SCIENCE BRIEFS

COVID-19 and Education Disruption in Ontario: Emerging Evidence on Impacts

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About Us: The Ontario COVID-19 Science Advisory Table is a group of scientific experts and health system leaders who evaluate and report on emerging evidence relevant to the COVID-19 pandemic, to inform Ontario's response. Our mandate is to provide weekly summaries of relevant scientific evidence for the COVID-19 Health Coordination Table of the Province of Ontario, integrating information from existing scientific tables, Ontario's universities and agencies, and the best global evidence. The Science Table summarizes its findings for the Health Coordination Table and the public in Science Briefs.

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Key Message

The COVID-19 pandemic has led to significant education disruption in Ontario. This has included mass and localized school closures, multiple models of educational provision and gaps in support for students with disabilities. The unequal distribution of school closures and pandemic-associated hardships, particularly affecting low-income families in which racialized and Indigenous groups, newcomers and people with disabilities are overrepresented, appear to be deepening and accelerating inequities in education outcomes, wherever data have been collected. Further, there are health risks associated with closures including significant physical, mental health and safety harms for students and children. Modelling suggests long-term impacts on students' lifetime earnings and the national economy.

There are substantial data gaps on the impact of closures on Ontario's children. However, existing information and analysis can inform strategies to minimize further pandemic disruptions to children's education and development. Identifying or tracking areas where students are facing the greatest challenges in the wake of COVID-19 and implementing systematic supports to address pandemic-associated educational harms are critical to minimizing the overall impact and supporting recovery.

Summary

Background

Education and schooling in Ontario have been profoundly disrupted by the COVID-19 pandemic. From March 14, 2020, to May 15, 2021, Ontario schools have been closed for 20 weeks total, longer than any other Canadian province or territory.

After a first school closure announcement on March 12, 2020, on March 17, 2020, Ontario declared a state of emergency. All schools and childcare centres were closed until June 30, 2020. Emergency remote learning was instituted during this time. During the 2020-21 school year, schooling experiences were more differentiated across the province because of diverse models of educational delivery and localized school closures. Various models of educational delivery were instituted – fully remote, during closures or by parent choice; blended online and face to face learning, mostly in secondary; and fully in-person. The 2020-21 school year began with a phased and staggered reopening of schools in September. On January 8, 2021, as the province entered the second wave of the pandemic, schools in some public health regions were closed, with a full reopening as of February 16. On April 12, the province announced Ontario-wide closure of elementary and secondary schools with no end period announced.

Science Brief are those of the authors and do not necessarily reflect the views of all of the members of the Ontario COVID-19 Science Advisory Table, its Working Groups, and its partners.

Questions

What are the impacts of COVID-19-related school disruption on students and schooling in Ontario?

What information is needed to track and minimize the impact of COVID-19-related disruptions on education and students in Ontario?

Findings

International evidence and emerging local evidence suggest school closures impact children's academic achievement and lead to learning losses. The duration of closures impacts academic achievement and learning. There is widespread consensus from families, educators, and children themselves that students learn better in person than online, and that access to online learning is a challenge for many due to technical, economic, or other barriers.

Most evidence suggests a greater impact of school closures on vulnerable populations. Closures have interacted with other COVID-related hardships to disproportionately affect students with lower socioeconomic backgrounds, racialized children and youth, newcomers, and students with disabilities.

Closures, as well as periods of education disruption have increased absenteeism, which is a measure of engagement in education and ability of schools to meet students' needs. School closures disrupted access to specialized educational services and programs for students with disabilities as well as English language learners. Closures have affected students' educational transitions, which affect students' later outcomes. There is evidence of decreased enrollment in kindergarten and reduced access to developmental services. There are concerns about increased streaming and whether students are 'on track' in early high school, as well as students' ability to access College or employment after graduation.

School closures have multi-dimensional consequences, including impacts on childrens' well-being, physical and mental health. Normally, school personnel are the largest group reporting suspected cases of abuse and neglect. COVID-19-related school closures have led to decreased reporting. Closures have immediate and future economic costs, with modelling data suggesting an impact on future lifetime earnings, as well as depressed labour force participation for parents, particularly mothers. Each month of skill loss is predicted to cause a ~1% drop in lifetime earnings for affected cohorts and is estimated to decrease the national income by 0.5 percent per year, which would translate to a GDP loss for Canada of 1.6 trillion CAD.

Interpretation

The far-reaching impact of disruption necessitate explicit educational recovery strategies. Two key strategies can minimize the impact of COVID-19 related disruptions on schooling. First, a strong priority, as expressed by numerous Medical Officers of Health, on keeping schools open wherever circumstances allow – a 'last closed, first open' policy. Keeping schools open in the context of new, more transmissible and more deadly variants of concern requires renewed and intensified commitment to a range of safety practices and accelerated vaccination of all education workers, parents and children as vaccines are shown to be safe and effective.

Second there is a need for explicit education recovery strategies to be funded in addition to regular schooling budgets. Strategies may include active measures to ensure appropriate universal responses (overall curriculum adaptations, instruction, and student supports), and targeted intensive accelerated learning programs for groups that have been most disadvantaged by health and education effects of COVID-19.

Background

Ontario is in its second academic year of education disruption resulting from COVID-19 and COVID-19 related policy responses, affecting over two million elementary and secondary school students.[1] Education disruption has resulted from mass closure of all schools, partial closures in specific geographies, and closures of individual affected schools and classrooms. Evolving policy and implementation responses to public health risks associated with COVID-19 – including emergency remote learning, virtual schools, blended learning, cohorting and moves to quadmester/octomester scheduling, limits on students' in-school activities, and shifting requirements – have also disrupted students' educational experiences.

Under Ontario's Education Act, the purpose of schooling is to 'provide students with the opportunity to realize their potential'. Partners in the education system have responsibility to promote student 'achievement and well-being'.[2]

This Science Brief reviews the growing body of literature that points to substantial, multi-dimensional consequences of COVID-19-related education disruptions. Consequences include depressed achievement relative to previous years,[3–21] negative psycho-social and mental health impacts and increased child protection risks.[22–37] These consequences have potential for substantial longer-term social and economic impacts.[38] The effects are more pronounced in communities and for individuals that are more negatively affected by COVID-19, and for those who entered the pandemic in pre-existing vulnerable circumstances.[39] In Ontario, as elsewhere, the impact of COVID-19 has been more severe on racialized groups, people with disabilities, and those with lower incomes.[40,41]

The purpose of this brief is to provide a high-level overview of key education impacts associated with COVID-19. Many of the topics considered in this brief are worthy of their own, distinct treatment, but given the paucity of Ontario or Canadian data on educational experiences and outcomes during COVID-19, we have focused on an overview of education issues. This brief does not address evidence relating to safety and school reopening, nor evidence or data on school-based transmission of COVID-19.

Terminology

The terminology associated with the different educational models during the COVID-19 pandemic is inconsistent and can be confusing. In this Science Brief, we use the following definitions.

Asynchronous Instruction

"Learning that is not delivered in real time. Asynchronous learning may involve students watching pre-recorded video lessons, completing assigned tasks, or contributing to online discussion boards."

Blended Learning

An adapted educational model where students spend part of the school week in face-to-face instruction, and engage in part of their instruction remotely.

Hybrid Instruction

Situations where a teacher simultaneously teaches some students who are physically present in class, while other students participate in learning activities remotely, typically through video conferencing.

Remote Learning

"Learning that occurs when classes are taught at a distance and when students and educators are not in a conventional classroom setting. Remote learning takes place in times of extended interruption to in-person learning – for example, as a result of a pandemic or natural disaster. Classes can be synchronous or asynchronous and can be taught online through a Learning Management System (LMS) or by using videoconferencing tools. In some cases, they may be delivered through emails, print materials, broadcast media, or telephone calls."

School Closure

The suspension of face-to-face, in-school instruction for the majority of students. This terminology is in line with global education practices monitoring disruption during COVID-19.[42] It also provides a more internally consistent unit for policy tracing, in view of varied responses to education continuity.

Synchronous Instruction

"Learning that happens in real time. Synchronous learning involves using text, video, or voice communication in a way that enables educators and other members of the school- or board-based team to instruct and connect with students in real time." The use of the term synchronous instruction is limited to remote contexts.

Virtual Schools

Describes schooling provided to students whose families have opted not to have their children return to in-person learning, even where it is otherwise offered. In some cases, boards have created separate administrative teams for virtual schools.

Quoted definitions are from the Ministry of Education, Policy and Program Memorandum 164.[43]

Questions

What are the impacts COVID-19-related school disruptions on students and education in Ontario?

What information is needed to track and minimize the impact of COVID-19-related closures and disruption on education and students in Ontario?

Findings

Overview of Education Policy Response to COVID-19

The 2019-20 and 2020-21 school years had two different education policy responses. Provincewide school closures and the suspension of face-to-face instruction were instituted between March and June 2020. The system moved to emergency remote virtual instruction during this time. The 2020-21 school year had both province-wide and localized school closures. Three models of educational delivery were instituted – fully remote, with minimum standards for synchronous and asynchronous instruction; blended; and in-person.[44] Due to the varying extent of school closures and the diverse models of educational delivery, the experiences and effects of education disruption are likely to be highly differentiated across student groups in Ontario.

School Closures and Reopening: Policy Tracing

School closures have the greatest immediate impact on education disruption. Figure 1 traces the main Ontario-level school closure and reopening periods between March 2020 and April 2021 affecting publicly funded elementary and secondary schools.

Publicly funded schools in Ontario account for 94% of enrolment in the province.[45,46] Policy responses for private schools are beyond the scope of this brief. Further, individual schools and classes were affected by localized closures during full or partial reopening throughout 2020-21.[47,48]

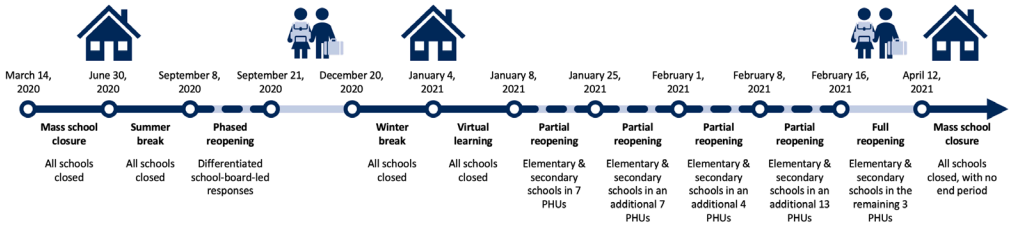

Figure 1. Ontario-Level School Closures and Reopening Policy Tracing, from March 2020 to April 2021
School closures are defined as the suspension of in-school, face-to-face instruction. Only public school closures are presented. Further localized municipal, regional, and board-level school closures are not presented. January 8, 2021: All schools in PHUs of Algoma, North Bay Parry Sound, Northwestern, Porcupine, Sudbury, Thunder Bay, Timiskaming. January 25, 2021: All schools in PHUs of Grey Bruce, Haliburton, Kawartha, Pine Ridge, Hastings and Prince Edward Counties, Kingston, Frontenac and Lennox & Addington, Leeds, Grenville and Lanark, Peterborough, Renfrew County. February 1, 2021: All schools in PHUs of Eastern Ontario, Middlesex-London, Ottawa, Southwestern. February 8, 2021: All schools in PHUs of: Brant County, Chatham-Kent, Durham, Haldimand-Norfolk, Halton, Hamilton, Huron Perth, Lambton, Niagara, Simcoe-Muskoka, Waterloo, Wellington-Dufferin-Guelph, Windsor-Essex. February 16, 2021: All schools in PHUs of Peel, Toronto, York. Data extracted from official provincial government announcements[49–52] and verified on the ICES COVID-19 Dashboard. Srivastava P, Taylor PJ. (2021). COVID-19 school dashboard (1.1 May 2021). http://covid19schooldashboard.com/[48] (See also Appendix A).

Similar to the majority of jurisdictions globally,[42] Ontario instituted mass school closures in the first phase. Basic measures for education continuity were instituted. The first school closure announcement was issued on March 12, 2020, for an initial period from March 14, to April 5, 2020, applicable to all publicly funded elementary and secondary schools.[53] On 17 March 2020, the government declared an official state of emergency under section 7.0.1 (1) of the Emergency Management and Civil Protection Act.[54] This extended the immediate closure to all private schools as defined in the Education Act and to all licensed childcare centres. Public school closures were extended another three times, to May 4, May 31, and finally, June 30, 2020.[55–57]

School closure and reopening during the 2020-21 school year were largely characterised by localized responses and increased variability, until April 2021. The 2020-21 school year began with a phased and staggered reopening of schools, which school boards were directed to implement. Comprehensive, centralized, publicly available data are lacking on the dates and order of phased reopening.

Following the winter break, there was a short period of extended virtual learning for all schools (January 4 to 8, 2021), followed by five localised and partial reopening phases (January 11 to February 16, 2021). Full system-wide reopening was as of February 16, 2021, and March break was rescheduled to the week of April 12, 2021.[58] During the week of April 5, 2021, municipal governments in Peel and Toronto issued orders to close all schools before the rescheduled spring break.[59–61] On April 12, 2021, the province announced that schools would be closed after the rescheduled spring break for an indeterminate period.[52]

Whenever schools were fully or partially open for in-person schooling throughout 2020-21, individual schools and classes were affected by localized closures.[47,48]

School Closures in Ontario Compared to the Rest of Canada

The extent of school closures has been highly variable across Canadian jurisdictions from March 14, 2020 to May 15, 2021. Figure 2 illustrates school closures across Canada for elementary schools, and Figure 3 for secondary schools. They illustrate the relatively heavy reliance on system-wide school closures, in Ontario relative to the rest of Canada.

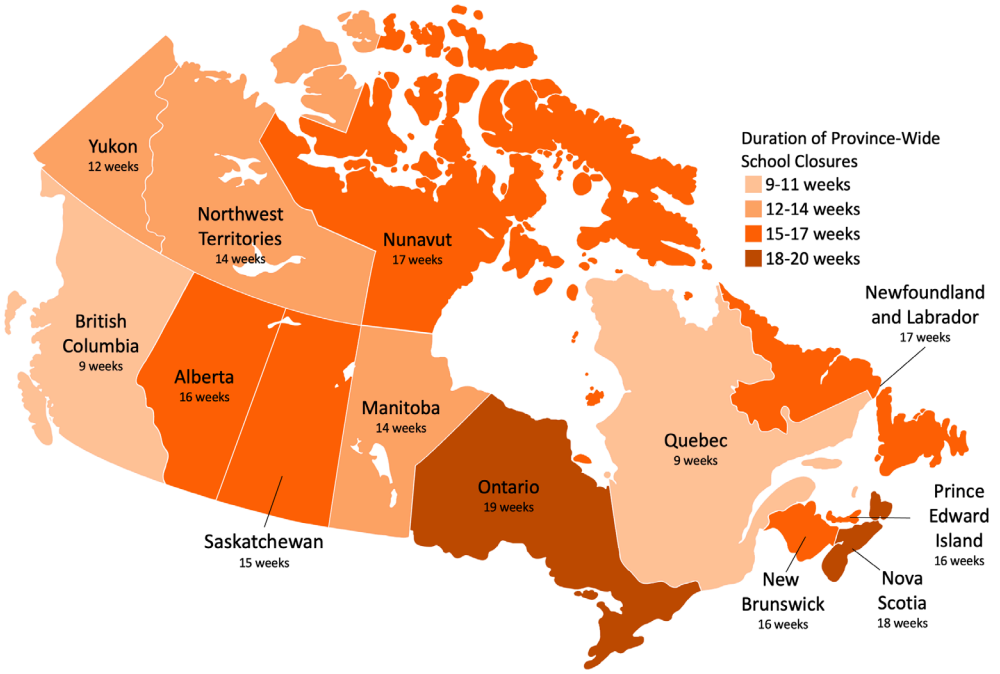

Figure 2. Provincial and Territorial-Level Elementary School Closures in Canada, from March 14, 2020, to May 15, 2021
School closures are defined as the suspension of in-school, face-to-face instruction. Only public school closures are presented. Municipal and regional school closures are not presented. School closures due to holidays are not presented. Partial school closures and blended learning models are not presented. Information presented is approximate. Sourced from multiple Canadian news outlets, provincial/territorial government websites and other online sources announcing COVID-19 related school closures.

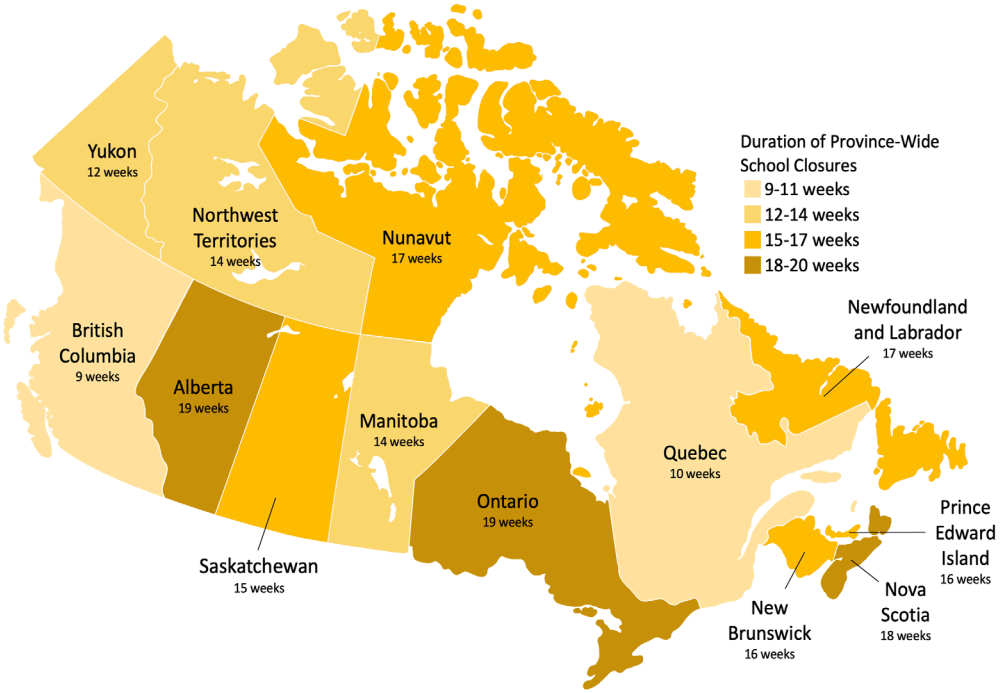

Figure 3. Provincial and Territorial-level Secondary School Closures in Canada, from March 14, 2020, to May 15, 2021
School closures are defined as the suspension of in-school, face-to-face instruction. Only public school closures are presented. Municipal and regional school closures are not presented. School closures due to holidays are not presented. Partial school closures and blended learning models (which are more common in secondary school) are not presented. Information presented is approximate. Sourced from multiple Canadian news outlets, provincial/territorial government websites and other online sources announcing COVID-19 related school closures.

Educational Provision Through Pandemic Emergency

The period from March to June 2020 has been characterised by 'emergency remote learning'.[62] This involved efforts to institute basic measures for educational continuity

under extremely uncertain circumstances. Expectations for synchronous and asynchronous teaching, student workload and feedback were inconsistent between classrooms, schools, and boards.[63] However, Ministry policy established that students' marks would not be lower than a baseline mark established by March 13, 2020, and students' graduation would not be jeopardized because of COVID-19.[64]

By the end of the 2019-20 school year, it was clear that COVID-19 would pose a community health risk into the 2020-21 school year, and that there would be continued education and welfare risks for children. The need to balance risks to children's educational and social development with risks of infection and spread of COVID-19 was increasing.[65] In its June 19, 2020 policy document, Approach to reopening schools for the 2020-2021 school year, the government expressed a preference for conventional, in-person delivery and explicitly restricted the requirement that school boards offer remote learning "as long as public health circumstances require adapted delivery of education".[66]

On 30 July 2020, the Ministry of Education released a plan that publicly funded schools were to operate in the fall according to one of three models: fully in-person (K-8 and secondary schools in areas with low COVID-19 risk), with safety-related adaptations; an 'adapted model of part-time attendance, alternating between attending in-person and online' (in secondary schools where there is higher COVID-risk); and fully remote learning. Parents would 'have the option to enroll their children in remote delivery, which respects their fundamental role in making the final determination of whether they feel safe with their children returning to school.'[44] An implication of the parental choice option was that virtual and in-person school are interchangeable.

Minimum requirements for asynchronous and synchronous remote delivery, and for the delivery of the full Ontario curriculum and assessment, as set out under the existing Growing Success policy, were communicated in August 2020.[43] They include:

- Expectations for teachers to provide differentiated support to all students, including English and French language-learners and students with disabilities or who have an individual education plan (IEP).
- Introduction of blended learning and quadmester or octomester scheduling in secondary school schedules to limit students' exposure to smaller cohorts of students.
- Restrictions for in-person learners on gatherings and extremely limited clubs or sports or other extra-curriculars were required as infection control measures.[43]

School boards were charged with developing locally contextualized implementation plans to deliver multiple models of schooling, and to ensure devices and connectivity for students in need. Complete guidance program and operational requirements,[67] Ministerial approvals of board implementation plans (e.g., in-person requirements for blended learning,[68,69] or changing length of school day to reduce class sizes)[70] and availability of additional funding to support safe re-opening came between mid-August and early October 2020 for fall 2020.[71–74]

This brief review of policy changes in education during COVID-19 demonstrates the rapidly evolving changes to educational structures and to teaching, learning and student experiences in COVID-19 that extend far beyond the question of whether schools are open or closed.

Remote Learning in the 2020-21 School Year

There are no publicly available aggregate data on how many students are enrolled in remote or in-person schooling during the 2020-21 school year. Reports suggest there was considerable variation between and within boards. For example, it was reported that 16% of students opted for virtual school in Lakehead District School Board in October 2020,[75] while 49% of students opted for virtual school by October 1,

2020 in Peel District School Board.[76] Students have switched between in-person and remote learning during the school year, although there are no aggregate data for the number of students who switched between options or the direction of that switch. This created disruptions within schools, such as classroom reorganizations, alongside additional transitions for individual students.

There is considerable variation in how remote schooling was delivered. For example, some school boards adopted a 'hybrid' model,[77] while others have rejected simultaneous online and in-person instruction. There are no systemwide data on the extent of this model in Ontario, nor evaluations of learning impacts of hybrid relative to other forms of remote learning.

The percentage of students choosing remote learning compared to in-person schooling may reflect the racial geographies of Canadian urban centres. A number of reports from the Greater Toronto Area analyzed the demographics of schooling choice during the COVID-19 pandemic.[78] These analyses showed that families living in neighbourhoods with lower incomes and with more racialized residents were more likely to choose online schooling.[78] Canadian analyses showed that COVID-19 risks were disproportionately higher in communities with higher household density, higher proportion of essential workers, lower educational attainment, lower income and more racialized residents.[40] US survey data suggested that Black and ethnic minority parents had greater concerns about school safety, consistent with higher exposure to COVID-19.[79]

There is a substantial international literature on schooling continuity during emergencies, including the use of technology, much of which pre-dated COVID-19.[80,81] However, there is little evidence on the effects of online-only schooling on learning at elementary and secondary levels,[82] or on the overall social development and well-being of students. Evidence in the COVID-19 pandemic context is in its infancy despite the fact that there are a large number of students in emergency online-only settings globally.

A key indicator of educational equity is students' access to non-segregated learning environments.[83] Policy changes which tend to increase de facto segregation between students along lines of race or socio-economic status merit sharp scrutiny, particularly when there is little evidence for the educational approach which is disproportionately being used with racialized and low-income students.

Impact on Educators

These policy changes had direct and indirect effects on students' classroom context, and, on their teachers. In general, the strongest in-school influence on students' learning is their teacher.[84,85] Teacher effectiveness is deeply shaped by the contexts in which they work.[86–88] COVID-19 has radically disrupted these contexts, with considerable impacts on teachers' work as well as their own health and well-being. Teachers have needed to dramatically change how they teach, with limited time or specific training provided.[89] They are supporting students, many of whom are themselves under exceptional stress.[90,91] Furthermore, they assumed new responsibilities associated with ensuring safety in-school under conditions that were considered by many to be unsafe.[92]

A highly feminized workforce,[93] educators as a group were particularly affected by caring responsibilities for their own children at home, while continuing to work. A national survey suggests that teachers have experienced considerable stress and burnout during COVID-19.[94] There are further reports of teacher shortages resulting from leaves and attrition from the profession in light of COVID-19 contexts.[95] As a result of these shortages, exceptional measures such as allowing student teachers temporary teaching certificates, and in some cases, hiring non-teachers were undertaken.[96] There may be long-term effects on the profession in terms of teacher supply.

There is an ongoing need for research on how the COVID-19 pandemic has affected

Ontario educators and the education workforce,[97] and how these challenges affect student learning and well-being.

Impact on Students' Educational Outcomes: Learning Loss, Educational Opportunities, and Transitions

As the policy summary above demonstrates, opportunities for students in Ontario to develop knowledge, skills and attitudes through education have been profoundly affected by COVID-19. Here we examine short-term and potential longer-term effects of these changes, recognizing that the nature of collective responses to COVID-19 will shape the longer-term picture.

Impacts and Social and Family Context

While there are long-standing debates about the relative importance of different factors, the inextricable interconnection between families, communities and education success is a central finding of the sociology of education and developmental psychology literatures.[98–101] In the context of COVID-19, the relative impact of family and community on achievement and well-being has likely been heightened. Restrictions on movement mean that children and youth have spent unprecedented amounts of time within their households, at the same time as the impacts of COVID-19 have struck in deeply unequal and complex ways.[102]

The mental health of families with children has declined overall, affecting the home climate in which children are spending more time.[103] New research conducted during COVID-19 showed that approximately half of parents with children learning remotely had at least one child struggling with distance learning, which in turn was associated with higher parental stress.[104] Results from Statistics Canada crowdsourcing initiatives show that among participants, youth, recent immigrants, certain groups designated as visible minorities, gender diverse people, and Indigenous people, were also more likely to report symptoms consistent with moderate or severe generalized anxiety.[105]

Data from Statistics Canada highlight that stress on families is unequally distributed. Groups designated as visible minorities, recent immigrants and people with disabilities are overrepresented among those with low incomes, and therefore, are more vulnerable to infection and to indirect effects of COVID-19.[105] Families with lower incomes tend to experience living spaces that are more crowded,[106] making quiet study more difficult. Parents have less ability to work from home and supervise learning. Wealthier parents have greater capacity to pay for or arrange private supports for learning such as tutors – reports suggest demand has increased substantially during the COVID-19 pandemic[107] – or support services for young people with disabilities.[108]

Declines in Achievement Relative to Previous Years, and Growing Gaps

Schools have broad purposes. In Ontario and internationally, there is growing acknowledgement of the vital importance of broad, non-cognitive or social-emotional skills, creativity, and capacity for collective action to prepare students for a fast-changing world.[109] However, the literature on learning loss concentrates primarily on students' test performance, mostly in literacy and numeracy. There are critics of this relatively narrow, and non-transformative focus of the learning loss discussion.[5] Others focus on non-school learning where students may have gained knowledge that is not reflected in current ways of thinking about achievement.[7] At the same time, these fundamental skills are clearly linked to present and future prospects for employment, health, and democratic participation.[9,10,110]

Ontario data: To date, there are no provincial data on learning loss available in Ontario. The administration of province-wide Education Quality and Accountability Office (EQAO) tests and the Early Development Index were paused in 2020-21.[43] There is one large-scale study of grade 1 reading conducted in the Toronto District School

Board using recognized diagnostic reading assessments administered by teachers.[11] Reading assessments were administered in October 2020 to students in in-person schooling, and in January 2021 to students in virtual schooling. The study showed grade 1 students in in-person schooling in October 2020 were 3 percentage points behind where grade 1 students were in October 2019. Students in virtual schooling in January 2021 were 9 percentage points behind where grade 1 students were in January 2020.[11,111]

Provincially, there have not been sample-based assessments of students using standardized measures against which it would be possible to measure relative progress.

Several school boards in Ontario have published results from surveys or thought exchanges to solicit parent and student perspectives on the online experience. While surveys of this type may tend to over-represent less disadvantaged and more engaged members of the school community, the samples are large, and they provide important insight. A Toronto District School Board survey in February 2021 found that while 60% of students thought their progress this year was good or excellent, 66% were worried that they would fall behind because of COVID-19 (n=36,000), and 53% of parents (n=96,500) shared that concern; 84% of students thought they learn better in-person than online.[12] A Canadian survey of 9,500 educators conducted in spring 2021 found that 55% of elementary and secondary teachers reported fewer students were meeting learning objectives compared to other years, 75% said they were behind schedule in covering curriculum, and 70% were worried that some students will not catch up academically.[112]

Québec economists estimated a decrease in overall learning of approximately 1.4 months due to the 3.2 months of school closures in the spring and that the socioeconomic skills gap could increase by as much as 30%.[113]

International evidence: There is a growing and broadly consistent body of evidence emerging from England and the US, supported by additional data from Belgium and the Netherlands, indicating the serious effects that school shutdowns have had on children. While the nature of school interruptions varied widely and the education systems themselves differ across jurisdictions, the data provide insight on what may be relevant for Ontario. Most importantly, they indicate the likelihood of differential effects on disadvantaged students (or schools).

Appendix B provides a detailed summary of the scope and findings of 14 large-scale international studies published in 2020-21. The review for this brief searched broadly the peer-reviewed and grey literature for any reported assessments during the COVID-19 period that used consistent measures of achievement, including results from standardized tests and aggregated results from diagnostic assessments used for classroom purposes.

The studies document considerably lower achievement levels in 2020 than in preceding years. While there are numerous differences in how studies measure the impact of COVID-19-related disruptions on learning (i.e., standard deviations, months behind, scaled points behind, percentages of students not at grade level), most point to average achievement that was well behind that of earlier cohorts, measured at the same point in preceding school year(s). There were significant losses,3 even in situations that would be considered relatively ideal, i.e., populations with relatively low levels of income inequality, school closures as short as two months, and excellent broadband access.

- Several studies report learning loss in months.[3,13–15,114] Most of these report losses, in fall 2020, of approximately two months behind where students would have been at the same time in earlier years (Figure 6).
- A number of studies, based on teacher-administered diagnostic assessments,

show substantial increases in the number of students who started 2020 well below grade level.[17–20]

- Younger students had greater losses than those in upper grades, or in secondary school.[15,17–19,21,114,115]
- Math achievement was further behind than reading achievement.[3,13,18,39,114,115]
- Three studies have shown that a return to in-person schooling is associated with some recovery of learning losses.[19–21]

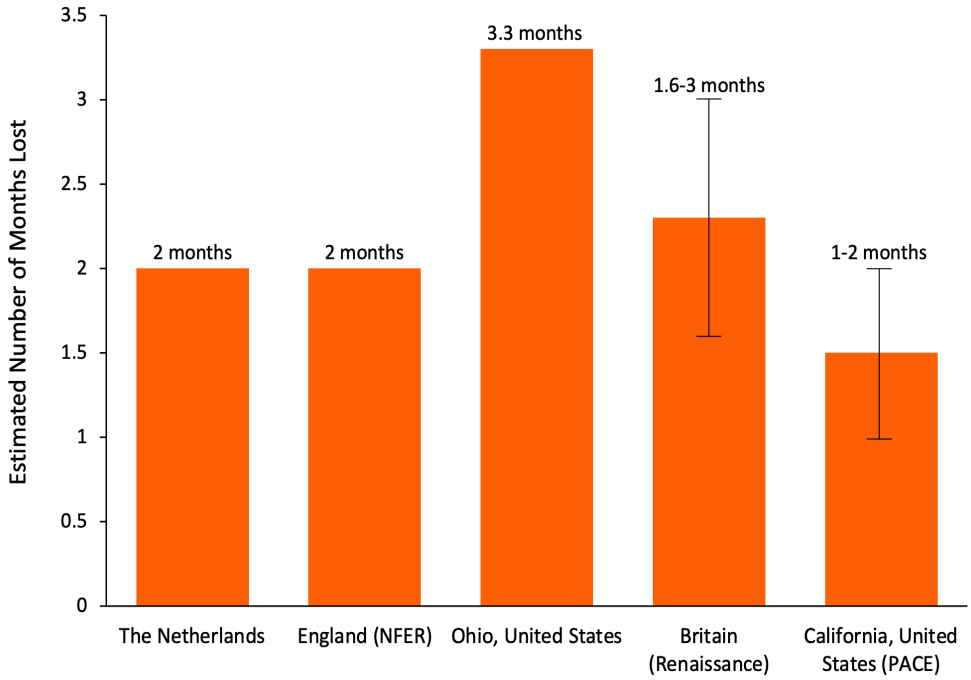

Figure 4. Evidence from International Assessments Reporting Average Learning Loss in Months, Fall 2020
Data for the Netherlands sourced from Engzell, P., Frey, A., & Verhagen, M. D.3 Data for England (NFER) sourced from Rose S, Twist L, Lord P, et al.[13] Data for Ohio, United States sourced from Kogan V, Lavertu S.[14] Data for Britain sourced from Department for Education (DfE).[16] Data for California, United States sourced from Pier L, et al.[15] NFER, National Foundation for Educational Research. PACE, Policy Analysis for California Education. Renaissance refers to the Renaissance Learning and Education Policy Institute.

One large-scale study, in Ohio, compared the effects online and in-person learning.[14] An analysis of statewide test data in grade 3 Language Arts showed students learning remotely were behind their in-person classmates, even controlling for unemployment shocks and county-level COVID-19 severity (0.278 standard deviations loss in students learning remotely, 0.233 for blended learning, and 0.182 loss for in-person instruction).[14]

These large-scale studies substantiate early concerns that learning losses are unequally distributed. Different assessments focus on different subpopulations of students. The range of studies found that students from lower-income backgrounds,[13,16,19,21,116] or, whose parents have less education,[3,116] or, who are Black or Hispanic,[14,39] or English language learners,[15] or have been identified with special education needs,[19] or who attend schools with a high percentage of low-income,[18,21,115,116] or racialized students or schools where there is significant unemployment - have fallen further behind their peers.[14,18,115] These patterns hold for studies that focus on differences between schools (in most of the studies),[116] or between students.[13,39]

While there are many differences in both measurement and context, international assessments suggest substantial learning loss during initial school closures, potential ongoing learning loss through the disruptions of the current school year, and unequal distribution of learning loss.

It is possible that the investments of resources in remote learning, and teachers'

skill and energy adapting to it during 2020-21 has mitigated learning loss. However, even internationally, with the exception of the Ohio study,[14] there is no data on how sustained, full-time remote learning is affecting students' academic skills. Any evidence of improved outcomes when schooling resumes[19-21] is associated with in-person schooling.

Students with Disabilities and Special Education Services

Disability rights organisations have declared a global "catastrophic failure" to protect the rights of people with disabilities throughout the COVID-19 pandemic.[117] Schools are one site of access to disability-related services; however, equally important to social and academic participation is the access gained through health, social services and recreational organizations.[118] Within schools, special education comprise a set of services and practices that are locally articulated through school board policy. For the most part, these services include teacher-led adaptations and modifications, but also access to staffing of educational assistants, resource consultants, and other professionals for direct service to students, and support for teachers to make adaptations and modifications in their classrooms. There are very few system-wide sources of data about referral to special education,[118] or about how services and accommodations are provided.[119]

In Canada, several studies indicate that there has been a disruption to services for students with disabilities and those accessing special education prior to COVID-19.[120] In a rapid review up to August 2020, researchers in British Colombia noted concerns about significant changes to services for students with disabilities, neurodiverse students and students with specific health care needs, with particular concern about access to technology and adaptive equipment, and disruption in access to important learning resources.[22] An analysis of service closures in a Manitoba community suggests that families with young children with disabilities are likely to have lost more services than other children and families.[121] One US-based survey found that the majority of families with a child with an intellectual disability had lost one or more education or health service during COVID-19.[122]

There is debate about the efficacy and effects of special education in general.[123–125] Whether these services lead to better educational outcomes is unclear and under researched. More widely researched is the negative effects of placement in segregated special education classrooms as compared to in inclusive placements.[123] We know, however, that the implementation of special education has been altered by COVID-19.[126]

In a longitudinal study of family experiences with childhood disability services in communities across Canada, the Inclusive Early Childhood Service System (IECSS) project found multiple sites of disruption across early years and elementary schooling. Teachers and students had less access to itinerant and specialist staff; individual planning including formal creation of and updating of Individual Education Plans were slow or not being done at all; and waitlists for services were slowed or removed altogether (Underwood K, van Rhijn T, Balter A, personal communication).[127] The same study showed that families with the lowest income were less likely to be accessing services from multiple sites or systems, a situation which has been exacerbated by the COVID-19 pandemic, leaving some families with little to no access to services (Underwood K, van Rhijn T, Balter A, personal communication).[127] The circumstances of families are important to consider since family advocacy and engagement across all learning environments is known to be important to qualify for and access disability services.[128]

For those children who worked harder to make gains in academic and social development, learning loss is likely to be greater and recovery slower – consistent with the outcomes of a UK assessment of 1.4 million students in 6,000 schools that was conducted directly after the summer following spring closures, and again at the

end of in-person schooling in fall.[19]

Many children with underlying health conditions are at increased risk should they contract COVID-19, but these same students may also be losing special education services, or appropriate education, in online environments. Some special education programs have continued to operate in-person, even during the school closures,[129] but concerns about staffing and safety for all stakeholders have been documented.[130]

There are no Ontario data about co-morbidities of those accessing special education services and the degree to which they have disrupted learning for particular populations of students. Further, there is no data on whether students will need more access to support and disability services due to the circumstances of the COVID-19 pandemic. It is much easier to identify disruptions to existing services than to track whether students are able access appropriate support, and who needs services.

English Language Learners

In 2019, the EQAO reported that 7% of grade 9 students,[131] and 14% of grade 3 students in Ontario are English-language learners.[132]

A study of 18 school districts in California showed that by fall 2020, English-language learners had fallen far behind the average student in the study – almost three times as many months behind (30% vs. 10% of a school year).[15] English Language Learners are particularly affected by isolation from peers and teachers, which limits immersion and slows down learning. Adapting to remote schooling is particularly difficult in these circumstances. English-language learners are more likely to live in poverty, which adds to stress; it is more challenging to support home learning when the language of instruction is different from the home language; home-school communication can be more difficult; and some parents who are English language learners may also need help to develop digital skills to support home learning.[133]

Where English language learners are also newcomers, they face additional challenges: students and their families may experience isolation from support networks, precarious citizenship status and navigation of often complex systems without the benefit of face-to-face interaction, which is particularly important if there are language barriers.[134]

Opportunity to Learn: Attendance and Digital Divides

Attendance is a measure of engagement in school, and the school's ability to meet student needs,[135] as well as a remarkably strong predictor of positive education outcomes.[136–139] A recent Ontario study showed that chronic absenteeism, usually defined as missing more than 10% of days in a school year, is more strongly associated with students graduating and transitioning to post-secondary education than grades, test scores, or holistic assessments of early development.[135,140–142] There have been significant successes with ambitious efforts by school boards working with public health to decrease absenteeism.[143–145] Nonetheless, missed school is a direct effect of school closures. Further, students learning in person may miss school due to isolation requirements.[146]

There are local reports suggesting increased absences during the pandemic,[147] but no province-wide data. Many students also lost school due to delays associated with the remote schooling option, including such factors as hiring new staff after the school year began in some regions.[148,149] There are also concerns about what 'attendance' means during remote schooling: are students merely turning their computers on and 'tuning out' or 'ghosting' their virtual classes?[150,151]

Since the COVID-19 pandemic began, a key concern has been the impact of an ongoing 'digital divide',[152,153] or the relative access to devices and the internet required to power the government's model of remote learning, with multiple hours of synchronous

activities every day. The provincial government asked boards to distribute devices they had and made a CAD 15 million investment with a goal of providing devices and/or internet to any student in need. However, there remain significant gaps.

According to an estimate by the Ontario Ministry of Infrastructure, 12% of Ontarians had either inadequate or no broadband access in 2020.[154] Pre-pandemic, 58% of households had fewer than one device per person, and 24% of households in the lowest income quartile reported using only mobile devices to access the internet.[105] Furthermore, not all families have the digital literacy skills to support a child's remote learning.[155]

Educational Transitions

Students' academic trajectories are not only determined by subject-matter knowledge or test scores. Educational transitions can shape outcomes and be particularly significant for students who are more vulnerable or marginalized within the school system.[156–158] Transitions are social and developmental processes that lead to new and different roles in relation to education, family and/or employment, with key roles for peers, families, schools, and community, which also reflect and reinforce unequal social structures. COVID-19 has impacted social and developmental processes that undergird educational transitions, specifically transitions to early childhood education, high school, postsecondary education, and work.

Early years: High quality early childhood education and care (ECEC),[159] as well as early intervention,[160] are known to be effective in long-term developmental outcomes.[161]

Childcare is one of many early childhood programs in Ontario. ECEC in Ontario includes family support, kindergarten, and nursery school, as well as early intervention in both clinical and community settings. Most of these programs have been either interrupted or adapted to online environments during COVID-19. In Ontario, play is a key foundation of the early years and primary division curriculum,[162] which reflects a balance between social-emotional learning and academic skill development. Play-based learning is particularly difficult to deliver remotely, or, even face-to-face, without the ability to share materials.

Childcare returned to operations relatively quicker than schools. However, we do not know how many children have not entered or continued in childcare due to concerns about COVID-19. There are no data on other forms of ECEC. A recent Canadian study indicates that in communities with higher childcare fees, families were more likely to keep their children out of childcare during COVID-19.[163]

The magnitude of the toll COVID-19 has had on quality or effectiveness of the childcare young children have experienced since March 2020, because of the rapid reshuffling of programs and overall service levels, is unknown. It is likely that the quality of care and early learning has decreased overall while families struggled to find care or had to resort to minding their children at the same time as working from home. Publicly funded early intervention programs have also been significantly disrupted,[164] pointing to the disparity in access to a range of early years income-based services.

Early reports from some school boards in Ontario, and across the United States, suggest there has been a considerable drop in kindergarten enrollment.[165–168] Reporting in the United States suggests a national drop in kindergarten enrollment of 16%.[169] Junior and senior kindergarten are not mandatory in Ontario. Significant drops in the numbers of children with access to childcare, or attending kindergarten may have an impact on students' development, and, potentially, long-term success.[170]

Transitions to high school: The shift from elementary to high school is an important transition marking increased independence of adulthood alongside social and emotional growth.[168] Friends, caring adults, and positive school cultures are particularly important in navigating these transitions. COVID-19 has deeply affected

the social world of young people entering high school.

Academically, grade 9 achievement (credit accumulation plus marks) is a particularly strong predictor of students staying 'on track' for graduation, and proceeding into and through post-secondary education.[171] Given concerns that students have fallen behind during the COVID-19 pandemic, it will be important to monitor whether there is renewed pressure directing students towards applied courses. These have been shown to have worse outcomes and to depress achievement, limiting students' future options.[172–174] Although applied math has been eliminated in Ontario, effective fall 2021, other academic courses will still be offered at the applied level.[175]

Graduation and beyond: There are presently no data on how COVID-19 affects students' graduation rates (87% in 2019), or on their progress into post-secondary. The rate of post-secondary access is not published at the provincial level.

For the minority of students who enter the workforce directly, there are extensive labour force data available from Statistics Canada on the challenges facing students who are entering the job market. Youth not attending school and a decrease in employment contributed to historic highs in rates of those not in education, employment, or training (NEET), rising to 24% in April 2020, the highest in 20 years. NEET rates among 20- to 24-year-olds, measured in September, October, and November 2020, were up to 3.5 percentage points higher than in January 2020. However, by December 2020, these rates were comparable to pre-pandemic levels.[176]

Secondary school programs designed to prove a smoother transition into the job market appear to have been profoundly affected by the COVID-19 pandemic, although data are limited. Local reports on co-op programs point to cancellations due to business closures or health and safety requirements, while some students have gained experience with 'virtual co-op' or work for teachers where students were unable to secure workplace experience.[177] Youth apprenticeships were suspended during the initial lockdown period. Programs designed to give students early exposure to post-secondary learning, such as dual-credit courses, had to be negotiated on a course-by-course basis, and hands-on program offerings were limited. Publicly supported paid work or volunteer experiences, which build skills, contribute to students' social capital, and can contribute to meeting students' basic needs, did not materialize at a large scale.

Access to support services, such as guidance counsellors, to assist in the process of applying for post-secondary may have been compromised by both remote learning and adapted schedules in high school, particularly for students who may have needed extra support and encouragement.[178] Students who were undecided about post-secondary may have been less likely to apply, given the end of the free tuition program for low-income families and the harsher economic climate. Provincial data from the Ontario Universities Application Centre shows that overall university applications were up in 2020,[179] a trend that differs from the United States.[180] Province-wide college applications data, which typically includes more students facing greater barriers, are not yet available; although in the initial COVID-19 period, there was a twenty-percent decline in students' intention to attend post-secondary in the fall.[181] US data shows significant declines in students applying to two-year college programs, with particularly large drops among Native American, Asian and Latinx students.[180]

Impact of School Closures on Overall Well-being

Education is a central determinant of health and well-being.[23] While the emphasis has been on the immediate student health and safety in light of COVID-19, motivating school closures and shifts to remote learning, there are nonetheless, a range of adverse health effects associated with those changes.

A rapid review by Public Health Ontario, capturing evidence up to June 2020 on the

effects of community health measures on children and families found a number of negative impacts of school closures on children and youth:[24]

- Loss of access to free or low-cost meals provided by schools can lead to lack of adequate nutrition. During COVID-19, the rate of Canadian families reporting food insecurity increased to 14.6% from 10.5%.[76] Some schools were able to redirect food program funds into support for families at home but there was not a province-wide approach.
- Lack of access to school-based healthcare services in Ontario is of concern. Many important services are sought via this mode including initial assessments, system navigation and access to information and referrals. This is in addition to losing access to the myriad of service providers themselves, which in turn may pose a risk for children's physical and mental health.
- Schools provide an environment for children with routine and structure where they can work on their ability to socialize, do physical activities, and participate in enriching extra-curricular activities. This disruption can have a significant impact on their emotional and mental wellbeing.

The British Columbia Centre for Disease Control identified concerns associated with decreased 'school connectedness'. School connectedness is associated with a number of major positive impacts on well-being: "higher self-esteem and life satisfaction, lower rates of substance use and violence, participation in fewer risk-taking behaviours, increased likelihood of completing secondary school, and greater feelings of positive mental health."[22] School closures may trigger social isolation and loneliness for children and youth, which is associated with emerging mental health challenges.[25]

Data from People for Education show the vast majority of schools offered no sports, clubs and co-curricular activities at elementary and secondary levels in 2020-21, even where in-person schooling continued, compared to 90% of schools offering these broader opportunities in previous years.[182] There is a strong body of literature associating these activities with social emotional skill development, more physical activity, and higher levels of engagement in school.[26–28]

A number of pieces of evidence suggest adverse health impacts on children during COVID-19, although not directly linked to school disruption. Cross-sectional survey evidence shows a decline during the lockdowns in children's levels of physical activity.[29] Similarly, heightened mental health challenges have been identified among children during the COVID-19 pandemic.[30] Youth, aged 15-24 years, saw the greatest declines in self-reported mental health of any age group.[31] The percentage of young people who reported their mental health was excellent or very good dropped from 60% to 40% between March 2019 and July 2020.[31] Other concerns include extensive screen time and a lack of outdoor play.[32]

A Canadian study of 2,100 youth-parent pairs found that students reported changed behaviours associated with school closures.[33] Most youth were found to be spending less time on homework, sleeping more than before, and almost half find school less interesting than before COVID-19. Multiple research projects into school-related pandemic effects on physical and mental health, health behaviours, and health-related service disruptions in Ontario are underway, but results are not yet published (Georgiades K, Leatherdale S, Tremblay M, personal communication).

Schools are an essential element of systems in place to prevent, detect and respond to child maltreatment.[34] School closures related to the COVID-19 pandemic may incrementally increase risks of maltreatment by increasing social isolation of children, youth and caregivers, and by creating a need for care during the day that may be particularly challenging for parents among low socioeconomic groups, who are overrepresented in the child welfare system.[35]

Pre-pandemic, school personnel were the largest group of those who reported suspected cases of abuse and neglect.[36] COVID-19-linked school closures have been shown to be correlated with decreased reporting.[183,184] Remote schooling, especially if students' cameras are off, may reduce opportunity for educators to observe risks, or to provide practical supports and relationships to promote resilience.

At the same time, UNICEF warns that increased time spent online due to isolation, school closures, and stay at home orders may also put children at heightened risk of susceptibility to predatory online behavior such as sexual exploitation, cyberbullying, online risk-taking behavior, exposure to potentially harmful content (e.g., violent content, misinformation about COVID-19, targeted marketing), and inappropriate collection, use and sharing of data.[37]

Economic Cost of School Closures and Learning Disruptions

Economic Cost of Learning Loss for School-aged Children

Education and the development of skills have significant economic value, and an established, strong relationship exists between skills gained in school and future labour market wages and opportunities.[185–189] Therefore, it is important to understand the extent to which learning loss associated with education disruption in Ontario during the COVID-19 pandemic may affect children's labour market outcomes as an adults.

While there is a paucity of evidence in the context of COVID-19 given the unprecedented nature of the pandemic, there is substantial evidence on the effects of school disruptions and learning loss on individuals in other contexts. The international evidence reviewed in this brief points to a clear pattern showing that, even as early as fall 2020, on average, students in the US, the UK, Belgium, and the Netherlands had experienced significant learning loss associated with education disruption during COVID-19. Further, all studies found that learning losses were unequally distributed, and disadvantaged students tend to experience greater gaps.

We have direct evidence of the consequences of school disruptions in Ontario by examining the impact of previous teacher strikes on learning loss.[190] In particular, "long" strikes (10+ teaching days) in length, negatively affected math and reading by between 0.20-0.33 standard deviations of test scores. To put these numbers into context, in Canada, a one standard deviation decrease in numeracy skills is associated with a wage gap in adulthood between 20-30%.[191] While teacher strike disruptions are not directly comparable to the disruption caused by COVID-19, this evidence illustrates that even schooling disruptions at a smaller scale can have large measurable effects on learning loss in Ontario.

For context, it is estimated that the that an additional year of schooling increases lifetime earnings by approximately 11 to 12% in Canada.[189,192] Assuming that decreasing a student's level of education by one school year decreases lifetime earnings in a similar manner, the school closures associated with the COVID-19 pandemic, which affect the total amount of schooling children receive, will have lifelong negative effects on students' earnings. This relationship implies that if students receive 10 months of instruction per year and each year of instruction provides the same return, a student's lifetime earnings could decrease 1.1–1.2% per month of complete learning loss with no remediation. This simple calculation assumes that each year of education (primary and secondary) are equivalent.

Using more conservative estimates, a recent study mapped COVID-19 lost learning to the reduction of earnings.[193] They estimated that, in high-income countries, such as Canada, the present value lifetime loss in earnings at the individual level is 21,372 USD.

While predicting the specific impact of COVID-19 in Ontario associated with school closures in terms of earnings and income based on historical data is challenging due

to the unprecedented global mass disruption, the established link between skills and later labour market opportunities is strong and consistent in the economics of education literature. This relationship is expected to disadvantage children affected by the COVID-19 pandemic.

Effect on Economic Growth

Skills and knowledge of a population directly impacts labour productivity and innovation which in turn effects economic growth. Skill losses due to school closures due to COVID-19 will impact the Canadian economy through labour productivity and loss of innovation. Without remediation, this impact may be felt for a very long time.

Researchers estimated a total long-term GDP loss of approximately CAD 1.6 trillion for Canadian student cohorts affected by the spring 2020 school closures and associated skills loss, assuming that gaps do not continue to grow after school resumes.[38] To put these numbers into perspective, the entire GDP of Canada was CAD 1.6 trillion in 2019.

Another recent study, estimates losses of about 4 to 9 percent over the effected cohort's lifetime as the percentage of current year GDP.[193] This translates to an annual loss in national income growth of 0.5 percent per year. It is important to note that these estimates do not consider the impact of lost early childhood education opportunities.

Effect on Female Labour Force Participation

COVID-19 is having an increasingly large economic impact on women, in part, due to closures of schools and childcare centres which have shifted additional hours of unpaid family care to parents, and disproportionately on mothers.[194] In addition, racialized Canadians were twice as likely as white Canadians to stop looking for paid work or reduce time spent on paid work as a result of increased domestic responsibilities.[195] New evidence from Canada uses the geographical pattern of primary school re-openings during COVID-19 to estimate the impact of school re-openings on parental employment and found positive impacts of school re-openings on employment and hours worked.[196]

Female labour force participation is associated with economic growth.[197] Using data from Canadian provinces, Petersson et al. estimated that real GDP would increase by 4% if the labour force participation gap between men and women with high educational attainment was eliminated.[198] Unfortunately, the opposite effect is occurring, and women in Canada continue to exit the labour force, which will, in turn, negatively affect GDP moving forward.[199]

Data Gaps and Needs

This review on the education impacts of COVID-related disruptions highlights pre-existing challenges with the data infrastructure for education in Ontario. More than a year into the COVID-19 pandemic, there are very little data on key processes or outcomes of pandemic schooling, at either the board or provincial level.

International best practices suggest localized strategies are preferable to system-wide shut-down, as they promote maximum continuity.[200,201] However, they will inevitably result in different groups of students experiencing different levels of disruption, and, likely, require different levels of support educationally and in the broader social service sector. Accordingly, this strategy requires careful data collection on schools and students that are directly affected, and ongoing monitoring of learning. The context of the COVID-19 pandemic highlights the extent to which key education data, important for strategic planning and resource allocation decisions, are not available in a timely or transparent way.

Data Gaps

This review highlights gaps in baseline data required to understand how the school system has responded in a time of unprecedented crisis, and on the short and long-term effects on students' well-being and progress. To collect relevant education data, the UNESCO Institute for Statistics suggests:

1. rapid data collection formats focusing on key indicators, sampling schools and students rather than the full population;
2. monitoring equity by over-representing vulnerable students (e.g., girls, students in poverty, students with disabilities or accessing special education services, minority or linguistic groups);
3. frequent and low-stakes learning measurement.[202]

This type of system-level monitoring is not underway at the provincial level in Ontario. Some key questions for understanding system responses and education effects in Ontario include:

- How many days of face-to-face instruction have been missed in 2021, across all models?
- What percentage of Ontario students are learning remotely? How has that percentage changed over time? Under what conditions? What are the demographic characteristics of those students?
- Have there been major changes in attendance and enrollment in Ontario schools?
- Relative to earlier years, how have Ontario students' learning outcomes been affected by COVID-19 and related policy responses? Do those outcomes vary by schooling model, and if so, how and for whom?
- How has the COVID-19 pandemic affected key indicators of educational equity?83 The U.S. National Academies of Science have identified the following key measures of equitable outcomes and opportunities: Students' engagement in school, performance on tests and coursework, on-time graduation and post-secondary preparedness, access to rigorous curriculum and academic breadth, access to high quality supports, and access to non-segregated learning environments.

On this point, only three school boards in Ontario (Durham District School Board, Grand Erie District School Board, Toronto District School Board) have published data disaggregated by race, Indigeneity, gender identity, etc. Disaggregated data are key to understanding equity in opportunities and outcomes.

- If there are significant inequalities of outcome, where is the need for support the greatest? What supports are being employed, and where? Are they helping students?
- Are students with disabilities able to access the special education services to which they are entitled under the Education Act? Are they being fully included and accommodated under COVID-related learning conditions?

It is critical that analyses are conducted on the comparative experiences and effects of the various models instituted to different degrees for education continuity in Ontario, virtual schools vs. in-person learning; hybrid models vs. purely online delivery; and the impact of condensed semesters in secondary. Any such analysis requires data collection on both educational opportunities and outcomes in a systematic, comparable way and over time.

Minimizing the Impact of COVID-19 on Education

Education and schooling has been called 'children's essential work'.[203] Emerging

models to balance COVID-19 mitigation with educational continuity suggest, where possible, that phased and localised approaches to school closures and reopening with appropriate mitigation strategies are preferable to blanket systems-wide shutdowns.[204,205] They reduce the number of students directly affected by well-documented harms associated with mass school closures.[206] However, they are not without their challenges.

Global best practices suggest localised closures should be part of clear, crisis-sensitive education planning, and best take place in the context of longer-term strategy for education recovery.[200,201] Clear-crisis sensitive education planning requires sufficient lead time to minimize disruption.

Adopting localised strategies necessarily means that the length and nature of school disruption will be variable. Segments of the school population will experience greater education disruption than others. This variability has implications for the extent of potential education and social harms associated with the closures, for the need for educational responses, and for data collection requirements to inform tailored responses and evaluate the impact of interventions.

There are two key strategies to minimize the impact of COVID-related disruptions on schooling.

First, a strong priority, as expressed by numerous Medical Officers of Health, on keeping schools open wherever circumstances allow – a 'last closed, first open' policy, based on local conditions rather than a systemwide shut-down. Keeping schools open in the context of new, more transmissible and more deadly variants of concern requires renewed and intensified commitment to a range of safety practices and accelerated vaccination of all education workers, parents and children as vaccines are shown to be safe and effective.

Second, major international organisations, such as the World Bank, UNESCO, and the G20, of which Canada is a constituent, have called for explicit education recovery strategies, and for these strategies to be funded in addition to regular schooling budgets. Strategies may include active measures to ensure appropriate universal responses (overall curriculum adaptations, instruction, and student supports), and targeted intensive accelerated learning programs for groups that have been most disadvantaged by health and education effects of COVID-19. Internationally, there are numerous initiatives underway to identify effective approaches and to scale them.[207,208] These activities fall outside the scope of this review.

There are major efforts and funding commitments in place in other OECD countries:[209]

- The government of the Netherlands committed USD 278 million to provide extra academic support due to COVID-19 in June 2020.[210] (2.5 million students)
- The English Government has committed £1 billion for educational "catch up" in the wake of the first reports on learning loss, including the creation of a £350 million tutoring fund where schools with demonstrated need could contract with qualified providers.[211] (11.7 million students)
- The recent US stimulus package included a commitment of USD 22 billion, equivalent to 20 days of extra schooling, to support learning recovery.[212,213] (56.6 million students)

Establishing large-scale initiatives such as tutoring, summer school, or extended hours programs alongside tailored support for students with disabilities or official language learners requires both financial investment and planning.

Interpretation

It is critically important that all stakeholders understand and respond to the differentiated educational impacts of these disruptions, which will be an ongoing challenge. The social and economic costs of education disruption in Ontario are potentially devastating, and as evidence shows, can far outlive the immediate period of the COVID-19 pandemic.

Author Contributions

KGM and BS conceived the Science Brief. KGM, PS, KU, ED, and LMC wrote the first draft of the Science Brief. KB, AM, AP performed the analyses. All authors revised the Science Brief critically for important intellectual content and approved the final version.

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