that did not have a strike. The largest impact was observed for math scores in grade 6, which decreased by 29% of the standard deviation of scores across cohorts (Baker, 2013).

3.2 Other pandemics/epidemics

Prior to COVID-19, schools around the world have experienced closures due to other disease outbreaks. Most recently, schools in various African countries were closed for 6-9 months during the Ebola pandemic of 2013-16, affecting 5 million children – representing the closest school shutdown experience to the current COVID-19 shutdown in terms of intensity and length (Meyers & Thomasson, 2017; Smith, 2021). Evidence from two countries that were most heavily impacted by the pandemic (Guinea and Sierra Leone) suggests that these school closures were associated with an increase in school dropout rates following the pandemic – especially among youth in the poorest households and rural areas. For example, results showed an 8.6% increase in probability of dropping out among

⁵ Test score growth was measured at the cohort/school/year level (i.e., the grade 3 through 6 change in the average test score of cohort *c* at school *s*), controlling for cohort attributes (e.g. % of the cohort who are female; % gifted or receiving special support) and school characteristics (e.g. socioeconomic characteristics of residents in the same postal code area as the school). Scores for students in French school boards were excluded from the analyses.

⁶ The number of instructional days lost in the sample ranged from 3 to 17, with 6 strikes lasting 2 weeks or more. The negative associations between strikes and reading and math scores were only significant for strikes that lasted at least 10 days, and were not significant when all strikes were included in the analyses.

secondary-age youth from the poorest households in Guinea from pre- to post-pandemic, and an 5.6% increase in Sierra Leone; whereas there was a decrease in probability of dropping out over the same period in the neighbouring country of Côte D'Ivoire, which was not impacted by the outbreak (Smith, 2021).

While there is little evidence on the impact of other pandemics on academic achievement, and no evidence from Canada, one retrospective analysis of the impact of the 1916 polio epidemic on educational attainment of US adults suggests that school closures in response to disease outbreaks can have long term consequences. Results showed that children living in areas with higher rates of polio infection during the pandemic⁷ had lower educational attainment as adults in 1940⁸ compared to similarly aged children in states with lower infection rates (Meyers & Thomasson, 2017). Specifically, a one-standard-deviation increase in polio intensity reduced the number of years of completed schooling by 0.07 years for children aged 14-17 and by 0.1 years for children 10 years and under (Meyers & Thomasson, 2021). However, there was no effect on educational attainment for other age groups (i.e. aged 10-14; or above 17). The authors hypothesized that while all children were impacted by school closures during the outbreak, the impacts may have been greater for younger children who were more susceptible to the virus and thus may have missed more days of school due to illness, and for children of legal working age (14-17 years) who would have been the most likely to leave school to join the work force at that time. While the effects of similar disease outbreaks in the present time may not be as great, the findings suggest that if pandemic-related school closures lead more students to leave school, they may experience lower overall educational attainment as a result (Meyers & Thomasson, 2021).

3.3 Weather-related closures, natural and other disasters

Evidence on natural disasters and weather-related closures (e.g. snow days) is also limited and geographically specific, with no relevant studies found from Canada. However, there is some evidence from other countries that natural disasters and events have negative effects on academic achievement outcomes. Moreover, some studies that have examined the long-term consequences of these disasters suggest that their impact on achievement may be long-lasting and even worsen over time (e.g., Andrabi, Daniels, & Das, 2020; Ichino & Winter-Ebmer, 2004).

⁷ State-level infection rates were used as the measure of pandemic exposure, as data on school closures was not available. Results were estimated for individuals who were school-aged, according to their state of birth (assuming they went to school in the same state) and age cohort. Results controlled for fixed effects of both state of birth and state of residence in 1940. Other historical events (e.g. WWII) were controlled for using birth year fixed effects.

⁸ Educational attainment was measured as the number of years of education, according to data from the 1940 census.

3.3.1 Closures due to weather

In the US, several studies suggest that losing school days due to unexpected weather-related closures is associated with lower scores on performance assessments. For example, in Maryland, Marcotte & Hemelt (2008) found an association between the number of unscheduled closures due to bad weather in a school year and scores on state math and reading assessments – in years with an average number of unscheduled closures, scores were nearly 3% lower for third graders compared to years with no closures. The



study authors estimated that for each school day lost to an unexpected closure, the pass rate for third-grade reading and math assessments fell by more than 0.5%, controlling for student characteristics and school fixed effects. In addition, SES gaps were shown for reading scores, as the negative effect of lost school days was larger for schools with the greatest proportion of economically disadvantaged students (as defined by the percentage of students receiving free/reduced price meals). In a similar study, Marcotte (2007) demonstrated that natural variation in snowfall over the year in the state of Maryland is related to students' performance on state assessment exams that take place in the spring. For students in grades 3, 5, and 8, about 1-2% fewer students performed satisfactorily on math exams after a harsh winter compared to mild winters. However, the impact of snow days appeared to be greater for younger students, who were affected in all subjects, whereas students in grades 5 and 8 were only affected on math scores. This may be because younger students have received less cumulative instruction time overall, meaning that school closures would result in a disproportionately larger learning loss compared to older students (Marcotte, 2007). Collectively, this evidence suggests that extending time in school could be an effective method for raising student achievement (Marcotte & Hansen, 2010).

3.3.2 Closures due to natural disasters

Besides minor weather-related closures, a few studies have also examined the impact of larger natural disasters such as hurricanes and earthquakes – which can have both direct (i.e. destruction of schools, relocation of students and/or teachers) and indirect (i.e. additional psychological impacts from stress and trauma) effects on student learning. Past studies on the effects of natural disasters on academic achievement have shown mixed results, with some variation depending on the age of the sample (i.e. primary and secondary vs. post-secondary students).

For example, among post-secondary students, studies have shown varying impacts:

- No impact of Hurricane Katrina in 2005 was found on the performance of medical students in New Orleans. While the hurricane was the most costly national disaster thus far in the US with significant psychological and financial effects on all students, the medical schools also moved quickly to re-establish their educational training

programs and relocate students, to reduce the loss of learning time (Krane et al., 2007).

- In contrast, findings from the 2009 L'Aquila earthquake in central Italy indicate that university students who were affected by the earthquake had a lower likelihood of completing their degree on time and a slightly greater probability of dropping out, compared to students in other nearby universities (Di Pietro, 2018). The author also suggested that post-disaster measures after the earthquake, such as relocating students and eliminating tuition fees, may have helped to reduce or offset some of the negative consequences on student performance.

Among younger students, findings on the effects of natural disasters are more consistent:

- A longitudinal study following achievement test scores among grade 3-8 students in Mississippi in the first two years following Hurricane Katrina found differences in scores between displaced and non-displaced students (Ward et al., 2008).⁹ For each grade, displaced students had lower mean scores in math, reading and language arts compared to non-displaced students – translating to attainment gaps of 2 months to half a year of schooling.



Displaced students were also more likely to drop out and had lower rates of attendance in the two post-disaster school years. However, an important finding of the study was that the gaps in achievement, attendance, and dropout existed prior to the hurricane, and did not significantly worsen post-Katrina. This may reflect sociodemographic differences between displaced and non-displaced children, as displaced children were disproportionately from low-income households and from minority ethnic/racial groups (Ward et al., 2008).

- A study of the short- and long-term effects of a devastating earthquake in Northern Pakistan in 2005, where schools were closed for an average of 14 weeks, found that children aged 3-15 at the time of the event exhibited physical and cognitive deficits four years later (Andrabi, Daniels, & Das, 2020). The effects were greater for children who lived closer to the location of the earthquake: test scores among children living within 10km of the fault line were 0.24 standard deviations lower than for children who lived 40km away – a learning gap equivalent to 1.5 school grades. Furthermore, the authors estimated that these deficits could translate into a loss of 15% of their future earnings over their lifetime. However, the results suggested that parental SES may have helped to mitigate the impact of the earthquake for some children, as

⁹ Displaced students were those who were still displaced from their schools by February 1, 2006, about six months after the hurricane struck (approximately 18,000 students were displaced from public and private schools in Mississippi at this time).

children whose mothers were educated (i.e. completed primary school) did not experience a negative effect on test scores, resulting in greater inequalities in achievement among children after the earthquake.

- A study of children's academic performance at the school level in Australia conducted 2-4 years after a major bushfire disaster in 2009 found a delayed impact of the disaster on academic progression¹⁰, with differences depending on the test subject and the degree to which schools were affected by the fires: scores on standardized assessments showed reduced expected gains between grades 3 and 5 in schools with higher levels of bushfire impact¹¹; however, only scores in reading and numeracy were affected, with no impact on other subjects (i.e. writing, spelling, grammar) (Gibbs et al., 2019).

3.3.3 Other disasters

Finally, educational disruptions have also occurred due to global wars, which may result in destruction of schools, loss of teachers, reduced access to transportation, and other disruptions to regular routines. A study examining the long-term educational costs of disruptions due to World War II demonstrated an impact on both instructional time and on future earnings (Ichino & Winter-Ebmer, 2004). Children in Austria and Germany who were 10 years old during the war received less education than their peers in other countries which were not directly involved in the war (Sweden and Switzerland) – a loss equivalent to about 20% of a year of schooling. Furthermore, this educational loss was shown to contribute to a sizable earnings loss 40 years after the war, amounting to 0.8% of GDP.

3.4 Annual summer breaks

In addition to unplanned school closures due to external factors, research has been conducted on the effects of learning gaps from planned or typical breaks in the school year such as annual summer holidays. Studies have consistently shown that student achievement tends to slow down or decline over the summer holidays, known as the “summer setback”. The learning loss over the summer does not affect all students equally; it has been found to be greater for more socioeconomically vulnerable students, resulting in a widening of educational inequalities over the summer (Alegre, 2016; Bonal & Gonzalez, 2020).

¹⁰ The study examined changes in assessment scores between grades 3 and 5 (conducted in 2011 and 2013), for students who were enrolled in grade 1 in 2008, the year prior to the bushfires.

¹¹ The level of impact was determined by loss of lives and properties. In high impact areas, over 70 schools and childcare settings were highly affected through building and student exposure, as well as other community facilities and resources.



Early studies on learning loss over the school year found that achievement gaps by SES grew more over the summer than during the school year, suggesting that non-school factors (e.g. family, neighbourhood) are the main source of inequalities and that schools serve as “equalizers” (Quinn et al., 2016; Downey et al., 2004). One theory to explain this effect, called the “Faucet theory”, proposes that the flow of resources (such as material or financial resources that allow for higher-quality learning experiences or human capital resources such as parental education level) slows down over summer for more disadvantaged students but not for students from more advantaged backgrounds. In contrast, the ‘resource faucet’ is turned on at the same level for all students during the school year (Entwistle, Alexander & Olson, 2000; Quinn et al., 2016).

One of the most widely cited studies on summer learning loss is a review by Cooper et al. (1996), which found that the decline in achievement test scores over summer vacation was equivalent to about one month on a grade-level scale relative to national norms, or 0.1 of a standard deviation relative to the spring. More recent studies using different methods are partially consistent with the theory of schools as equalizers. For example:

- Using nationally representative data from the Early Childhood Longitudinal Study—Kindergarten Cohort of 1998–99 in the US, Downey et al. (2004) found that SES gaps in cognitive skills are reduced during the school year compared to the summer months among children in kindergarten and first grade.
- Quinn et al. (2016) also examined data from the 2010–11 Early Childhood Longitudinal Study to examine changes in test score gaps by race/ethnicity and SES over the school year and summer but followed the children over a longer time period. Equalizing effects¹² between lower- and higher-achieving students were found initially, but this effect diminished over time as students aged. These findings suggest a greater potential for school curriculums to help equalize students of

¹² Equalizing effects were observed when test score gaps grew over the summer periods but narrowed over the school year. Specifically, results showed that lower-achieving groups experienced steeper learning trajectories than higher achieving groups over the school year.

different backgrounds in younger grades (i.e. kindergarten) than in later grades. This is also supported by a review of the evidence on the effectiveness of summer learning programs on educational outcomes, which found that programs tend to work better among primary school students than secondary students (Alegre, 2016).

- An analysis of data on family demographics, SES and student achievement from 1982-1987 in Baltimore showed the importance of schooling as well as families in shaping children's academic development (Alexander et al., 2001). Results showed that learning gains over the school year did not differ across SES levels, but there was an SES gap over the summer – for higher SES children, scores improved over the summer whereas they remained flat for lower SES children. These findings also support the compensatory role of schools in reducing the SES achievement gap.
- More recently, Atteberry & McEachin (2021) published a comprehensive empirical analyses to date on variability in summer learning loss across students and the contribution of these losses to end-of-school achievement gaps by eighth grade. Using data from over 200 million test scores across all 50 US states from 2008-2016, they found greater variability in learning between students over the summer compared to during the school year – while some students maintain their school-year learning rate over the summer, others lose almost as much as what they had gained in the preceding school year. Moreover, summer learning losses tend to accumulate for the same students over time rather than being randomly distributed, and these consecutive losses have a sizeable impact on achievement gaps during the school-age years. For example, among students who showed summer learning losses 5 years in a row, the average student lost nearly 40% of their school-year gains in English and math.

Equity Spotlight: *Summer achievement gaps by race*

While most studies have shown that achievement gaps tend to widen over summer breaks and narrow over the school year, some evidence suggests this pattern may not hold for racial differences – specifically, achievement gaps between Black and White students. A few studies (Quinn et al., 2016; von Hippel et al., 2018; von Hippel & Hamrock, 2019) have found that Black-White racial gaps actually widen over the school year in some cases, but remain flat over the summer. These findings are more consistent with a model of schools exacerbating inequalities rather than serving as equalizers. However, results tend to vary depending on the subject (ie. math vs. reading) and grade level, suggesting that seasonal patterns in racial and ethnic achievement gaps are inconsistent. Further research is needed to understand why the Black-White achievement gap appears to be maintained or grow during the school year while other gaps (e.g. Hispanic-White gaps and low-high SES gaps) are reduced (Quinn et al., 2016), and what can be done to reduce these inequalities. This requires assessing education policies, practices and programs to determine the ways in which structural factors contribute to academic inequalities and lower academic outcomes for racialized students (James, 2020).

Evidence from Canada:

Davies & Aurini (2013) conducted the first large scale study of summer learning in Canada – where the summer break is typically shorter compared to the US¹³ and SES inequalities (i.e. more upward social mobility, less income inequality, less concentrated urban poverty) are not as great. International comparisons of mathematics achievement using 2012 PISA scores from 42 high-income countries has shown that SES-based achievement gaps are smaller in Canada compared to the US (Rowley et al., 2020). However, despite these country differences, similar evidence was found in Canada for the existence of summer learning inequalities which widen achievement gaps between low and high SES students (Davies & Aurini, 2013):

- Data from literacy test scores as well as parent surveys among a sample of grade 1 to 3 students in Ontario in 2010-11 indicated that summer learning was relatively stable overall, as relatively equal proportions of students had learning gains and losses over the summer. However, the pattern of results showed strong disparities by SES, with children from higher SES families gaining literacy while poorer children lost literacy.
- The achievement gap was already present before summer break, with students in the top SES quartile having about a half-school year advantage in June; and these students also gained more over the summer months, expanding the literacy gap even further by almost two months. As a result, the literacy gap between the highest and lowest SES groups reached over seven months by the time of returning to school in September, with about 25% of the fall SES gap attributed to the preceding summer.
- SES was the only demographic variable that predicted summer learning, although home learning resources (e.g. books, newspapers, computers) also increased baseline literacy scores (measured in June), and SES effects on both baseline literacy and summer literacy gains/losses were partly mediated by family practices.¹⁴

Among the studies on summer learning gaps across countries, there is consistent evidence that math scores tend to be affected more by the summer break compared to other subjects such as reading (Cooper et al, 1996; Quinn et al, 2016; Alexander et al., 2001). Researchers have suggested that this disparity across subjects may be related to children's differential access to resources or participation in educationally beneficial activities over the summer, outside of school (Burkam et al., 2004; Quinn et al., 2016; Davies & Aurini, 2013). For example, while all students tend to be exposed to literary experiences over the summer that help to maintain their reading skill levels, students from advantaged backgrounds are more likely to experience math-enriching inputs over the summer break compared to lower SES children. These findings also suggest that quantitative learning is more school-dependent than verbal learning (Alexander et al., 2001). However, existing evidence has not supported this theory. For example, Burkam et al (2004) found that the SES gaps in summer learning

¹³ For example, Ontario has 194 regulated school days per year, while most states in the US have 180 days.

¹⁴ Measures of family practices in the study included learning resources, time spent on homework, extracurricular activities, parental involvement in school activities, and parental aspirations for their child's education.

were not explained by class-related differences in children's out-of-school summer activities. In Ontario, Davies & Aurini (2013) found that after controlling for SES and other demographics, the only family practice variable that predicted summer learning growth was parents' aspirations for their child, but other family variables such as extra-curricular activities and home learning resources only predicted literacy scores before summer break.

3.5 Absenteeism

Finally, besides full school closures, another source of lost instructional time comes from individual student absences while schools are still in session. Students may miss school for various reasons, which may be related to individual factors, neighbourhood characteristics, home/family factors, school factors, or a disconnect between home and school (Brown, Gallagher-Mackay & Parekh, 2020; Railsback, 2004). Evidence from the US shows that students from disadvantaged backgrounds (including low-income and minority students) may face greater barriers to attendance (e.g. lack of transportation, safety concerns, poorer health, needing to care for family members), resulting in more absences (Balfanz & Byrnes, 2012; Whitney & Liu, 2017; Kuhfield et al., 2020a; Aurini & Davies, 2021). Student absenteeism from school (i.e. low attendance) is a measure of school engagement and is generally associated with poorer educational outcomes including academic performance, gaps in skills development, and greater likelihood of school dropout, as well as other behaviours that could result in negative life outcomes, such as juvenile delinquency and drug and alcohol use (Balfanz & Byrnes, 2012; Ginsburg, Jordan & Chang, 2014; Bonal & Gonzalez, 2020; Gonzalez Motos, 2016).

Evidence suggests that individual student absences or attendance rates are important determinants of achievement and may even have an even greater impact on learning and achievement than unexpected school closures. However, evidence from Canada on the association between absences and achievement gaps is lacking.

- For example, using statewide, longitudinal data from Massachusetts, Goodman (2014) found a strong relationship between student absences and achievement, but no relationship between full school closures and achievement – except for a small but significant association between school closures and lower math achievement in younger grades (grades 3-6). Results showed that each absence due to bad weather reduced math achievement by 0.05 standard deviations overall, with no differences between age groups. Differences by SES were also found, with lower SES¹⁵ students having more days absent per year – in terms of both a higher number of regular absences and a stronger impact of weather (i.e. snowfall) on attendance rates for disadvantaged students. As a result, math scores decreased more for students of lower SES, suggesting that attendance can account for up to one-fourth of the achievement gap by income. However, these findings were based on absences and school closures due to weather only, not absences due to other factors such as illness or truancy.
- Aucejo & Romano (2016) also found a larger impact of student absences than the number of days of class on test score performance in elementary schools in North Carolina. Results showed that reducing the number of absences by 10 days per year

¹⁵ As defined by the receipt of free or reduced price lunch at school

would be associated with higher test scores by 2.9% for reading and 5.5% for math – a greater increase compared to the effect of extending the school calendar year by 10 days. In other words, the value of the effect of each day of missing school due to student absences on test scores was larger relative to the value of an additional day of class. Results by grade level showed that absences appeared to have a larger negative effect on both math and reading scores for older grades – for example, missing a school day in grade 5 was three times more detrimental for math scores compared to missing a day in grade 3. The authors suggested a possible explanation is that school subjects are more complex in higher grades and more subject matter is taught, making it more difficult to catch up. Absences were also found to have a more negative effect on low-performing students, who may find it more difficult to catch up, resulting in greater achievement gaps in classrooms.

According to Goodman (2014), the reason that individual absences are more detrimental to achievement than school closures is because it is more difficult to coordinate student absences and help individual students to catch up on missed learning compared to situations when the whole classroom missed a lesson due to a school closure. In other words, teachers are more prepared to deal with coordinated disruptions, such as by postponing or canceling lesson plans.

Evidence on the long-term effects of absences appears to be mixed. For example:

- In Canada, longitudinal data from elementary school students in the Toronto District School Board demonstrates the importance of attendance in elementary school for future acceptance into post-secondary education (Brown, Gallagher-Mackay & Parekh, 2020). Results showed that the majority (52%) of students with high absenteeism (defined as missing more than 10% of classes) in grade 4 did not apply to post-secondary school, and that chronic absenteeism was a stronger predictor of post-secondary access than other risk factors, such as standardized test scores in grade 3 and sociodemographic variables.
- Outside of Canada, Cattani et al. (2017) demonstrated a significant negative short-term effect of individual student absences on academic performance in Sweden elementary schools. Using historical records and administrative data, the researchers found a reduction in grade point average of 3.3% of a standard deviation for 10 days of absence over a school year. However, the findings on the long-term outcomes such as employment, income, and educational achievement suggest that the impact of student absence may fade over time – the only outcome associated with elementary school absences was early career employment at ages 25-30 (i.e. lower likelihood of being employed).

3.6 Summary of evidence on past school closures by age group

Most of the research on learning loss prior to the COVID-19 pandemic has focused on younger children, specifically primary school aged students. Among this age group, evidence has shown that loss of instruction time due to factors such as teacher strikes, weather, larger natural or other disasters, as well as regular summer closures negatively affects educational outcomes and achievement gaps (Johnson, 2009; Baker, 2013; Marcotte & Hemelt, 2008; Gibbs et al., 2019), and may even impact their long-term outcomes such as future earnings (Ichino & Winter-Ebmer, 2004). Among secondary school aged students,

there is some evidence that learning loss due to other disease outbreaks (e.g. Ebola, polio) affects academic outcomes, including a higher likelihood of dropping out of school and lower levels of educational attainment (Smith, 2021; Meyers & Thomasson, 2017). Among post-secondary school students, the impact of school closures due to disasters is mixed, but evidence from one study shows a greater likelihood of dropping out and not completing one's degree on time (Di Pietro, 2018).

Studies that have compared effects of learning loss for students of different ages have found varied results. For instance, the effect of teacher strikes in Ontario was found to be greater for older students (grade 6 vs. grade 3) (Johnson, 2009). Findings from another study suggest that the impact of individual student absences also appears to be greater for older students (grade 5 vs. grade 3) (Aucejo & Romano, 2016). In contrast, the effect of school closures due to snow days has been shown to be stronger for younger students (grade 3 vs. grades 5 or 8, Marcotte, 2007; and grades 3-5 vs grades 6-8, Goodman, 2014). There is no consistent evidence for age differences in summer learning loss, although research suggests that variability in test score growth may be greater among younger students (i.e. younger students may lose more of their learning gains during school closures but also show more growth compared to older cohorts) (Blagg, 2021). Evidence also suggests that achievement gaps seen in younger age cohorts over the summer break tend to diminish over time, in later grades (Quinn et al., 2016), and that interventions to improve summer learning may be more effective for younger children (Alegre, 2016). As noted by Marcotte (2007), the effects of learning loss due to school closures may be greater among younger students because they have been exposed to less schooling overall (i.e. number of days of instruction), so the proportional impact of lost instructional time would be larger in earlier grades.

Together, these findings suggest that school closures due to the COVID-19 pandemic may affect learning and academic achievement for students of all age groups in different ways, and that special concern should be given to students who require additional support to recover from the loss in learning time, including those from disadvantaged backgrounds.

4.0 Methods

After examining the literature on the effects of school closures prior to the COVID-19 pandemic, another literature scan was conducted to identify and synthesize the available evidence related to the impact of school closures *during* the COVID-19 pandemic on student achievement and achievement gaps. Various search engines, research portals, and institution-specific websites were utilized for the identification and collection of relevant data. Two main categories of data sources were selected: 1) peer-reviewed journals found in electronic databases; and 2) internet based grey literature, including published reports; websites of relevant organizations or groups; working papers; and news articles. Data sources were limited to those published in English. In addition, in order to gather the most relevant and current information for this section, the search was limited to sources published since the beginning of the COVID-19 pandemic (after March 2020). We included any studies from Canada, as well as evidence from other countries. Search keywords included: COVID-19, pandemic, impact, academic achievement, achievement gaps, educational outcomes, Canada. Results were summarized according to the type of study (i.e.

modelling studies vs direct evidence; short-term vs long-term outcomes) and the study sample (i.e. by country; by demographics; and by age group), where appropriate.



5.0 Results

5.1 Overview of evidence on the impact of COVID-19 school closures

While most initial research on school closures during the pandemic has focused on determining the public health benefits of closing schools to reduce the spread of the virus, information on the potential costs – social, developmental, educational, health (physical and mental), and economic – of these closures for students and their families is lacking (Maldonado & De Witte, 2020). Evidence from studies on learning loss due to school closures prior to the COVID-19 pandemic suggests that the loss of instruction time does have a negative impact on students' educational outcomes (see Section 3). New international and emerging Canadian evidence on the impact of school closures suggests that school closures during the pandemic may also have short- and long-term consequences on student achievement and may increase achievement gaps; however, more research is needed to determine the extent of learning losses and identify which students are more at risk. A greater body of evidence on the impact of school closures on the full range of outcomes for children in the context of the pandemic will help to inform decisions related to school reopening plans and procedures, as well as efforts to prevent or respond to future closures. However, challenges with measuring educational outcomes including achievement levels during the pandemic must also be addressed in order to fill existing data gaps and develop the most effective policies to support children's recovery.¹⁶

¹⁶ For example, in Ontario all standardized testing – which typically takes place in grades 3, 6, 9, and 10, was cancelled for the remainder of the 2019-20 school year, and elementary school tests were cancelled for the 2020-21 school year.

Existing evidence on the impact of school closures during COVID-19 on student achievement gaps consists of three types, summarized in the following sections.

5.2 Evidence from modelling studies

Early evidence comes from modelling studies that have predicted the amount of learning losses that will result from the pandemic, based on extrapolations and evidence from prior studies on the impact of school closures. As described in Section 3, evidence from past school closures, including summer breaks, unexpected disruptions and student absences suggests that the impact of lost instructional time is likely to affect both short-term academic achievement and long-term educational, social and economic outcomes among the affected children and youth. Parallels between these other types of closures and the closures during the COVID-19 pandemic have allowed researchers to calculate preliminary estimates of the potential scale of the impact of the current school closures on similar outcome measures. These studies have included estimates of both the short-term (e.g. changes in learning and test scores in the years immediately following the pandemic) and long-term (e.g. future earnings losses) consequences, described below.

However, it is important to note that the current COVID-19 crisis introduced unprecedented shocks to both the economy and global health (Azevedo et al., 2020). As the authors of many of these modelling studies themselves have emphasized, predictions of the effects of school closures due to COVID-19 that are based on other prior situations and contexts often fail to take into account the unique and complex characteristics of the current COVID-19 crisis, including the larger social and economic impacts on society, schools, and families. For example:

- Along with school closures, parents may struggle with job losses, economic uncertainty, or balancing the demands of working from home while supporting their children's learning without childcare; there are additional psychological impacts including fear of the health and mortality risks of the virus, social isolation and the many disruptions to regular life due to public health restrictions; and a chance of increased family violence during the COVID-19 pandemic (Engzell, Frey & Verhagen, 2021; Kuhfield et al., 2020a).
- Previous unplanned closures were generally shorter than the closures due to COVID-19 (Education Endowment Foundation, 2020).
- Another key difference between current and past school closures that limits the ability to make direct comparisons is that remote learning still occurred in many schools during the pandemic closures; however, closures due to other factors such as weather or strikes usually meant that no instruction took place. Estimates of the impact of pandemic-related school closures would be expected to vary depending on factors such as the mode of instruction (including switching between modes) and the level of support and engagement with online learning during this period – which projection studies do not take into account (Education Endowment Foundation, 2020).
- In addition, the widespread effect of COVID-19 across jurisdictions may motivate government and education sectors to take stronger action to help reduce the potential negative impact of school closures on student achievement now and in the

post-pandemic period, compared to closures due to other factors (Engzell, Frey & Verhagen, 2021).

All of these distinguishing factors make it difficult to accurately estimate the total impact of the pandemic on student achievement and achievement gaps, and resulting projections may be inaccurate. Moreover, there are no standard methods or templates for measuring exact learning losses or the effect of modified forms of instruction during the pandemic and post-pandemic such as hybrid learning approaches, resulting in wide variance in estimates across studies (Blagg, 2021).

Nevertheless, the evidence from individual modelling studies and review studies is fairly consistent in predicting that missing school for prolonged periods due to the pandemic will likely have a substantial impact on student achievement gaps, indicating that educators and policymakers will need to prepare for long-term recovery efforts to help students regain the losses they experienced during school closures – especially in countries where school closures have continued into 2021.

5.2.1 Findings from review studies

- A review of the evidence conducted early in the pandemic (in May 2020) suggested that school closures due to the pandemic are likely to reduce educational achievement, at least in the short term, and that there could be other potential long-term impacts on other outcomes related to educational attainment, such as future employment and earnings (Eyles, Gibbons & Montebruno, 2020). Moreover, the evidence reviewed shows that children from disadvantaged backgrounds are likely to be more affected than others by school closures, given their lower levels of access to family and school resources that could help to offset the loss in instructional time.
- Another rapid review of the evidence on the potential impact of school closures on attainment gaps published by the Education Endowment Foundation in June 2020 concluded that school closures are likely to reverse the progress that has been made in the last decade to narrow achievement gaps between disadvantaged students and their peers (Education Endowment Foundation, 2020). Based on estimates of various projection studies that were produced from the literature on summer learning loss, calculations indicated that the achievement gap would increase by about 36% (the median estimate among the reviewed studies). The review also determined that support for effective remote learning could help to reduce achievement gaps that result from school closures; however, this strategy must extend to all students – especially disadvantaged students who may have less access to online instruction – in order to be effective.

5.2.2 Estimates of short-term impact

Studies that have estimated the short-term impact of COVID-19 school closures in the Canada, the US, and the UK have examined learning losses during the closure period and the following school year. While estimates vary depending on the length of the school closure, age of the students, and quality of remote instruction, the evidence suggests that losses will occur relative to a typical school year, and that losses could be greater for more disadvantaged students:

Evidence from Canada:

- In Canada, data from PISA scores in math, reading, and science from 2000-2018 were used to document existing achievement gaps between 15-year old students and assess the impact of the COVID-19 pandemic on inequalities between low and high SES students (Haeck & Lefebvre, 2020). Using estimates from the literature on the impact of prior school closures and their own estimates of pre-existing SES gradients, the researchers found that achievement gaps could increase by more than 30% as a result of school closures in Canada during the pandemic.¹⁷ Prior to the pandemic, SES gaps in reading test scores between the highest and lowest SES students were estimated to equal about 40 points, or about one year of schooling; and the gap was slightly smaller for math and science. The impact of school closures was projected to decrease scores in reading by 10 points, 10 points for math, and 7 points for science. However, after taking SES differences into account, reading scores could decrease even further for students from low-income families, while other students could gain reading skills, thereby widening the gap between high and low SES students by an additional estimated 20.8 points. The authors acknowledge that these estimates may represent a 'worst case scenario' given that students have continued to learn through virtual instruction during school closures; however, the SES gaps are likely to persist as a result of differences in home learning environments (e.g. access to technology and parental support).
- Aurini & Davies (2021) used data from Ontario summer learning programs collected between 2010-2015 to predict likely shortfalls in learning and achievement gaps among Canadian elementary school students caused by COVID-19 school closures. Estimates of learning rates over the period of March-September 2020 were generated based on three different scenarios of the plausible effectiveness of schools' online instruction during closures.¹⁸ For each scenario, comparisons of mean learning scores were made between students in the lower and upper quartiles of the distribution of scores across cohorts. Findings showed that school closures during the pandemic likely resulted in a loss of learning equivalent to 4 months on average, with greater losses among lower-achieving students, and widened achievement gaps by a large amount. In the best-case scenario (similar to a typical school year without closures), students would still gain learning skills, with a gap of about 6.5 months between the upper and lower quartiles. However, in the worst-case scenario (assuming that online instruction was ineffective and similar to an extended summer), the gap could increase to 1.5 years. The intermediate scenario (in which online learning effectiveness was similar to the effects of a summer learning program) produced similar estimates as the worst-case scenario, with modest effects on reducing achievement gaps. The authors noted that the actual extent of learning losses due to pandemic school closures may be more extreme than these estimates, as they were extrapolated from data on learning rates during

¹⁷ Based on the known closures that lasted at least 3.2 months in Canada (5.5 months in total minus the annual regular summertime closure of 2.3 months)

¹⁸ Each scenario involved different assumptions about the initial school closure period from mid-March to late June; and added estimates of typical summer learning for the period of summer vacation from July to mid-September.

standard summer breaks of 2-3 months, yet the actual non-school time during the pandemic was 2 to 3 times longer.

Evidence from other countries:

- One of the largest and most widely cited preliminary modelling studies used estimates from the literature on student absences and summer learning patterns to project COVID-19 related learning losses in the US from the beginning of the shutdown period in the spring of 2020 through to the following 2020-2021 school year (Kuhfield et al., 2020a). The study used a national sample of 5 million students in grades 3 to 8 and compared typical growth trajectories in a standard school year to projections for the disrupted 2020 school year, assuming that students were out of school for 3 months. Results examined not only the potential impact of COVID-19 school closures on current achievement, but also the predicted effect on variability in assessment scores in the fall of 2020 and growth over the following school year, including the potential impact on SES-based achievement gaps. Key findings from this study are summarized below:
 - Overall, students across all grades were expected to begin the next school year with less learning gains compared to a typical school year, although predictions varied depending on the scenario.¹⁹ Specifically, under the “COVID-19 slide” projections¹⁷, students were expected to have 63-68% of the typical gains in reading skills and only 37-50% of the average gains in math by the end of the 2019-20 school year. Under the partial absenteeism¹⁷ scenario, students would begin the next school year with 60-87% of their typical learning gains.
 - The expected variability in scores in the fall was larger than normal for reading scores (i.e. some students would gain and others would lose reading skills over the break), but about the same for math scores. This finding suggests that students may have differential access to parent and teacher supports during the school closure months, and that teachers may need to adapt instruction for a greater variety of skill levels after the pandemic school closures.
 - A positive finding was that data from earlier years indicated that students who lost more ground over the summer break actually showed more growth during the next school year; therefore, a similar recovery effect may be expected after COVID-19 school closures among students who are most affected.
 - In addition, assuming that all students experience the same loss in instruction time due to COVID-19, the projections showed that SES-based achievement gaps would not widen; however, if students in high-SES schools²⁰ receive

¹⁹ Gains were lower under the “COVID slide” scenario which assumed that school closures would be equivalent to a longer summer break that began in March, and slightly better under models that assumed learning during school closures was equivalent to “partial absenteeism” (ie. being absent 50% of the time in normal conditions; or receiving half the amount of typical instruction)

²⁰ School-level SES was used in the analyses since student-level indicators of SES were not available. School SES was measured based on the percentage of students receiving free or reduced price lunch (FRPL) in 2017-

more remote instruction than students in low-SES schools, achievement gaps would be expected to increase compared to a typical school year.

- Using data from a large national longitudinal study in the US (the Early Childhood Longitudinal Study), Bao et al. (2020) estimated the impact of school closures during COVID-19 on changes in literacy ability among over 3,000 children between kindergarten and first grade – a period of critical literary skills development. Data from the 2010-11 kindergarten cohort was used to predict children’s literacy gains or losses in 2020, relative to a normal year. Results showed that while children would still gain literacy skills during the school closure period, the rate of reading ability gains would be 66% slower than it would have been without COVID-19 school closures. The average gain in reading scores among kindergarten children from January-September 2020 would be 31% lower than it would be without COVID-19 school closures.
- Also in the US, Dorn et al. (2020) estimated the potential impact of school closures on learning for students based on the level and quality of remote learning and according to three different epidemiological scenarios.²¹ Under the middle scenario²², where schools would continue to experience intermittent closures through the 2020-21 school year, with a return to in-person learning in January 2021, students could lose 3 to 4 months of learning time with an average-quality remote learning environment; 7-11 months with lower-quality remote learning; or up to 12-14 months without any instruction. Moreover, expected learning losses would be greater than average among low-income, Black, and Hispanic students – who are less likely to have access to a high-quality remote learning environment. These differences would increase existing achievement gaps by an estimated 15-20%. For example, Black students were estimated to fall behind by 10.3 months and Hispanic students by 9.2 months, compared to the average loss of 7 months.
- In the UK, where schools were closed for 15 weeks beginning in March 2020, the number of schooling hours that students lost was estimated to be about 20% of the total number of hours during a regular school year. Using previous evidence on learning and applying a conservative assumption that online schooling is as effective as in-person instruction, the learning loss for primary school students was estimated to be about 30% of a standard deviation, or one year of schooling as a result of COVID-19 school closures (Pensiero, Kelly & Bokhove, 2020). The predicted loss for secondary school students was slightly lower (23% of a standard deviation, or slightly less than one year of schooling). Large socioeconomic differences in estimated learning loss were found – for primary students, estimated learning loss ranged from 24% of a standard deviation among children from the most advantaged

18. High-SES schools were defined as schools with <10% FRPL eligibility, and low-SES schools were defined as those with >90% FRPL eligibility.

²¹ In the first scenario (virus contained), in-person instruction resumes in the Fall of 2020. In the second scenario (virus resurgence), school closures and part-time schedules continue intermittently through the 2020-21 school year, with a return to in-person instruction in January 2021. In the third scenario (pandemic escalation), schools operate remotely for the entire 2020-21 school year until vaccines are available.

²² Given that schools in some areas have experienced further recurring closures throughout the 2020-21 academic year, this scenario is likely to be the most relevant.

backgrounds, up to 31% of a standard deviation for the least advantaged children. For secondary students, the gap was greater – from 14% to 28%. These findings suggest that the transition to remote learning during COVID-19 is likely to exacerbate learning inequalities by socio-economic groups.

5.2.3 Estimates of long-term impact

Given the importance of education for future success and economic growth at both the individual and societal level, research has also examined the potential long-term impact of school closures due to COVID-19, summarized below. Overall, estimates of the longer term impact suggest that the learning losses experienced by students during the pandemic will have lasting effects on both academic and economic outcomes that will not be easily made up. Furthermore, evidence suggests that the negative long-term consequences will be greater for more disadvantaged students.



Studies on long-term economic impact:

- Hanushek and Woessmann (2020) estimated possible ranges for the long-term economic impact of COVID-19 learning losses based on existing economic research and the literature on the relationship between academic skills, years of schooling, and individual and aggregate income. Results indicate that given a learning loss equivalent to one-third of a school year, students in the current cohort would experience almost 3% lower income over the course of their entire careers – although estimates varied by country. For low-achieving students from disadvantaged households, greater COVID-19-related learning losses are expected to translate into even larger losses in lifetime earnings. At the country level, the loss of cognitive skills among the future labour force could lead to lower national economic growth – specifically, even if all subsequent student cohorts return to normal schooling and performance levels, the average annual GDP would be 1.5% lower for the remainder of the century. Moreover, these losses could be greater if schools are unable to re-start quickly, and would be permanent unless schools are able to return to performance levels that are greater than pre-pandemic levels.
- Psacharopoulos et al (2020) estimated the worldwide economic impact of school closures due to COVID-19 in terms of lost wages and lost GDP across low-, middle-, and high-income countries. The model was based on the assumptions that school closures last for four months, and that each additional year of regular schooling translates to 8% in future earnings; with an adjustment factor to allow for distance learning during the COVID-19 closure period which would mitigate some of the learning loss. The average estimated loss in lifetime earnings was about US\$11,000 globally, with a range from \$2,833 in low-income countries to \$21,158 in high-income countries. The total global losses in future earnings would be US\$11-15

trillion, representing 12-18% of current global GDP. Results also suggest that students from low-income countries will be affected the most by greater earnings losses.

- Dorn et al. (2020) also examined the possible long-term effects of COVID-19 related school closures on achievement gaps based on income and race; as well as the related impact on the US economy as a whole. Given that the pandemic and its associated public health restrictions may have negative social and psychological effects, and have disrupted access to resources and supports for vulnerable students as well as extracurricular activities, students may experience lower levels of academic engagement and motivation, leading to higher high-school drop-out rates. The combined effects of learning loss and increased drop-out rates may translate into long-term economic effects for both individual students and the economy. For example, under the scenario of a return to full-time in-person learning in January 2021, the average student in the US was predicted to lose \$61-82,000 in lifetime earnings, or the equivalent of about one year of work – solely due to COVID-19 related school closures. These losses were expected to be even greater for minority students (Black and Hispanic). Furthermore, by the year 2040, these earnings and productivity losses could result in a total GDP loss of 0.8-1.2%, or \$173-271 billion per year.

Studies examining multiple long-term outcomes:

- A report published by the World Bank Group in June 2020 (Azevedo et al., 2020) simulated the potential impacts of COVID-19 school closures on total years of schooling, expected learning losses, and lifetime earnings. The simulations were based on global data from 157 countries and considered different lengths of school closures as well as different levels of effectiveness of remote learning to produce three different scenarios: optimistic, pessimistic, and intermediate.²³ Results showed that in the absence of effective policy action, COVID-19 school closures could result in a loss of between 0.3-0.9 years of schooling (depending on the scenario) adjusted for quality of learning, and an increase in the number of students who could drop out of school. In the intermediate scenario, average test scores could also decrease by 16 PISA points, leading to a 25% increase in the percentage of secondary school students who are below the minimum level of proficiency. Each student from today's cohort could also face an average reduction of \$872, or 5% in expected yearly earnings, equivalent to \$16,000 in lifetime earnings for the typical student at present value. Results suggest that the extent of these losses will vary by country; and that the impact of COVID-19 school closures will be greater for vulnerable and marginalized populations (i.e. females, ethnic minorities, and people with disabilities), thereby exacerbating existing inequalities.
- Blagg (2021) expanded on the previous studies by incorporating evidence from some of the recent research examining the direct impact of COVID-19 on

²³ In the *optimistic* scenario, schools are closed for only 3 months and the effectiveness of mitigation measures such as remote learning efforts is high; in the *intermediate* scenario, schools are closed for 5 months with middle level of effectiveness of remote learning; and in the *pessimistic* scenario, schools are closed for 7 months with low effectiveness of remote learning.

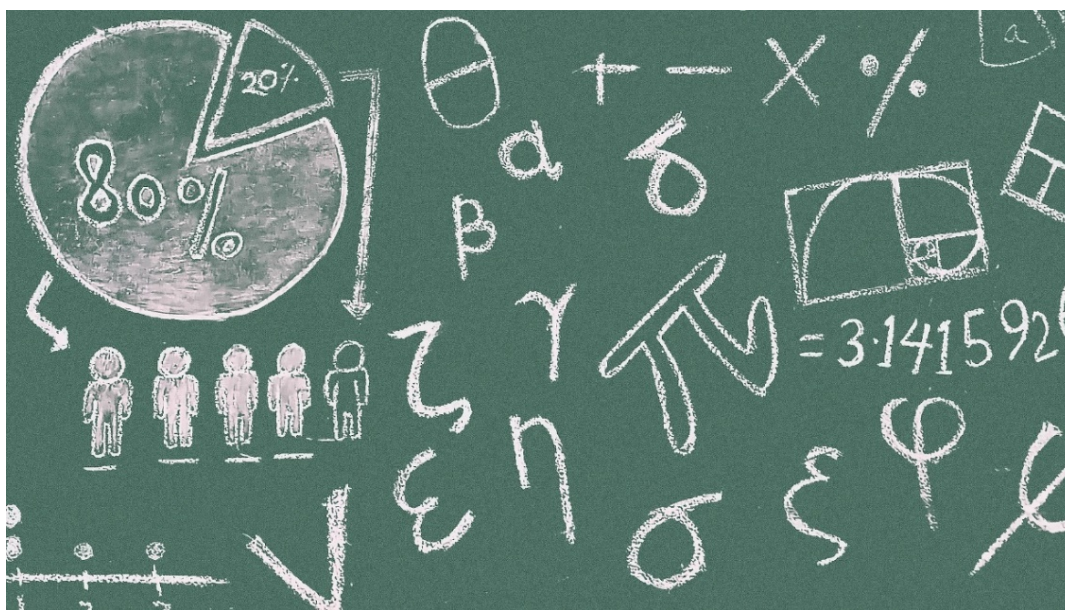
achievement into their modelling approach, in addition to the pre-pandemic evidence on learning loss from previous school closures. Using longitudinal data from national surveys, the study estimated the effects of sustained COVID-19 learning loss among four student cohorts on three adult outcomes: earnings at age 30, lifetime income, and attainment of associate's and bachelor's degrees. Findings indicated that learning losses equivalent to spending 3 months out of school (i.e. from March to June 2020) would result in a loss of 0.7 to 3.5% of income at age 30 and 0.4-2.0% of total lifetime earnings; as well as declines in the rates of attaining associate's or bachelor's degrees. Differences were also found according to sociodemographics, such as gender, income, race, and age cohort:

- First, female students were predicted to experience greater losses of both income and degree attainment.
- Second, if low-income students experience larger learning losses during COVID-19, then results suggest a widening gap in adult earnings between low- and high-income students.
- Third, under the preferred model where learning losses tend to be larger in earlier grades than in later grades, kindergarten students were predicted to have greater declines in adult outcomes compared to students in older grades overall.
- However, a different relationship was observed for Black students – pandemic-induced learning losses were predicted to have a greater impact on future outcomes (i.e. lifetime earnings) for Black adults if the disruption occurred in adolescence (i.e. ninth grade) than in kindergarten. This finding suggests that academic declines in older grades may have a larger impact on future educational and employment opportunities for Black students than non-Black students.
- Kaffenberger (2021) estimated the potential long-term losses to children's learning due to COVID-19 school closures using a simulation model and found that short-term learning losses could continue to accumulate even after children return to school, resulting in even larger losses as they age and are unable to catch up. For example, results showed that if learning in grade 3 is reduced by one-third (about the amount of time children would be out of school during the pandemic) followed by a normal return to school that does not include remedial efforts, then learning levels by grade 10 would be a full year lower, compared to a counterfactual of the same children who did not experience the grade 3 interruption. If grade 3 learning was reduced by half (equivalent to direct learning loss from school closures plus additional learning regression during the time out of school), then students would be 1.5 years behind by grade 10 as a result.

5.2.4 Estimates of the impact of remediation strategies

In addition to estimating the long-term consequences of COVID-19 school closures, several studies have also examined how these losses might be mitigated or offset by educational strategies or programs that aim to help students catch up after they return to school. For example:

- The model estimated by Blagg (2021) examined whether remedial academic interventions such as tutoring²⁴ could ameliorate the long-term impact of COVID-19 learning loss on adult outcomes. Results indicated that after a three-month disruption in schooling during kindergarten due to pandemic school closures, the effects of learning loss could be substantially reduced if an intervention with the same effect size as tutoring was implemented by the third grade. However, the intervention would not fully eliminate the impact of learning losses.
- Kaffenberger (2021) estimated the effects of two different remediation approaches. Results suggested that a short-term remediation strategy (i.e. helping returning students to catch up on missed material from grade 3 when they re-enter school in grade 4) could reduce the long-term learning losses in grade 10 by half, but children would still be further behind compared to no COVID-19 school closures. According to the findings, even larger learning gains could be produced through short-term remediation efforts combined with a long-term strategy that reorients instruction to better align with children's learning and skill levels.²⁵ This approach was estimated to not only fully mitigate the long-term learning losses due to COVID-19, but even surpassed the learning level that would be seen in the case of no COVID-19 school closures by more than a year's worth of learning. These findings suggest that long-term improvements to the education system would be most beneficial to help students recover from the impact of the pandemic.



²⁴ Based on prior research suggesting that tutoring has a strong effect on academic outcomes, and could improve math achievement by 0.38 SD and reading achievement by 0.35 SD.

²⁵ This approach is based on studies showing that reorienting the curriculum and adapting instruction to better match children's ability levels can substantially improve learning, as this allows children to gain competency and skills at a "optimized" pace in each grade, which maximizes learning outcomes within cohorts and enables children to continue learning for longer, with fewer falling behind (Kaffenberger, 2021).

5.3 Evidence from direct studies of the impact of COVID-19 school closures

In addition to modelling studies, a few studies conducted during the pandemic have begun to examine the actual impact of school closures on learning loss and achievement gaps, using outcomes such as assessment test scores in 2020 compared to previous years. The available evidence thus far is mostly limited to a few studies in Europe and preliminary findings from the US and Canada; however, this initial evidence suggests that as predicted, the pandemic has contributed to learning losses that are greater than what would have occurred during a regular school year and have exacerbated educational inequalities. In particular, socially disadvantaged students have experienced greater learning losses as a result of the pandemic compared to more advantaged students. Early data also suggests that children spent less time studying and learning during COVID-19 lockdown, with some evidence of differences across students and SES levels.

International evidence:

- A study from the Flanders region of Belgium, where all schools were fully closed for a period of nine weeks from March to May 2020, found that academic performance decreased as a result of COVID-19 school closures, and that learning inequalities increased significantly within and across schools (Maldonado & De Witte, 2020). This study evaluated annual standardised test scores²⁶ across a large number of Flemish Catholic schools over a period of six years and compared scores after the COVID-19 lockdown in 2020 to previous years. Administrative data on school characteristics and measures of SES were also included in the analyses. Results showed that the 2020 student cohort had significant learning losses in all tested subjects – average scores decreased by 0.2 standard deviations in math and 0.3 standard deviations in Dutch compared to the previous cohort. This finding remained after controlling for school characteristics and school fixed effects. However, learning losses were larger in schools with a higher proportion of disadvantaged students, leading to an increase in inequalities in 2020.
- In the Netherlands, data from primary schools over a three-year period (2017-2020) showed learning losses in math, spelling, and reading after the pandemic compared to previous years, with a disproportionate impact on children from disadvantaged homes (Engzell, Frey & Verhagen, 2021). Scores on standardized tests administered twice a year to students aged 8-11 years were analyzed along with student demographics and school characteristics. The timing of tests allowed for comparisons of scores just before and after the nationwide school closures that occurred for 8 weeks beginning in March 2020. Results showed that after adjusting for confounding factors due to trends, testing date, and sample composition, students lost 0.08 standard deviations on average in the composite measure of performance across subjects in 2020 compared to the three previous years. Furthermore, learning losses were not distributed equally, but were concentrated among students from less educated homes, where the size of the learning losses was up to 60% greater than other students in the general population. It should be noted

²⁶ The tests are administered to grade 6 students at the end of every school year (in June) and cover language and mathematics.

that the Netherlands had a relatively short school closure period compared to other countries, as well as a high level of technological preparedness for home learning (e.g. high rates of broadband penetration and efforts to ensure access to home learning devices). Therefore, results from this study may represent a “best case scenario” of the lower bound of estimated pandemic learning losses, and losses may be greater in other countries.

- Evidence from Germany shows a more minor decrease in test scores after schools were closed for two months during the pandemic, suggesting that efforts by teachers, students, and parents may have helped to mitigate the impact of the closure on achievement (Schult et al., 2021). Schools in the state of Baden-Württemberg were closed for two months beginning in March 2020, followed by a rotating schedule for the remainder of the school year. Data from statewide assessments in math and reading administered to students at the start of secondary school (grade 5) were compared before (2017-2019) and after (September 2020) the first wave of the COVID-19 pandemic. Results showed that scores in 2020 were lower on average than the previous three years, equivalent to about one month of learning, although the observed learning losses after lockdown were smaller than expected. Specifically, the standardised difference was -0.07 for reading comprehension, -0.09 for operations, and -0.03 for numbers. However, the pattern of results differed for high and low achieving students – the decrease in reading scores was larger for high-achieving students, while the difference in math subjects was larger for low-achieving students. The authors suggest that students may have spent more time on reading activities or received more help from teachers with reading tasks, which may have helped lower-achieving students to improve their reading skills during lockdown.
- In contrast, other evidence from Germany suggests that a lack of teacher support during COVID-19 school closures had a negative impact on student learning and achievement gaps. According to findings from Grewenig et al. (2020), students spent less time on learning activities during the school closure period compared to before lockdown, and this decrease was greater for low-achieving students. Specifically, a survey of over 1,000 parents of school-aged children was conducted in June 2020 to assess any changes in the reported number of hours spent on school related activities and other activities deemed to be either conducive or detrimental to child development. Results showed that overall learning time among all students decreased by over half during school closures (from 7.4 hours to 3.6 hours per day). However, high-achieving students were found to spend more time on school-related activities (3.9 vs. 3.4 hours/day) and less time on detrimental activities such as watching TV, playing computer games, social media (6.3 vs. 4.8 hours/day) than low-achieving students, resulting in a greater gap in learning time after the school closures. These findings suggest that the level of self-regulation and independence required for out-of-school learning without the same level of support from trained educators may be more challenging for low-achieving students than for high-achieving students.
- In England, data from assessments of Year 2 (ages 6-7) students conducted in the fall 2020 term showed that children have fallen behind overall in reading and math

skills attainment, and that achievement gaps based on SES have widened (Rose et al., 2021). The attainment gap resulting from COVID-19 school closures was estimated to be about two months of learning compared to 2017; and the disadvantage gap²⁷ was estimated to be about 7 months of learning for both reading and math – greater than what would be expected without school closures, based on pre-COVID-19 estimates from 2019.

- More recent data from England suggests that learning gains were made in the fall of 2020 after schools re-opened, but further increases in learning losses were observed in the spring of 2021, after a second period of restrictions to in-person learning that were in place from January-March 2021.
 - Following the first period of school closures in spring of 2020, learning losses of about 1-2 months were observed among primary school students (grades 3-6), as measured in the first half of the fall 2020 term. Learning losses were greater for math compared to reading skills; and for more disadvantaged schools (Department for Education, 2021a).
 - Evidence from two different assessments of primary school students in England showed some recovery of learning losses between the start and end of the fall term (September-December 2020), demonstrating considerable catch-up during the period of in-person schooling. However, overall scores were still lower by the end of the fall 2020 term compared to the previous year (Department for Education, 2021b; Blainey & Hannay, 2021).
 - Initial findings from the spring 2021 term showed that primary school students lost an additional 0.7-1 months of learning in reading and 0.3-1.2 months of learning in math after the second school closure period, compared to the second half of the fall 2020 term²⁸ (Department for Education, 2021c).
- Evidence on the impact of remote learning during COVID-19 on secondary school educational outcomes in developing countries comes from a natural experiment in Brazil, where exams were conducted remotely throughout 2020 and in-person secondary school classes resumed in some municipalities at the end of 2020 (Lichand et al., 2021). Findings showed that average standardized test scores decreased by 0.32 standard deviations during remote learning in 2020, equivalent to a nearly 75% setback relative to 2019. Dropout risk also increased dramatically under remote learning, by 365%. In schools that re-opened in the fall of 2020, test scores increased again by 20% relative to the control group of schools that did not re-open; however, resuming in-person classes was not enough to mitigate the effects of school closures on dropout risks during the study period.

²⁷ Students were classified as disadvantaged vs. non-disadvantaged based on eligibility for free school meals. About 18% of students were classified as disadvantaged in September 2020.

²⁸ The lower estimates for reading and for math represent results for the spring term which included all results from any point in the term (including during the closures); and the higher estimate represents results from the second half of the term only (after re-opening).

Evidence from the US:

- Surveys of teachers in the US from May 2020 also indicate that students reduced the amount of time spent on learning during the pandemic (Gewertz, 2020). Not only did teachers report that their students spent 3 hours less per day on learning since schools closed (from 6 hours before the pandemic to 3 hours after), but they also reported spending less hours themselves on instruction. Time spent on learning and instruction, and levels of student engagement with schoolwork were reportedly lower in high-poverty neighbourhoods.
- A report led by the NWEA, a leading education research organization, presented initial findings on how school shutdowns in the US impacted student achievement at the start of the 2020-21 school year, using data from assessment tests taken by over 4 million students in grades 3-8 (Kuhfield et al., 2020b). The report was a follow-up to the group's earlier projections on the impact of school shutdowns released at the start of the pandemic, which predicted reduced learning gains compared to a typical school year, based on models of summer learning loss (see Kuhfield et al., 2020a as described in Section 5.2.2, pages 17-18). The new findings showed that student achievement in the fall of 2020 was similar overall to results from the previous year in reading, but was lower by 5-10 percentile points in math. Assessments of growth in achievement since the start of the pandemic showed that most students made gains in both reading and math achievement between winter 2020 (pre-COVID-19) and fall 2020, but growth in math was still lower compared to a typical school year and there were no gains observed for math in grades 5 and 6. Overall, the results showed that students scored better than what was expected based on the earlier projections for reading, but math scores were generally in line with the projection models that predicted lower gains.²⁹ Together, these findings suggest a more optimistic scenario for reading, where learning gains appear to have remained on track despite the school closures, but a less positive outcome for math, where scores were not only lower once students returned to school compared to previous years, but also showed less growth over the period of school closures than usual.

Early evidence from Canada:

While large-scale data measuring the impact of school closures on student achievement in Canada is lacking due to cancellations of the majority of standardized testing during the pandemic, there is some preliminary evidence from cities such as Edmonton and Toronto suggesting that literacy learning in the early years has been significantly disrupted due to the loss of in-person instruction.

- Evidence from regular reading assessments among over 4,000 students in grades 1-9 across 25 schools in the Edmonton, Alberta area indicates that children were farther behind in their reading ability after COVID-19 school shutdowns compared to previous years (Betskowski, 2020; Okafor, 2021). The observed reading ability

²⁹ Specifically, scores from fall 2020 for grade 4-6 students fell in between the estimates based on the "partial absenteeism" model (ie. assuming students received half the amount of typical instruction in the spring of 2020) and estimates of a typical school year. However, actual scores for grade 7-8 students were slightly above the earlier projections.

deficits were greater for younger students and for those who were already struggling to read. For example, learning losses were estimated to be about 6-8 months for students in grades 1-3 when students returned to school in September 2020, compared to the previous three years, while students in grades 4 and above performed either at or better than their grade level in reading by 4-6 months. The study author suggested that the loss of in-person instruction may have a greater impact on reading ability for younger children who are still in the process of learning to read and may need more explicit instruction from teachers, whereas older children are able to read better on their own (Betskowski, 2020).

- Preliminary data from the Toronto District School Board (Gold, Ennis & Cameron, 2021) on grade 1 reading assessments and secondary school report cards in the 2020-21 school year shows mixed results. Among secondary students, report card marks actually increased by 4 percentage points since the pandemic began compared to previous years (from 72% average in 2018-19 to 76% average in 2019-20), and this increase was sustained through the fall and winter terms of 2020-21. Reasons for the increase may be related to several factors, including differences in how teachers have approached assessments and grading and different opportunities for students to make up grades during the pandemic. In contrast, comparisons of reading scores for grade 1 students who attended in-person vs. virtual school during the pandemic with scores from prior to the pandemic show a decrease in the proportion of students who are meeting grade level expectations in reading. The percentage of students meeting expectations decreased by almost 10 percentage points from January 2019 (54%) to January 2021 (45%) among students attending virtual school. The two-year decrease was slightly smaller among students who were attending school in person in the fall of 2020 (from 49% in October 2018 to 46% in October 2020).
- Canadian teachers have also reported observed declines in academic progress among their students during the 2020-21 school year compared to pre-pandemic years. Findings from a survey of about 9,500 education workers across 8 provinces showed that 55% of elementary and secondary school teachers reported a decrease in students who were meeting learning objectives; 75% reported being behind schedule in the curriculum; and 70% believed some students will not catch up academically (Wong, 2021).



5.4 Evidence on the role of school and family factors during school closures

In the context of the COVID-19 pandemic and during the post-pandemic recovery period, schools have practiced different strategies to allow for instruction to continue outside of the school environment – including the use of technology and web-based programs, written materials to complete at home, and hybrid approaches involving a mix of in-person and online learning (Hanushek & Woessman, 2020). However, evidence on the effectiveness of remote instruction has been mixed. Research suggests that the success of these strategies depends on a number of other factors. This includes school-based factors (e.g. leadership and support from teachers and educational directors; school approaches to following the curriculum and amount of work assigned); home-based factors (e.g. access to suitable technology and space for home learning; amount of time, support, and supervision provided by parents); and student factors (e.g. level of engagement with the material, time spent on learning activities) (Andrew et al, 2020a).

Therefore, another area of study on the impact of COVID-19 on achievement has focused on how students, families, and schools have dealt with school closures and how their differential responses might impact students' learning and achievement gaps, including the role of socioeconomic differences. Findings from these studies generally show that inequalities in the ability of schools, teachers, and parents to respond to the unexpected and unprecedented crisis during COVID-19 impacted students' opportunities to learn, with a greater impact on children from socially disadvantaged backgrounds.

Given that some schools may be required or choose to continue to limit full-time in-person instruction for at least part of the 2020-21 school year and possibly the following year as well, it is important to understand factors that may improve or decrease student's academic achievement through online/hybrid learning methods.

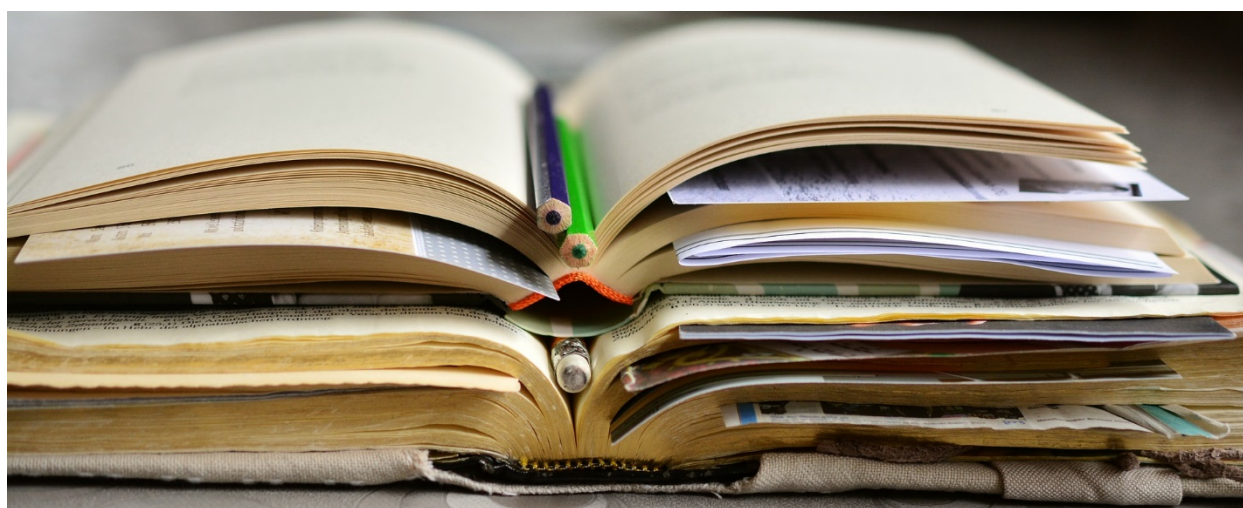
5.4.1 Evidence on family factors

Past educational research prior to the COVID-19 pandemic has shown that family and community play important roles in educational success. For example, there is a relationship between stronger academic achievement among students and greater parental involvement in the learning process, and parents' social background is an important predictor of their involvement (Bonal & Gonzalez, 2020).

Families and parents may play an even more critical role in children's learning experiences and academic achievement when schooling is replaced by at-home instruction, such as during the pandemic school closures. For instance, families are usually responsible for providing the material resources to access and complete the required schoolwork, including computers and physical space; access to other resources such as books; and providing academic and motivational support to students (Pensiero, Kelly & Bokhove, 2020). However, the unequal effects of the COVID-19 pandemic means that some families (i.e. low-income, recent immigrants) face greater challenges in accessing these resources. Research suggests that parents with a higher level of income and education are more likely to have flexible jobs that allow them to work from home; access to internet-enabled computers and laptops; more time and ability to provide academic support and resources to their children; are better able to navigate school systems; and are more likely to enrol

their children in better performing schools – all of which can enhance the effectiveness of home learning and reduce the impact of school closures (Haeck & Lefebvre, 2020; Pensiero, Kelly & Bokhove, 2020; Greenlee & Reid, 2020). This is supported by recent Canadian data collected through an online survey of parents of children aged 0-14 in June 2020, which showed that parents with higher education reported that their children engaged in academic activities at home more often, and were less concerned about their child's academic success due to the pandemic compared to parents with lower education. Specifically, 80% of parents with a bachelor's degree or higher reported that their children engaged in structured academic activities at home (i.e., worksheets, online school resources, and other educational resources) three times per week or more, compared to 67% of parents with a high school diploma or less; and 42% of parents with a bachelor's degree or higher reported being "very" or "extremely" concerned about their children's school year and academic success compared to 56% of parents with a high school diploma or less (Greenlee & Reid, 2020).

Providing an enriching home learning environment may help to reduce the consequences of school closures – particularly for reading skills. Preventing literacy losses is critical during COVID-19 school closures, as global estimates indicate that over 100 million children worldwide will fall below the minimum reading proficiency level as a result of school closures, reversing recent progress prior to the pandemic (UNESCO, 2021b). Research shows that during summer breaks, literacy losses can be reduced by activities such as summer school, visiting libraries, and reading. However, since many of these activities were not available during the COVID-19 shutdown, it became even more important for parents to provide literacy-rich activities for their children at home (Bao et al., 2020). Findings from a modelling study among kindergarten children in the US show that the more frequently children were read to during school closures, the more literacy abilities they gained. Based on the estimates from this study, children whose parents read to them every day would experience up to 42% lower loss in literacy ability due to COVID-19 school closures compared to those who are not read to as often (Bao et al., 2020).



Additional evidence on the impact of children's home environment on learning and achievement during the pandemic largely comes from surveys conducted in the United Kingdom:

- A survey of UK households conducted in April 2020 during the school shutdown found that family income and parents' education were important factors in the amount of schoolwork completed (Pensiero, Kelly & Bokhove, 2020). Results from this study showed that children with a main parent in a 'top' occupation³⁰ spent more hours per day (2.6 hours/day for primary students and 3 hours for secondary students) compared to children whose main parent was in a 'routine' occupation (2 hours/day for primary students and 2.5 hours for secondary students). In addition, having both parents working regularly from home was positively associated with a greater total volume of schoolwork – particularly for the number of offline lessons completed – compared to other parent working patterns. Other factors associated with more time spent on schoolwork including having one's own computer. These findings suggest that the most advantaged students during periods of remote learning are those that have a service class parent, two parents at home, and those with their own computer. Children in this group were estimated to have completed more hours of schoolwork (26% more for primary students and 46% more for secondary students) than their more disadvantaged peers.
- Surveys of over 4,000 parents in the UK conducted between April – June 2020 suggest that there were SES differences in learning activities among children during the lockdown (Andrew et al., 2020a, 2020b). Findings indicate that children from more affluent households spent more time on home learning and had better access to resources for home learning. For example, children in the highest income quintile reportedly spent 5.8 hours per day on educational activities, compared to 4.5 hours among children in the lowest income quintile. This difference would equal at least 7 full school days of extra learning time under the minimum school closure length, and was estimated to be even greater if schools remained closed until September. The learning time gap was also found to be greater among primary school children compared to secondary school students. Findings showed that children in better-off families not only spent more time on learning activities, but also had access to higher quality learning opportunities including more interactive and individualized activities, such as online classes, videoconferencing with teachers, and private tutoring. Finally, inequalities were also found in access to study space at home – for example, almost 60% of primary school students in the lowest income quintile did not have their own dedicated study space, compared to 35% of children in the highest income quintile.
- In a follow-up analysis, these researchers also compared home learning practices during the lockdown period with pre-lockdown data (from the 2014-15 UK Time Use Survey) to estimate the impact of the pandemic on learning inequalities (Andrew et

³⁰ Parents' occupation was defined by the eight-category version of the National Statistics Socio-economic Classification (NS-SEC). Examples of the 'top' occupational category include higher managerial positions and employers in large establishments; Examples of the 'routine' include sales and service, production, technical, and agricultural occupations.

al., 2020b). Results showed variation in the amount of time spent learning at home, the types of learning activities, and the available resources for home learning during the lockdown depending on family income level. Moreover, inequalities in learning were found to either remain stable or worsen over the course of lockdown, depending on the age group. For example, a gap in learning time emerged during the pandemic for primary school aged children, with a difference of 1.5 hours per day between children from the top and bottom income levels, whereas there was no gap prior to the COVID-19. Among secondary school students, inequalities in time spent on learning activities already existed prior to lockdown and persisted during the pandemic, although inequalities did not worsen further. Children from low-income homes were also less likely to have access to resources that were associated with learning time, such as computers/tablets and a dedicated study space, as well as less access to active school support with home learning.

5.4.2 Evidence on interaction of multiple factors

Other research evidence suggests that multiple factors – including both family, student and school level factors – are important predictors of student achievement and learning during school closures. For example:

- An online survey of families in Spain (Bonal & Gonzalez, 2020) examined the impact of school closures in March 2020 on the learning gap between children of different SES backgrounds and found inequalities in learning opportunities depending on family characteristics (including income and parental educational attainment) and school characteristics (e.g. school sector). The study authors created an index of “opportunities to learn” (OTL) that ranged from 1 to 100 points and was based on a number of measures including: time spent on schoolwork during lockdown, frequency of contact with schools and teachers, amount of schoolwork, and amount of feedback on schoolwork. Results showed that OTL scores were positively associated with the following factors: higher family income; having greater access to digital devices; higher parent educational attainment; and being enrolled in private (vs. public) schools. For example, almost half (49%) of children in the richest family income quintile had a score of 80 points or higher on the OTL scale, compared to only one-third (33%) of children in the poorest quintile.
- Survey data from almost 10,000 parents of elementary school students in one public school district in the US was used to examine factors that predicted student engagement with remote learning³¹ during the school shutdown in the spring of 2020 (Domina et al., 2021). Engagement with the instruction material is an essential component of effective remote learning and is a first step towards achieving other favourable academic outcomes. The results highlighted the importance of the following factors as predictors of student engagement with remote instruction:
 - *Household access to material and technological resources:* students in households with fewer than one device per child and without access to high-

³¹ Measures of engagement in this study as reported by parents included students’ enjoyment of remote learning, completion of assignments, and commitment to online learning (measured by the number of logins per week).

speed Internet scored lower on measures of engagement, even after controlling for other measures of family socioeconomic status (i.e. parental education, family income, food insecurity).

- *Instructional strategies*: student engagement increased with more opportunities for socioemotional learning through remote instruction, such as interaction with friends, encouragement from teachers, and extracurricular activities; and with a greater number of modes of instruction (e.g. virtual meetings; one-on-one sessions; printed assignments).
- *Family social capital*: there was a strong positive association between engagement and family social capital, as measured by the extent of communication and connection between parents and schools as well as other parents.

These findings are consistent with other literature demonstrating the significance of social ties within communities during times of disaster or transition, and suggests that efforts to develop and maintain these connections among students and their families could help to improve the remote learning experience, in addition to providing technological resources and ensuring a diverse range of learning opportunities are available.

5.5 Evidence on the impact of school closures for specific population groups

In addition to the overall impact of school closures during the pandemic on student achievement and the achievement gap between students of different socioeconomic backgrounds, the impact on other subgroups of children should also be considered. This includes Indigenous children, visible minorities, children and families with language barriers (e.g. immigrant families and English as a Second Language (ESL) students), children in the child welfare system, and children with disabilities, including intellectual or developmental disabilities. Evidence from before and during the pandemic suggests that these students may be particularly vulnerable to the negative consequences of COVID-19 school closures.

5.5.1 Evidence on low-income, ethnic/racial minorities, and ESL students

Statistics Canada, in partnership with Children First Canada, launched an interactive online tool to provide data and insights into the potential impacts of pandemic-related school closures on children and youth, using existing baseline data and available data during the pandemic. The tool focuses on populations that were already vulnerable prior to the pandemic to examine the degree to which some populations may be impacted more than others. Existing data thus far shows that children in some population groups, such as visible minorities, recent immigrants, and Indigenous peoples are overrepresented in low income categories, and thus may be more vulnerable to the economic impacts of the pandemic (Statistics Canada, 2021). For children in these households, this may result in challenges with accessing and participating in remote learning opportunities due to a lack of appropriate technology and other home resources.

Evidence from assessments among students across US schools at the start of the 2020-21 school year (i.e. after pandemic-related school shutdowns) suggests that these concerns about the disproportionate impact of school closures may be warranted. For example:

- Data from assessment test scores among over 4 million students in grades 3-8 showed that while average reading scores were generally the same in the fall of 2020 compared to previous years, there was evidence of small but disproportionate declines in reading among certain students, particularly Hispanic and Black students in upper elementary grades (Kuhfield et al., 2020b). Furthermore, findings showed that many of the most vulnerable students (including those who were ethnic/racial minorities, those with lower baseline achievement, and students in schools with higher concentrations of socioeconomically disadvantaged students) were not tested in the fall of 2020³², meaning that the available data on the impact of the pandemic on achievement may be underestimated for these students from disadvantaged backgrounds.
- Preliminary results from diagnostic tests³³ used to determine grade level placements for students in grades 1-8 showed that overall, a greater proportion of students were placing below grade level in the fall of 2020 compared to the average from the previous three years – especially in math (Curriculum Associates, 2021). However, there were important differences by race/ethnicity: schools with a higher proportion (i.e. more than 50%) of BIPOC (Black, Indigenous, People of Color) students had a larger percentage of students performing below grade level in both reading and math compared to schools with fewer (i.e. less than 25%) BIPOC students (e.g. 41% vs. 25% in reading; and 44% vs. 29% in math for grade 3 students). This pattern existed prior to COVID-19, but continued in the fall of 2020, with a greater increase in the gap between schools compared to previous years (except for older students in reading scores).
- In Ohio, data on student achievement in third-grade English language assessments showed that average scores decreased by about 0.23 standard deviations between fall 2019 and fall 2020 after school closures (Kogan & Lavertu, 2021). However, test score declines were greater for Black students (0.31 standard deviations) and for economically disadvantaged students (0.25 standard deviations). The racial gap in test score declines was about 50% larger for Black students compared to White students – equivalent to about half a year of learning loss.
- Preliminary data from standardized testing in California showed significant learning loss in the fall of 2020 after COVID-19 school closures for English and math – especially among earlier grades (Pier et al., 2021). However, certain groups of students appeared to be falling behind more than others, suggesting a severe equity impact. Specifically, learning losses from 2019 to 2020 were significantly greater for students from socioeconomically disadvantaged backgrounds, and for English language learners.

³² Reasons for attrition from testing were unknown but missing assessment data may occur at both the school level (e.g. due to technological difficulties or other challenges in administering tests) or individual level (e.g. being absent from school and/or opting out of testing for economic, health, technological, or other reasons).

³³ The *i-Ready Diagnostic* is an assessment for reading and mathematics for students in grades K-12, which provides five grade-level placements: mid/above grade level; early on grade level; one grade level below; two grade levels below; and three or more grade levels below. Data came from 348 schools for reading and 447 schools for math at the start of the 2020-21 school year.

5.5.2 Evidence on Indigenous students

Indigenous children already faced significant barriers and deficits in access to education compared to national averages in their countries, and these pre-existing inequalities are expected to be exacerbated as a result of school closures during the pandemic (Azevedo et al., 2020). Colonialism has produced lower rates of technology skills from reduced access to broadband Internet among this population group – especially in remote communities, and may further limit the effectiveness of virtual learning. While evidence on the impact of COVID-19 on achievement gaps between Indigenous and non-Indigenous children is not yet available, researchers have predicted that Indigenous children will fall further behind during school closures, and as a result, achievement gaps will be even more pronounced as schools re-open unless educators are able to develop culturally appropriate and informed remedial instruction strategies post-pandemic (Cherubini, 2020).

5.5.3 Evidence on students with disabilities and other health care needs

The impact of school closures and the transition to remote learning may be especially difficult for children with disabilities and their families, especially those with neurodevelopmental disorders and learning problems – which includes approximately 8% of children aged 5-17 in Canada according to pre-pandemic data (Statistics Canada, 2021). Many of these students already experienced educational inequalities prior to COVID-19, including a lack of support services and barriers in school access, learning, and participation, resulting in academic challenges and lower levels of educational attainment (Majnemer et al., 2021). Evidence suggests that the pandemic has magnified existing inequities for students with intellectual and developmental disabilities and has disrupted access to specialized services (Majnemer et al., 2021; Gallagher-Mackay et al., 2021; Lawrence, Underwood & Douglas, 2020)). Specifically, many of these students did not have access to the individualized learning supports provided by schools (e.g. one-one-one support workers) during the closures or to accessible online instruction that has been adapted to support their unique learning needs. Data from Statistics Canada (2020) collected in June 2020 suggests that children with disabilities required a higher level of parental involvement with educational and other daily activities during school closures. For example, parents of children with disabilities were more likely to spend at least 10 hours per week supporting their children's learning (33%) compared to parents of children without disabilities (23%). Access to other early childhood programs and specialists that serve children and families with disabilities (i.e. family support,



healthcare, speech and language, occupational therapy) has also been disrupted or delayed because of the pandemic, which may impact children's development – especially for those living in rural communities and Indigenous communities (Lawrence, Underwood & Douglas, 2020).

Finally, students and families have also lost access to important school-based health and mental health care services (i.e. information and referrals, nursing, physiotherapy, diet and nutrition counselling) (Public Health Ontario, 2020). While the impact of school-based health care on children's overall health and educational outcomes is beyond the scope of this review, evidence from Ontario prior to the pandemic suggests that these programs are not only effective in providing early assessments and services to at-risk children, but also have indirect benefits on schooling and learning experiences, such as reduced absenteeism and improved academic performance (Yau et al, 2015).

5.5 Summary of results

The COVID-19 pandemic and its associated public health measures have created significant challenges for education systems and left schools, families, and students struggling to adapt to changing guidelines and make decisions that attempt to balance the need for protection from the health risks of the virus with the right for students to access educational and learning opportunities in a safe, supportive environment. The full impact of school closures during the pandemic on outcomes such as academic achievement and inequalities will take many years to measure and understand. However, the available evidence from modelling studies and initial estimates of the effects of school closures on current achievement levels suggests that school closures due to the pandemic will have lasting effects on student academic outcomes and achievement gaps, and could even affect their future earnings. These effects are expected to be even greater for children who were already more disadvantaged in terms of learning ability and resources (e.g. students from lower SES backgrounds, racial/ethnic minorities, and students with disabilities and special education needs), indicating that achievement gaps between students will likely increase further as a result of the school closures.

Moreover, the expected learning loss is just one of the potential multi-dimensional consequences of the COVID-19 pandemic and school closures on children and youth; other consequences may include socio-economic, developmental, physical, and mental health impacts – which could also indirectly affect academic engagement and success. Therefore, the estimates from the literature so far may be underestimating the full costs of COVID-19 school closures on children's educational outcomes.

However, some encouraging findings also suggest that efforts by schools, teachers, and parents may help to reduce the negative impact of school closures. Future research is needed to understand the strategies that will be most effective to help students and schools recover from the losses during the pandemic and to “build back better”.

5.5.1 Summary of evidence by age group

The available evidence from prediction studies and direct studies conducted after the initial pandemic school closures shows that the loss of in-person learning will have consequences on students of all age groups, with learning losses observed for children at both primary and secondary school levels. There is some evidence that the impact on learning and

academic achievement may differ for children in younger grades compared to those in older grades (Blagg, 2021; Pensiero, Kelly & Bokhove, 2020). For example, secondary school students face an increased risk of dropping out of school, especially in developing countries (Lichand et al., 2021). Among younger children, literacy skills in particular may be significantly impacted, as these children are still learning to read and may benefit more from in-person instruction. For example, reading ability gains among kindergarten students have been estimated to be almost one-third lower than expected due to COVID-19 school closures (Bao et al., 2020). Preliminary evidence from the US and Canada suggests that on average, children in younger grades have larger deficits in reading ability after school closures compared to children in older grades (Curriculum Associates, 2020; Betkowski, 2020; Toronto District School Board, 2021), and that reading gains have largely remained on track for some older students (i.e. grades 3-8) (Kuhfield et al., 2020b).³⁴

As a result, achievement gaps may be expected to be greater among younger children due to school closures during the pandemic. This is supported by a recent evidence review which found that observed learning losses tend to be greater among younger primary school students compared to those in older grades (Gallagher-Mackay et al., 2021); as well as data from California showing that students in younger grades have been affected the most by learning losses in English and math resulting from COVID-19 school closures (Pier et al., 2021); and data from the UK indicating that educational inequalities remained fairly constant over the lockdown period among secondary school students, but a gap in learning time emerged between primary school children from higher and lower SES backgrounds during the pandemic (Andrew et al., 2020b).

5.6 Limitations of the research

Recurring school closures during the 2020-21 school year as well as ongoing adjustments to the curriculum and learning modes (i.e. virtual or hybrid) have created challenges for educators and researchers to measure student achievement and achievement gaps resulting from the COVID-19 pandemic and its associated public health restrictions. Most provinces cancelled their planned standardized testing in 2020 and 2021, resulting in a lack of any large-scale data that directly measures the impact of pandemic school closures on academic performance in Canada (Vaillancourt, Davies & Aurini, 2021). The data that is available thus far is mostly limited to a small number of schools, often within a single school board; and may not be representative of all students within the school board. A further limitation of the available evidence is the timeframe in which existing studies have been conducted – most studies were conducted in the fall of 2020 to assess the impact of the initial period of pandemic-related school closures (i.e. during the first wave of COVID-19); however, school closures have continued for longer periods in some provinces such as Ontario and Alberta. The longer duration of the closures as well as greater variation in learning environments throughout the 2020-21 school year in these areas may limit the applicability of the initial evidence on the impact of COVID-19 school closures on achievement.

³⁴ However, note that caution is warranted in interpreting these results as systematic demographic differences in the available assessment data suggest that the impacts for more vulnerable students may be underestimated (Kuhfield et al., 2020b).

As noted by Kuhfield et al. (2020b), caution is also warranted when interpreting data on achievement during the pandemic as data from students with disadvantaged backgrounds – who have been found to be less likely to be included in standardised assessments administered in-person or remotely during the pandemic – may be missing. Therefore, evidence on COVID-19 related achievement gaps may not reflect the larger student population, which could result in underestimates of the extent of the learning loss due to school closures. A lack of data from these students also has implications for strategies to decrease achievement gaps in the post-pandemic period - if educators are unable to identify the students with the smallest learning gains who require more support to recover from COVID-19 related learning losses, then achievement gaps could continue to grow.

Differences across studies in how the effects of COVID-19 school closures on achievement are measured is another limitation of the existing literature. As there are no standard methods for measuring learning losses or the impact of different instruction methods, estimates vary widely across studies, making comparisons and syntheses of overall findings more difficult. For example, some studies have measured learning loss in terms of changes in standard deviations on test scores; number of months behind in schooling; or percentage of students not performing at grade level.

In addition, as mentioned when describing the modelling studies conducted early in the pandemic, most of the evidence on the impact of the pandemic on student achievement gaps does not factor in other pandemic effects on children, youth, and their families, meaning that the negative consequences of school closures may be even greater than projected (Vaillancourt, Davies & Aurini, 2021).

There is a need for more data – especially from Canada – to evaluate the impacts of the pandemic and repeated school closures during the 2020-2021 school years on student achievement and achievement gaps. Special attention is also required for determining new evaluation methods and strategies that will enable researchers to overcome measurement challenges during and after the pandemic, in order to more fully assess the ongoing consequences of COVID-19 on children and youth.

6.0 Synthesis and Implications

Based on the literature reviewed in this report, it is clear that the COVID-19 pandemic will have lasting effects on children and youth and that school closures during 2020 and 2021 will impact students' academic achievement. Achievement gaps between students of different backgrounds and skill levels are expected to increase further as a result of repeated school closures, unless innovative solutions and remedial strategies are implemented to help students recover from the loss of learning.

The available evidence on school closures before and during the COVID-19 pandemic points to the need for enhanced policies that will help to not only offset the learning losses and achievement gaps that have grown as a result of pandemic school closures, but that will also support the development and academic success of all children and youth as they transition into a new school year. Enabling a return to in-person learning for all students without additional interruptions or shutdowns will be an important first step in efforts to prevent further learning loss. As governments and educators move to ensure schools are able to open safely and in accordance with public health guidelines, there is also a need to ensure

that equitable and accessible learning opportunities are available for all students regardless of whether instruction takes place in-person or remotely, and that appropriate supports and resources are in place to help students, teachers, and families to navigate new systems successfully. This includes recognizing the range of learning abilities and specific needs across students and schools following school closures and providing targeted interventions where needed to help the students who are more at risk of falling behind. It will also require a collaborative effort involving parents and communities in the learning process to enhance the benefits of schooling (Alexander, 2001).

However, as some researchers have noted, there is likely no single solution or intervention that will be sufficient on its own to help children and youth recover from the effects of the pandemic (Alexander, 2001; EEF, 2020). Instead, a combination of short-term remediation strategies combined with enhanced supports for students and teachers as well as long-term improvements to education systems may be needed to help reduce achievement gaps and maintain equity moving forward.

Finally, given the lack of Canadian data on the effects of pandemic-related school closures on academic achievement, there is a need for enhanced efforts to measure and evaluate student achievement following school closures, as well as continued monitoring of the impact of interventions and policies to reduce achievement gaps.

7.0 References

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