

School Closures and the Online Preparedness of Children during the COVID-19 Pandemic

by Marc Frenette, Kristyn Frank, and Zechuan Deng

Release date: April 15, 2020



Statistics
Canada

Statistique
Canada

Canada

How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

Email at STATCAN.infostats-infostats.STATCAN@canada.ca

Telephone, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following numbers:

- Statistical Information Service 1-800-263-1136
- National telecommunications device for the hearing impaired 1-800-363-7629
- Fax line 1-514-283-9350

Depository Services Program

- Inquiries line 1-800-635-7943
- Fax line 1-800-565-7757

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "Contact us" > "[Standards of service to the public](#)."

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Published by authority of the Minister responsible for Statistics Canada

© Her Majesty the Queen in Right of Canada as represented by the Minister of Industry, 2020

All rights reserved. Use of this publication is governed by the Statistics Canada [Open Licence Agreement](#).

An [HTML version](#) is also available.

Cette publication est aussi disponible en français.

Economic Insights

Catalogue 11-626-X, Issue 2020001 No.103, April 2020, ISSN 1927-503X, ISBN 978-0-660-34483-6

School Closures and the Online Preparedness of Children during the COVID-19 Pandemic

by Marc Frenette, Kristyn Frank, and Zechuan Deng
Social Analysis and Modelling Division

This *Economic Insights* article discusses the potential impact of recent school closures on learning and academic performance of school children. To benefit from online resources, students require access to internet-enabled devices that are suitable for learning. The article estimates the percentage of households with children under the age of 18 with access to these learning tools by level of household income, and also discusses the potential impact of receiving no instruction on academic performance based on an earlier Statistics Canada study.

Introduction

As part of a concerted effort to slow down the spread of the COVID-19, provincial governments have closed schools and suspended all in-class instruction until further notice. To reduce the impact on schoolchildren, new online learning resources for students have been announced¹ or online materials are under development.²

This article discusses the potential impact of school closures on learning and academic performance of school children. Since everyone is being asked to remain at home unless absolutely necessary, having access to home internet is a requirement for students to benefit from online learning resources. While it is not known to what extent the online resources will be effective, school children who cannot access them may potentially fall behind other students academically. Even with access to the internet, the quality of children's learning may also be affected by the number of internet-enabled devices available within their household given that their parents or siblings may also be at home. In addition, the type of devices they use for educational activities may also matter, as some are less conducive to educational activities than others.

If some students do not have adequate access to the internet at home, or to devices that can be used to facilitate their learning, or if online learning is otherwise not effective, then there will be a gap in learning over the duration of the school closures. Gaining insight into this impact is important as academic performance is a major predictor of educational attainment (Frenette 2007).

1. For example, Ontario and Quebec (Ontario Ministry of Education 2020; Government of Quebec 2020).

2. Several provinces have also indicated that they will develop alternative approaches for families without access to the internet in their home, or for students with special needs (e.g. British Columbia Ministry of Education 2020; Government of Alberta 2020; Government of Prince Edward Island 2020).

The study is based on two data sources that can inform parents, schools, and governments on the potential impact of school closures. First, the Canadian Internet Use Survey (CIUS) of 2018 contains information on access to the internet at home, as well as the number and types of devices used to access the internet.³ Only households with children under the age of 18 are examined.⁴ Second, an earlier study by Statistics Canada estimated the relationship between instructional time and performance on standardized reading, mathematics, and science tests by comparing children who were born just before and just after school entry cut-off dates (Frenette 2008). These students were essentially the same age, but some had received one less year of schooling (and spent one additional year at home in early childhood) simply because they were born slightly later.⁵ This article will discuss these findings in light of the current school closures.

Vast majority of households with children under 18 had home internet access

Overall, the vast majority of households with children less than 18 years-old had internet access at home in 2018. In fact, only 1.2% did not have internet access. Moreover, access did not vary much by level of household income.

Indeed, fewer than 1 in 20 households with children under age 18 in each income quartile did not have internet access at home (Table 1).^{6,7} Households in the lowest income quartile (i.e. the bottom 25% of the income distribution⁸) were more likely to not have home internet access (4.2%) than their counterparts in highest quartile (0.2%).⁹

3. Although the CIUS also asks about the speed of the internet connection, more than half of all respondents did not provide a response.

4. The CIUS does not contain specific information on children's ages, therefore, the sample could not be limited to school-aged children specifically.

5. The study was based on the Youth in Transition Survey, Cohort A (YITS-A). Students born in 1984 wrote the Programme for International Student Assessment (PISA) reading test from the Organization for Economic Co-operation and Development (OECD) in April or May of 2000 (when most were 15 years-old). Half of the students also wrote the PISA mathematics tests, while the other half also wrote the PISA science test. In Quebec and Nova Scotia, school entry is determined by the age of the student as of September 30 and October 1, respectively. Most students in the sample were in grade 9 (if they were born after the cut-off date) or grade 10 (if they were born before the cut-off date). Thus, the study estimated the impact of receiving instruction throughout most of grade 10 compared to receiving one year less of instructional time. To provide more useful insight during the current pandemic, the results of the earlier study are expressed in terms of the impact of one less year of instructional time.

6. The proportion of households with children under 18 with internet access at home was higher than the proportion of all households in Canada with internet access at home (i.e., including households with and without children). In 2018, 80.9% of all households in the lowest income quartile and 99.6% of households in the highest internet quartile had internet access at home, a gap of 18.7 percentage points (Statistics Canada Table 22-10-0113-01). The gap between the highest and lowest income groups has decreased over time. Results from the 2010 wave of the CIUS indicated a gap of 43.5 percentage points – 53.7% of all households in the lowest income quartile had access to internet at home compared to 97.2% of households in the highest income quartile in 2010 (Statistics Canada Table 22-10-007-01).

7. Additional results were also produced by income deciles. These results were similar, with 95.3% of households in the lowest decile and 99.9% of households in the highest decile having home internet access.

8. Household income quartiles are defined as follows: lowest quartile is less than \$40,000; second quartile is between \$40,000 and \$80,000; third quartile is between \$80,000 and \$125,000; highest quartile is \$125,000 or higher. Household income was self-reported, therefore income values were clustered around rounded values (such as \$40,000 and \$80,000). To obtain equal weighted counts for each quartile, cases with incomes equal to the category cut-offs were randomly assigned to one of the two categories on either side of the cut-off.

9. All differences discussed in the text are statistically significant at $p < 0.05$ unless otherwise noted.

Very low rates were also registered among households in the two middle income quartiles.¹⁰

Table 1
Internet access at home by household income quartiles, 2018

	Lowest	Second	Third	Highest	Total
			percent		
Does not have internet access at home	4.2	1.9	0.4	0.2	1.2
Has internet access at home	95.8	98.2	99.6	99.8	98.8

Sample: Households with children under 18.

Source: Statistics Canada, Canadian Internet Use Survey, 2018.

Fewer internet-enabled devices per household member in lower income households

Although the majority of households with children under 18 have internet access, other factors could also affect the time that children can invest in their educational activities at home. In particular, the number of internet-enabled devices available within the household can restrict the amount of time children can devote to online learning. This may be especially pertinent during the COVID-19 pandemic, as the demand for these devices will be greater in multi-child households and households where parents must now work from home. Lower income households may be at particular risk for this as previous research has shown that lower income families are more likely to have to share devices with other household members compared to their higher income counterparts (Rideout and Katz 2016). However, since individuals with higher levels of education are more likely to work from home (Turcotte 2010), this could also be an issue for higher income families given the strong positive relationship between postsecondary education and earnings (Frenette 2019).

Overall, 58.4% of households who had internet access at home had less than one internet-enabled device per household member (Table 2).¹¹ However, this varied by level of household income. Among households in the lowest income quartile, 63.0% had less than one internet-enabled device for each household member. In comparison, 56.2% of households in the highest income quartile had less than one device per household member. Households in the third quartile were also less likely than those in the lowest quartile to have less than one device per household member (56.9%).^{12,13}

10. Results were also examined by province and rural or urban area. The sample sizes for most provinces were too small to produce reliable estimates across income quartiles, with the exception of Quebec and Ontario. In Quebec, households in the lowest income quartile were less likely to have internet access at home than those in the highest income quartile (97.3% and 100.0%, respectively; statistically significant at $p < 0.10$). Similarly, 96.9% of Ontario households in the lowest quartile had internet access at home, compared to 100.0% of Ontario households in the highest income quartile ($p < 0.10$). Overall, there were no significant differences in home internet access between rural and urban households.

11. Information about internet-enabled devices in the home was determined from the survey question: "During the past three months, what devices did you use to access the internet?"

12. This result was statistically significant at $p < 0.10$. The difference between the lowest and second lowest income quartile was not statistically significant.

13. The average number of devices was also lower among households in the lowest income quartile (0.77) compared to households in the highest income quartile (0.87).

Table 2**Number of internet-enabled devices used per household member by household income quartile, households with home internet access, 2018**

	Lowest quartile	Second quartile	Third quartile	Highest quartile	Total
	percent				
Less than one device per household member	63.0	60.7	56.9	56.2	58.4
At least one device per household member	37.0	39.3	43.1	43.9	41.6

Sample: Households with children under 18 who have internet access at home.

Note: Results for the highest quartile do not sum to 100% due to rounding.

Source: Statistics Canada, Canadian Internet Use Survey, 2018.

Lower income households more likely to rely on mobile devices to access the internet than higher income households

The quality of students' learning activities at home may also be affected by the type of devices available to them. While mobile devices such as smartphones and tablets are often seen as a means to encourage independent learning, they are primarily designed for receiving information rather than producing information (Dias and Victor 2017; Napoli and Obar 2014). Mobile devices also have more technical limitations than personal computers¹⁴, such as less memory and storage capacity (Napoli and Obar 2014), and some educational activities are more difficult to accomplish on mobile devices. For example, reading and writing large amounts of text are more challenging on mobile devices than personal computers due to differences in screen size and ease of use of the keyboard (Dias and Victor 2017; Napoli and Obar 2014).

Previous studies have found that lower income families are less likely to have personal computers at home, relying instead on mobile devices to access the internet (Chen 2015; Looker and Thiessen 2003; Rideout and Katz 2016). The results of this study support this finding with more recent data. Among households that had internet access at home, lower income households were far more likely than higher income households to use only mobile devices¹⁵ to access the internet at home (Table 3). Nearly one-quarter (24.1%) of households in the lowest income quartile reported using only mobile devices for accessing the internet, three times higher than the share among households in the highest income quartile (8.0%). Households in the lowest quartile were also significantly more likely to use only mobile devices to access the internet than those in the second and third income quartiles, which registered rates of 14.7% and 13.8%, respectively. Moreover, households in the second and third income quartiles were more likely than households in the highest quartile to use only mobile devices to access the internet.

14. Personal computers are defined as desktops, laptops and netbooks in the current study.

15. Mobile devices are defined as smartphones, tablets and other mobile devices such as handheld gaming consoles, e-book readers or smart watches. Although laptops and netbooks are often categorized as mobile devices, they are identified as personal computers for the purposes of this study as they perform a wider range of tasks and facilitate similar educational activities as desktop computers.

Table 3**Type of devices used to access the internet by household income quartile, households with home internet access, 2018**

	Lowest quartile	Second quartile	Third quartile	Highest quartile	Total
	percent				
Mobile devices only	24.1	14.7	13.8	8.0	13.5
Personal computer (with or without mobile devices)	75.9	85.3	86.2	92.0	86.5

Sample: Households with children under 18 who have internet access at home.

Source: Statistics Canada, Canadian Internet Use Survey, 2018.

Reduced instructional time associated with poorer performance in reading, mathematics, and science

With schools being closed, students who cannot access online learning resources with adequate devices may not participate in many learning-based activities. Moreover, it is not known if those activities will be effective at fostering learning. If certain students are prevented from learning online either due to limited access or because online learning does not benefit them, then they may fall behind academically. To what extent exactly? There is no way to know for sure, although an earlier study may provide some insight as it estimated the relationship between instructional time and academic performance in reading, mathematics and science among a sample of 15 and 16-year old youth (Frenette 2008).

The study found that students who received one less year of instructional time (because they were born just after the school entry cut-off date) achieved, on average, a score that was 6% lower on a standardized reading test than their counterparts with one additional year of schooling, 5.9% lower in mathematics, and 4.0% lower in science. Poorer results were also achieved in all three sub-components of the reading test, including retrieving (5.9% lower), interpreting (6.3% lower), and reflecting (5.0% lower). All of these results were virtually unchanged when students who were very close in age according to their exact date of birth and came from similar socio-economic backgrounds were compared.

Boys and youth from the lower half of the parental income distribution were more susceptible to reduced instructional time in certain academic areas

Reduced schooling was associated with different levels of academic performance, depending on sex and parental income.

Boys who received one less year of schooling performed 7.3% poorer on the mathematics test, on average, than their counterparts with one additional year of schooling. This difference was considerably larger than girls, who registered test scores that were 4.7% lower when they had one year less of schooling.

Similarly, the academic performance of youth from the bottom half of the parental income distribution was more strongly associated with time spent in school compared to their higher-income counterparts. Specifically, youth from the bottom half of the income distribution performed 7.0% lower in reading and 5.3% lower in science with one less year of schooling. In contrast, youth from the top half of the income distribution only performed 3.9% lower in reading and 1.9% lower in science with one less year of schooling.

Conclusion

While several measures have been put into place to limit the spread of COVID-19 in Canada, it is important to consider the potential non-health related consequences of these measures as we move past the pandemic. One such measure, school closures, may have a negative academic impact on children. This has resulted in a need to shift students' educational activities to their home through online resources, which may have implications for the quality of learning activities in which they can participate and their subsequent academic performance.

The results of this study showed that the vast majority of households with children under the age of 18 had access to the internet in the home in 2018, with modest differences in accessibility by level of household income. However, lower income households had access to fewer internet-enabled devices per household member. Moreover, lower income households were more likely to rely on mobile devices to access the internet, which may be less effective educational tools compared to personal computers. If students do not have adequate home access to an internet device that is appropriate for learning activities, or if online learning is otherwise ineffective for them, then their academic progress may be at risk. Although the extent to which they will be affected is unknown at this time, an earlier Statistics Canada study found that students who received less instructional time (because they were born just after the school entry cut-off date) performed more poorly in on standardized tests in reading, mathematics, and science.

An additional consideration is the level of parents' involvement in their children's learning activities. Parental involvement is positively associated with the educational outcomes of students engaged in traditional, in-class learning (e.g., Barnard 2005; Fan and Chen 2001; Sheldon and Epstein 2005). However, the role of parents' engagement may be amplified when their children are engaged in online learning, as students are more likely to face difficulties with organization, self-regulation, motivation, and understanding the learning material when the teacher is not physically present (Hasler Waters, Menchaca and Borup 2014; Liu et al. 2010; Stevens and Borup 2015).

Lower-income parents tend to be less involved in their children's learning activities than parents in middle- and upper-income families (Smith 2006). This difference has been largely attributed to lower-income parents being more likely to work long hours, hold multiple jobs, or have less flexibility in their work schedules than parents in higher income families (Smith 2006; Heymann and Earle 2000; O'Sullivan, Chen and Fish 2014). Additionally, higher income parents typically have higher levels of education (e.g., Frenette 2019). This may benefit students who are engaged in online learning at home as higher educated workers are more likely to be able to work at home (Turcotte 2010), have higher educational expectations for their children (Frenette 2007) and may be in a better position to help their children understand more advanced material, particularly at the high school level.

References

- Barnard, W. M. 2004. "Parent involvement in elementary school and educational attainment." *Children and Youth Services Review*, 26(1): 39–62.
- British Columbia Ministry of Education. 2020. *Supporting the K-12 Education Response to COVID-19 in B.C.* March 27. www.sd8.bc.ca/sites/default/files/k-12-covid-19-integrated-planning-framework---march-27-2020.pdf. Accessed March 30, 2020.
- Chen, B. 2015. "Exploring the digital divide: The use of digital technologies in Ontario public schools." *Canadian Journal of Learning and Technology*, 41(2): 1-23.
- Dias, L. and A. Victor. 2017. "Teaching and learning with mobile devices in the 21st Century digital world: Benefits and Challenges." *European Journal of Multidisciplinary Studies*. Vol. 2, No. 5, pp. 339-344.
- Fan, X. and M. Chen. 2001. "Parental involvement and students' academic achievement: A meta-analysis." *Educational Psychological Review*, 13(1): 1–22.
- Frenette, M. 2007. *Why Are Youth from Lower-income Families Less Likely to Attend University? Evidence from Academic Abilities, Parental Influences, and Financial Constraints*. Analytical Studies Branch Research Paper Series, Catalogue no. 11F0019MIE no. 295. Ottawa: Statistics Canada.
- Frenette, M. 2008. *The Returns to Schooling on Academic Performance: Evidence from Large Samples around School Entry Cut-off Dates*. Catalogue no. 11F0019M no. 317. Ottawa: Statistics Canada.
- Frenette, M. 2019. *Are the Career Prospects of Postsecondary Graduates Improving?* Analytical Studies Branch Research Paper Series, Catalogue no. 11F0019M no. 415. Ottawa: Statistics Canada.
- Government of Alberta. 2020. *Student learning during COVID-19*. www.alberta.ca/student-learning-during-covid-19.aspx. Accessed March 27, 2020.
- Government of Prince Edward Island. 2020. *Home learning resources*. Department of Education and Lifelong Learning. www.princeedwardisland.ca/en/information/education-and-lifelong-learning/home-learning-resources. Accessed March 27, 2020.
- Government of Quebec. 2020. *Situation of the coronavirus (COVID-19) in Québec: Closing of schools and childcare services*. <https://www.quebec.ca/en/health/health-issues/a-z/2019-coronavirus/situation-coronavirus-in-quebec/>. Accessed March 30, 2020.
- Hasler Waters, L., M.P. Menchaca, M. P., and J. Borup. 2014. "Parental involvement in K-12 online and blended learning." In R. E. Ferdig and K. Kennedy (Eds.), *Handbook of research on K-12 online and blended learning* (pp. 325–346). Pittsburgh, PA: ETC Press.
- Heymann, S.J. and A. Earle. 2000. "Low-income parents: How do working conditions affect their opportunity to help school-age children at risk?" *American Educational Research Journal*, 37(4): 833-848.
- Liu, F., E. Black, J. Algina, C. Cavanaugh and K. Dawson. 2010. "The validation of one parental involvement measurement in virtual schooling." *Journal of Interactive Online Learning* 9(2): 105-132.

Looker, E.D. and V. Thiessen. 2003. "Beyond the digital divide in Canadian schools: From access to competency in the use of information technology." *Social Science Computer Review* 21(4): 475-490.

Napoli, P.M. and J.A. Obar. 2014. "The emerging mobile internet underclass: A critique of mobile internet access." *The Information Society*, 30: 323-344.

Ontario Ministry of Education. 2020. "Learn at home." <https://www.ontario.ca/page/learn-at-home> Accessed March 27, 2020.

O'Sullivan, R.H., Y-C Chen and M.C. Fish. 2014. "Parental mathematics homework involvement of low-income families with middle school students." *School Community Journal* 24(2): 165-188.

Rideout, V. J. and V.S. Katz. 2016. *Opportunity for all? Technology and learning in lower-income families*. A report of the Families and Media Project. New York: The Joan Ganz Cooney Center at Sesame Workshop.

Sheldon, S. B. and J.L. Epstein. 2005. "Involvement counts: Family and community partnerships and mathematics achievement." *The Journal of Educational Research*, 98(4): 196–206.

Smith, J. G. 2006. "Parental involvement in education among low-income families: A case study." *School Community Journal*, 16: 43-56.

Statistics Canada. Table 22-10-0007-01. Household access to the Internet at home, by household income quartile and geography.

Statistics Canada. Table 22-10-0113-01. Use of internet services and technologies by age group and household income quartile.

Stevens, M. and J. Borup, J. 2015. "Parental engagement in online learning environments: A review of the literature." In M. F. Rice (Ed.), *Advances in research on teaching volume 25: Exploring pedagogies for diverse K12 online learners* (pp. 95-111). Bingley, UK: Emerald Group Publishing.

Turcotte, M. 2010. "Working at home: An update." *Canadian Social Trends*, Catalogue no.11-008-X. Ottawa: Statistics Canada.