ANNENBERG
BROWN UNIVERSITY

EdWorkingPaper No. 22-671

Socio-economic inequalities in opportunities and participation in in-person learning during the COVID-19 pandemic

Juan Pablo Valenzuela
Universidad de Chile

Eduardo A. Undurraga
Pontificia Universidad Católica de Chile

Danilo Kuzmanic
Universidad de Chile

Andrea Canales
Pontificia Universidad Católica de Chile

Susana Claro
Pontificia Universidad Católica de Chile

Fernanda Cortés
Pontificia Universidad Católica de Chile

The disruption of in-person schooling during the Covid-19 pandemic has affected students' learning, development, and well-being. Students in Latin America and the Caribbean have been hit particularly hard because schools in the region have stayed closed for longer than anywhere else, with long-term expected adverse consequences. Little is known about which factors are associated with the slow in-person return to school in the region and how these factors have had differential effects based on students' socio-economic status. Combining a longitudinal national survey of the Chilean school system and administrative datasets, we study the supply and demand factors associated with students' resuming in-person instruction and the socio-economic gaps in school reopening in Chile in 2021. We defined socio-economic status based on parents' education and household income. Our results show that in-person learning in 2021 was limited mainly by supply factors (i.e., sanitary, administrative, and infrastructure restrictions). However, once the supply restrictions decreased, many low-income students and their families did not resume in-person instruction. We found vast inequalities in face-to-face instruction by school's socio-economic characteristics. On average, schools in the highest 10% of the socio-economic distribution had three times higher attendance rates than the remaining 90%. We found no significant differences between schools in the lowest 90% of the distribution. After exceptionally long school closures, most school authorities, students, and their families did not return to in-person instruction, particularly those of low socio-economic status. These inequalities in in-person instruction will expand existing disparities in students' learning and educational opportunities.

VERSION: November 2022

Suggested citation: Valenzuela, Juan Pablo, Eduardo A. Undurraga, Danilo Kuzmanic, Andrea Canales, Susana Claro, and Fernanda Cortés. (2022). Socio-economic inequalities in opportunities and participation in in-person learning during the COVID-19 pandemic. (EdWorkingPaper: 22-671). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/332x-3y41

Socio-economic inequalities in opportunities and participation in in-person learning during the Covid-19 pandemic

Juan Pablo Valenzuela[1], Eduardo A. Undurraga[2,3,4], Danilo Kuzmanic[1], Andrea Canales[5], Susana Claro[2], Fernanda Cortés[2]

[1]*Center for Advanced Research in Education, Institute of Education, Universidad de Chile*

[2] *Escuela de Gobierno, Pontificia Universidad Católica de Chile*

[3] *Research Center for Integrated Disaster Risk Management (CIGIDEN), Santiago, Chile*

[4] *Canadian Institute for Advanced Research, Azrieli Global Scholars Program, CIFAR, Toronto, Canada*

[5] *Instituto de Sociología, Pontificia Universidad Católica de Chile*

Correspondence concerning this article should be addressed to Danilo Kuzmanic, Instituto de Estudios Avanzados en Educación/CIAE, Universidad de Chile, Santiago, Chile. Email: danilo.kuzmanic@ciae.uchile.cl

Author Note

Juan Pablo Valenzuela https://orcid.org/0000-0003-0445-968X

Eduardo A. Undurraga https://orcid.org/0000-0002-4425-1253

Danilo Kuzmanic https://orcid.org/0000-0003-3414-518X

Andrea Canales https://orcid.org/0000-0002-0391-1681

Susana Claro https://orcid.org/0000-0001-5168-4164

Acknowledgments: The authors acknowledge funding from the Agencia Nacional de Investigación y Desarrollo ANID, Programa de Investigación Asociativa PIA Basal Funds for Centers of Excellence [grant BF0003], and from the BHP Foundation. The funders had no role in the study design; collection, analysis, and interpretation of data; writing of the report; or in the decision to submit the article for publication. The authors also thank the collaboration of the Chilean Ministry of Education throughout this study.

Declarations of interest: none

Data availability: Data are available upon request to the Agencia de Calidad de la Educación (https://formulario.agenciaeducacion.cl/solicitud_cargar) and Ministerio de Educación (https://datosabiertos.mineduc.cl/). Data from the Survey to Monitor Open Schools during the Pandemic (https://www.covideducacion.cl/) are also available upon request. The survey is a joint initiative between Universidad de Chile and Pontificia Universidad Católica de Chile, whose objective was to collect information on Chilean schools during the pandemic.

Abstract

The disruption of in-person schooling during the Covid-19 pandemic has affected students' learning, development, and well-being. Students in Latin America and the Caribbean have been hit particularly hard because schools in the region have stayed closed for longer than anywhere else, with long-term expected adverse consequences. Little is known about which factors are associated with the slow in-person return to school in the region and how these factors have had differential effects based on students' socio-economic status. Combining a longitudinal national survey of the Chilean school system and administrative datasets, we study the supply and demand factors associated with students' resuming in-person instruction and the socio-economic gaps in school reopening in Chile in 2021. We defined socio-economic status based on parents' education and household income. Our results show that in-person learning in 2021 was limited mainly by supply factors (i.e., sanitary, administrative, and infrastructure restrictions). However, once the supply restrictions decreased, many low-income students and their families did not resume in-person instruction. We found vast inequalities in face-to-face instruction by school's socio-economic characteristics. On average, schools in the highest 10% of the socio-economic distribution had three times higher attendance rates than the remaining 90%. We found no significant differences between schools in the lowest 90% of the distribution. After exceptionally long school closures, most school authorities, students, and their families did not return to in-person instruction, particularly those of low socio-economic status. These inequalities in in-person instruction will expand existing disparities in students' learning and educational opportunities.

Keywords: school closure; Covid-19 pandemic; socio-economic status; inequalities; Global South

Word count: 6358/4500-10,000; Abstract: 244/300

Highlights

- Delays in the in-person return to school have affected students' learning, development, and well-being.
- We study the supply and demand factors associated with students' resuming in-person instruction in Chile.
- We use novel data on school reopening, infrastructure restrictions, and students' attendance throughout 2021.
- Although in-person learning was limited mainly by supply factors, lack of demand became increasingly relevant in time.
- Large socio-economic gaps prevailed in the return to in-person learning, probably leading to long-term inequalities.

Introduction

The Covid-19 pandemic resulted in the most significant disruption of the educational system in recent history. The rapid expansion of the pandemic and the vast uncertainty about the potential effects and transmission dynamics of SARS-CoV-2, the virus that causes Covid-19, led governments to implement several large-scale interventions and regulations to limit transmission (Hsiang, et al., 2020; Walker, et al., 2020). Extended school closures were one of the greatest disruptions for children and adolescents. More than 190 countries canceled in-person instruction during the pandemic's early months, affecting an estimated 1,600 million students (UNESCO, 2021; Willyard, 2021).

Several studies show that the disruption of in-person learning has resulted in significant learning losses (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996; Engzell, Frey, & Verhagen, 2021; Jaume & Willén, 2019). The longer the school closures, the greater the adverse effects on learning (Betthäuser, Bach-Mortensen, & Engzell, 2022; World Bank, UNESCO, & UNICEF, 2021). The consequences of school closures on students' learning have been aggravated by the effects of the pandemic on students' physical and mental health and the increase in unemployment, job instability, and domestic violence (Baron, Goldstein, & Wallace, 2020; Gassman-Pines, Ananat, Fitz-Henley II, & Leer, 2022; Hansen, Sabia, & Schaller, 2022; Pereda & Díaz-Faes, 2020; Singh, et al., 2020). Further, the impact of school closures is not limited to students' learning and cognitive development; it also affects the development of socio-emotional skills. In low- and middle-income countries, school closures have deprived students of essential services such as nutrition and care (Claro, et al., 2022; Haderlein, et al., 2021; Van Lancker & Parolin, 2020).

School closures have not affected all students equally. Remote or not in-person modes of instruction have had lower effectiveness among students from ethnic and racial minorities and of lower socio-economic status (Bacher-Hicks, Goodman, & Mulhern, 2021; Dreesen, et al., 2020; Haeck & Lefebvre, 2020; Kogan & Lavertu, 2021; Kuhfeld, Soland, & Lewis, 2022). This has led to substantial learning losses in disadvantaged groups and has expanded existing inequalities (Betthäuser, et al.,

2022; Domingue, et al., 2021). Moreover, the loss of educational contact with students has been greater in low-income communities. High-income students have been less affected by school closures because their schools have better infrastructure than low-income students, and their households have higher social, cultural, and economic capital. These better-off communities have adapted more effectively to the disruption of the educational system (Bacher-Hicks, et al., 2021). The increase in learning and educational inequalities will probably have long-term educational, income, and employment consequences (Hanushek & Woessmann, 2020; Parolin & Lee, 2021).

With a better understanding of SARS-CoV-2 transmission, the development of pharmaceutical interventions (e.g., Covid-19 vaccines), and improvements in clinical treatments, governments have been adapting more focused and less disruptive interventions to control the pandemic. Research suggests that the risk of infection can be substantially reduced within schools by the application of specific sanitary protocols (Ehrhardt, et al., 2020; Ertem, et al., 2021; Fukumoto, McClean, & Nakagawa, 2021; Hershow, et al., 2021) and the protective effect of pediatric Covid vaccines (Jara, et al., 2022; Walter, et al., 2022). As a result, governments and international organizations have promoted the return to in-person instruction (UNICEF, 2021b). However, the results of school reopenings have been heterogeneous. Countries in Latin America and the Caribbean have had a substantial delay in reopening schools compared to higher-income countries in 2021 (Bello, 2022; UNICEF, 2021a). The factors behind differences in reopening and socio-economic inequalities in school reopening remain poorly understood.

Chile had a flexible-and-voluntary return to in-person instruction in 2021. Face-to-face learning during the pandemic depended on the students' possibility to attend school in person (supply) and the students' and their parents' decision to return (demand). Determining the impact of the supply restrictions on in-person instruction and demand for in-person instruction by students provides essential information to manage future educational disruptions and identify the students most affected during the pandemic. Understanding the factors associated with in-person return to school by socio-economic level is vital.

In this manuscript, we study the supply and demand factors associated with students' resuming in-person instruction and the socio-economic gaps in school reopening in Chile in 2021. We combine various data sources, including data from a novel longitudinal survey with information on school reopening, schools' capacity restrictions, and students' attendance in 2021, and three administrative datasets. We defined socio-economic status based on parents' education and household income. Building on our results, we propose a bundle of policy measures that could help address some of these gaps and respond more effectively to future disruptions in the educational system.

This paper contains five sections. First, we review the literature on school closures during the pandemic. Second, we describe the educational system in Chile and the non-pharmaceutical interventions that affected learning in 2021. Next, we describe the methods and data used for this study. Last, we show the main results, discuss their implications and relation to other studies, and put them in a broader context.

Literature Review

Effect of school closures in students' development

The Covid-19 pandemic has remarkably impacted people's lives, including their physical and mental health and economic activity (Asahi, et al., 2021; Singh, et al., 2020). Extended school closures and limitations to in-person instruction have resulted in the largest disruption of learning in history. Schools closed in 19 out of every 20 countries worldwide for a median of 17 weeks (UNESCO, 2021). Along with school closures, the pandemic brought additional shocks to the students' families, including adverse health impacts (Jain & Dupas, 2022; Kidman, Margolis, Smith-Greenaway, & Verdery, 2021) and economic shocks, such as parental unemployment (Gil, et al., 2021; Hansen, et al., 2022; Sáenz & Sparks, 2020). The consequences of school closures can be profound for students' human capital, well-being, and achievement, with long-term consequences.

Soon after schools closed, researchers began simulating potential learning loss. Kaffenberger (2021) estimated that a three-month school closure could translate into a year of learning loss. Azevedo, Hasan, Goldemberg, Geven, and Iqbal (2021) forecasted a loss of ten percentage points in reading comprehension for primary school students. These predictions align with empirical research conducted worldwide. A systematic review and metanalysis in 12 countries found a persistent learning deficit, particularly large among low-income households (Betthäuser, et al., 2022). Overall, these studies show that school closures during the pandemic have led to substantial learning losses.

Research suggests that remote teaching is less effective compared to in-person schooling. However, there are relevant global heterogeneities. For instance, studies in the UK and the USA have consistently shown learning losses among primary and secondary school students (Kuhfeld, et al., 2022; Kuhfeld, et al., 2020; Renaissance Learning, 2021; Rose, et al., 2021). In Europe, primary school students show predominantly negative effects. For example, a study in the Netherlands found that learning decreased by 0.08 standard deviations (SD) during an eight-week primary school closure (Engzell, et al., 2021). Similar results were found in Belgium and Germany after nine weeks of school closures, with smaller effects in Germany (Maldonado & De Witte, 2020; Schult, Mahler, Fauth, & Lindner, 2022). In Switzerland, a computer-based evaluation of primary and secondary school students found a slowdown in learning among primary school students following an eight-week shutdown (Tomasik, Helbling, & Moser, 2021). Finally, Contini, Di Tommaso, Muratori, Piazzalunga, and Schiavon (2021) found a 0.19 SD drop in math scores among fourth graders following 15 weeks of school closure in Italy.

The results in low- and middle-income countries are more mixed. Studies in Burkina Faso, Burundi, Côte d'Ivoire, Senegal, Zambia, and Uganda found no evidence of learning loss associated with school closures (UNESCO, 2022). In contrast, research in Latin America and South Africa found extensive learning losses consistent with studies in high-income countries. For example, a study in Brazil found a drop in test scores of 0.32 SDs when comparing secondary school students' learning in 2020 (Lichand, Dória, Neto, & Cossi, 2021). A study in Mexico showed that 10 to 15-year-old

students experienced a learning loss of 0.34 to 0.45 SD in reading and 0.62 to 0.82 SD in mathematics (Hevia, Vergara-Lope, Velásquez-Durán, & Calderón, 2022). In South Africa, after a ten-week school closure in 2020 and a delayed school reopening in 2021, a survey of primary students' reading ability found they learned half of what was expected based on learning before the pandemic (Shepherd & Mohohlwane, 2021).

Empirical research consistently shows that compounding pre-pandemic learning gaps, learning loss affects the most disadvantaged students (poorest, minorities, and low performers) and is concentrated in the most disadvantaged schools (Curriculum Associates, 2021; Halloran, Jack, Okun, & Oster, 2021; Kuhfeld, et al., 2022; Rose, et al., 2021). In the Netherlands, learning losses were 60 percent higher for students whose parents had lower education (Engzell, et al., 2021). Similarly, disadvantaged children were likelier to experience a more significant decline in learning in the United Kingdom and Mexico (Hevia, et al., 2022; Renaissance Learning, 2021; Rose, et al., 2021). In the USA, achievement gaps between schools with low and high poverty levels widened by 0.10 SD (Kuhfeld, et al., 2022). Learning losses were larger in districts with a higher share of Black and Hispanic students (Halloran, et al., 2021). In Belgium, inequality within schools rose by between 17 and 20 percent, with more considerable learning losses in schools with more disadvantaged students (Maldonado & De Witte, 2020). Research also shows that the more extensive school closures, the larger the adverse learning effects (Betthäuser, et al., 2022; World Bank, et al., 2021).

Inequality in school reopening modes and student attendance

Schools, districts, and countries have used various learning modes to mitigate SARS-CoV-2 transmission (Kaufman & Diliberti, 2021). Some schools remained closed, others provided remote learning options (partially or fully remote), and some operated entirely in-person (Henderson, Peterson, & West, 2021).

There have been substantial socio-economic, racial, and geographical disparities in instruction modalities during the pandemic. Compared to wealthier countries, the poorest countries remained

closed substantially longer (UNESCO, 2021). Extant research from the USA shows that more substantial schooling disruptions affected districts and schools with higher proportions of disadvantaged students (Haderlein, et al., 2021; Parolin & Lee, 2021). Compared to wealthier school districts, districts serving larger proportions of non-white students in cities and areas with higher poverty were more likely to begin the 2020-21 school year with remote instruction (Hartney & Finger, 2020; Marshall & Bradley-Dorsey, 2020; Schweig, McEachin, Kuhfeld, Mariano, & Diliberti, 2022). Private schools, which students from higher socio-economic backgrounds mostly attend, were closed for significantly fewer days than public schools (Fuchs-Schündeln, et al., 2021). Similarly, secondary schools were also more severely affected by disruptions than elementary schools. Recent research suggests that school closures during the 2020-2021 school year disproportionately affected districts with less in-person and more virtual learning in the previous academic year (Halloran, et al., 2021; Henderson, et al., 2021; Oster, et al., 2021).

Schools and districts that offered hybrid and virtual instruction rotated between different numbers of days in school and the degree of synchronous instruction (Marshall & Bradley-Dorsey, 2020). Compared to schools with in-person instruction, schools that provided remote teaching were more likely to shorten the school day, cut instructional minutes, and eliminate some non-core courses (Schweig, et al., 2022). Private and elementary schools experienced a smaller drop in attendance during the pandemic than public and secondary schools (Fuchs-Schündeln, et al., 2021). Overall, private and elementary school students have more effective instructional time. As is well-established, scheduled teaching time is a significant predictor of student achievement (Karweit & Slavin, 1982).

Once schools reopened, parental preferences for remote learning endured in many cases. Higher-income parents were more likely to prefer in-person schooling for their children, potentially exacerbating the socio-economic gap in learning losses due to remote learning (Haderlein, et al., 2021). Students from ethnic and racial minorities in the USA were more likely than white students to have remotely started the school year 2021-2021 (George, 2021). Parents from minority groups were less likely to want their children to attend in-person classes.

Despite the growing evidence from high-income countries, little is known about socio-economic disparities in exposure to in-person learning during 2021 in other settings and to what extent supply-side restrictions determined in-person learning, including sanitary, administrative, and infrastructure restrictions, or demand-side factors, such as parents deciding not to send their children to school.

We address this gap in the literature by examining the Chilean school system during the pandemic. Two characteristics of the Chilean experience are worth highlighting. First, the Ministry of Health limited students' possibilities to return to in-person instruction, especially during the first semester of 2021 (March-July). In-person instruction depended on epidemiological conditions in the school's municipality and the school administrator's voluntary decision to reopen. On July 19, 2020, the Ministry of Health implemented a gradual five-phase program, *Paso a Paso*, with local quarantines only in Phase 1 (Ministerio de Salud, 2020); schools in Phase 2 or higher were allowed to resume in-person instruction. Schools had to comply with a strict sanitary protocol to reopen (Ministerio de Educación, 2021). The protocol included differentiated schedules for starting and ending classes, mandatory masks, adequate ventilation, frequent hand-washing, and distance rules of at least one meter (3.2 ft.) between students. Mandatory distancing forced schools to restrict the number of students allowed in a classroom (*capacity restrictions*). The principal's decision to reopen was strongly associated with the schools' socio-economic status. Also, capacity restrictions primarily affected lower-income schools because of their limited infrastructure. Second, even when these schools reopened for in-person instruction, attendance was voluntary in 2021. A more detailed description of the school system is shown in the Supplementary Material.

Materials and Methods

Data

We combined primary and secondary datasets, including a longitudinal national survey of the Chilean school system and administrative datasets. The longitudinal survey is a joint initiative between

Universidad de Chile and Pontificia Universidad Católica de Chile in collaboration with the Chilean Ministry of Education to understand how schools operated during the 2021 Covid-19 pandemic. This voluntary survey was sent monthly between March and November 2021 (nine waves) to all 9,450 school principals in the Chilean educational system by email. The data contains information on school reopening, enrollment, capacity restrictions (number of students that could simultaneously attend the school), and the average number of students who attended the school each day during the week analyzed.

We complemented this data with three administrative databases. First, we used data from the Education Quality Assurance Agency (in Spanish, Agencia de Calidad de la Educación) to access the average socio-economic level of students in 8,286 schools. The agency estimates the socio-economic status (SES) based on parents' education and students' monthly household income. They divide schools into five groups: low, medium-low, medium, medium-high, and high. For ease of analysis, we grouped these categories into low SES (low and medium-low), medium SES (medium and medium-high), and high SES. Second, we used data from the Chilean Ministry of Science, Technology, Knowledge, and Innovation (Ministerio de Ciencia, 2022) to include the phase of *Paso a Paso* plan that the school was in when the surveys were sent. Last, we used data from the Ministry of Education's Academic Performance records between 2015 and 2018 to compare 2021's attendance levels to those before the pandemic in the same schools. These data provide information on the annual student attendance percentage before the pandemic.

Because the survey responses were voluntary and non-random, we weighted each observation by its representation in the total school system population to obtain results representative of the system. We calculated sample weights following Valliant and Dever (2011). Using a *logit* model, we estimated the probability of being in the final sample from the complete school system based on observable school attributes (region, urban/rural, education levels, type of secondary education, enrollment size, school administration, and SES). The sample weights correspond to the inverse of such probability.

This method also allows partial correction due to non-response in the questions of interest for this study (capacity and attendance).

Analysis Strategy

We wanted to determine to what extent factors linked to the supply and demand of in-person instruction were associated with face-to-face instruction. Supply restrictions relate to local epidemiological conditions (schools not allowed to open in Phase 1) (*sanitary restriction*), school principal's decision to not reopen (*administrative restriction*), and the classroom capacity restrictions to comply with distancing protocols (*capacity restriction*). On the other hand, demand relates to the decision of students and their families to not attend even if the school has reopened (*lack of demand*).

We defined the number of participant schools in socio-economic group g in wave o as T_{og}, which can be decomposed as:

$$T_{og} = F_{og} + C_{og} + A_{og} \quad (1)$$

where F_{og} represents the number of closed schools in Phase 1, C_{og} the number of closed schools in Phase 2 or higher, and A_{og} the number of opened schools. We defined total school enrollment i as m_i and consider that each school in the sample represents w_i schools in the school system. Thus, Equation (1) can be rewritten based on the total number of students in each group of schools, that is,

$$\sum_{i=1}^{T_{og}} w_i \times m_i = \sum_{f=1}^{F_{og}} w_f \times m_f \ + \sum_{c=1}^{C_{og}} w_c \times m_c \ + \sum_{a=1}^{A_{og}} w_a \times m_a \quad (2)$$

Only a fraction of students in open schools can attend, which is equivalent to the capacity set in each case (a_i). Of those that can attend, not all do for various reasons. If we define the number of students attending on an average day as d_i and use convenient zeros, an open school's enrollment equals

$$m_a = (m_a - a_a) + (a_a - d_a) \ + \ d_a \quad (3)$$

That is, open school enrollment equals students who cannot attend because of capacity restrictions ($m_a - a_a$) plus those students who do not attend in-person despite being able to do so ($a_a - d_a$) plus those that attend in person. By incorporating Equation (3) into Equation (2), we obtain that the total enrollment in the sample can be rewritten as:

$$\sum_{i=1}^{T_{og}} w_i \times m_i = \sum_{f=1}^{F_{og}} w_f \times m_f + \sum_{c=1}^{C_{og}} w_c \times m_c + \sum_{a=1}^{A_{og}} w_a \times (m_a - a_a) + \sum_{a=1}^{A_{og}} w_a \times (d_a - a_a) + \sum_{a=1}^{A_{og}} w_a \times d_a \quad (4)$$

By dividing this equation by the total enrollment of group g in wave o on both sides and adjusting some terms, we obtain that the fraction of students that did not have in-person instruction (*no in-person instruction*) in each wave corresponds to

$$no\ inperson\ instruction_{og} = 1 - inperson\ instruction_{og} = 1 - \frac{\sum_{a=1}^{A_{og}} w_a \times d_a}{\sum_{i=1}^{T_{og}} w_i \times m_i}$$

$$= \frac{\sum_{f=1}^{F_{og}} w_f \times m_f}{\sum_{i=1}^{T_{og}} w_i \times m_i} + \frac{\sum_{c=1}^{C_{og}} w_c \times m_c}{\sum_{i=1}^{T_{og}} w_i \times m_i} + \frac{\sum_{a=1}^{A_{og}} w_a \times (m_a - a_a)}{\sum_{i=1}^{T_{og}} w_i \times m_i} + \frac{\sum_{a=1}^{A_{og}} w_a \times (d_a - a_a)}{\sum_{i=1}^{T_{og}} w_i \times m_i}$$

$$= sanitary_{pg} + administrative_{og} + capacity\ restriction_{og} + lack\ of\ demand_{og} \quad (5)$$

The students with no in-person instruction, as a percentage of total enrollment, can be linearly decomposed as the sum of the percentage of students whose school was in Phase 1 ($sanitary_{og}$), the percentage of students whose school did not open in Phase 2 or higher ($administrative_{og}$), the percentage of students that could not attend due to school capacity restrictions ($capacity\ restriction_{og}$), and the percentage of students that, despite being authorized to attend, did not attend ($lack\ of\ demand_{og}$).

Thus, the attendance gap, for instance, between high- and low-socioeconomic-level schools can be decomposed as

$$inperson_{high} - inperson_{low}$$
$$= (sanitary_{low} - sanitary_{high}) + (administrative_{\text{low}} - administrative_{high})$$
$$+ (capacity_{low} - capacity_{high}) + (lack\ of\ demand_{\text{low}} - lack\ of\ demand_{high}) \quad (6)$$

Our central analysis seeks to decompose the share of students without in-person instruction from those who were unable to attend in-person due to supply restrictions (sanitary, administrative, and capacity) and the share of students that did not participate in in-person instruction despite being able (lack of demand). We also decompose the in-person instruction exposure gap between socio-economic groups based on the socio-economic differences in sanitary, administrative, and capacity restrictions and the student participation in in-person instruction, following Equation (6).

Results

Our final sample consists of 13,441 observations from 4,902 different schools out of 8,094 schools with available administrative data. Table 1 shows the number and socio-economic composition of participating schools in each wave, compared to all schools with available administrative data. The descriptive statistics suggest that each wave resembles the characteristics of schools in Chile.

Table 1. Enrollment's Socioeconomic Composition of the School System and Each Wave's Sample

		Survey Wave							
SES	School System	Apr 12-16	May 3-7	May 24-28	Jul 14-18	Aug 9-13	Sep 20-24	Oct 18-22	Nov 22-26
Low	41.5%	39.2%	38.1%	38.4%	37.8%	40.6%	40.8%	39.5%	41.8%
Medium	49.0%	51.0%	51.1%	50.3%	49.4%	51.3%	49.7%	52.9%	48.9%
High	9.4%	9.8%	10.9%	11.3%	12.8%	8.1%	9.6%	7.6%	9.3%
N° of schools	8094	2619	2163	1782	1685	1174	1136	1395	1487

Notes. SES denotes socio-economic status. Own elaboration based on the weighted sample. The eight waves correspond to the following weeks from left to right: April 12-16, May 3-7, May 24-28, June 14-18, August 9-13, September 20-24, October 18-22, and November 22-26.

Figure 1 shows the decomposition of total enrollment in the five components in Equation (4): school was in Phase 1 (sanitary restriction), school is closed despite being in Phase 2 or higher (administrative), the student cannot attend due to capacity restrictions (capacity restriction), the student does not attend despite being able to do so (lack of demand), and the student attends (attendance). The decomposition is done for each wave, which shows the evolution of each of the five components. To compare 2021's in-person attendance rates with those expected in a typical year, we also show the annual attendance average in 2015-2018.

First, in-person attendance was practically null during the first semester of 2021. Between April and June, the maximum attendance occurred in the fourth week of May, when a daily average of 6% of the total students enrolled attended. The main reason for this was the high incidence of Covid-19 during the first months of the school year and the restrictions implemented in the *Paso a Paso* plan to face this high incidence (sanitary restrictions). Moreover, 91% of enrolled students were in schools in Phase 1 the second week of April. This proportion decreased to 31% by the end of May and increased

again to 57% in the third week of June. However, even in the last week of May, when most schools were authorized to return to in-person instruction, 38% of students did not have their schools opened despite being in Phase 2 or higher (administrative restriction). In addition, 17% of the enrolled students could not attend due to capacity restrictions. In total, supply restrictions (sanitary, administrative, and capacity) resulted in an average of 92% of students being unable to attend daily between April and June.

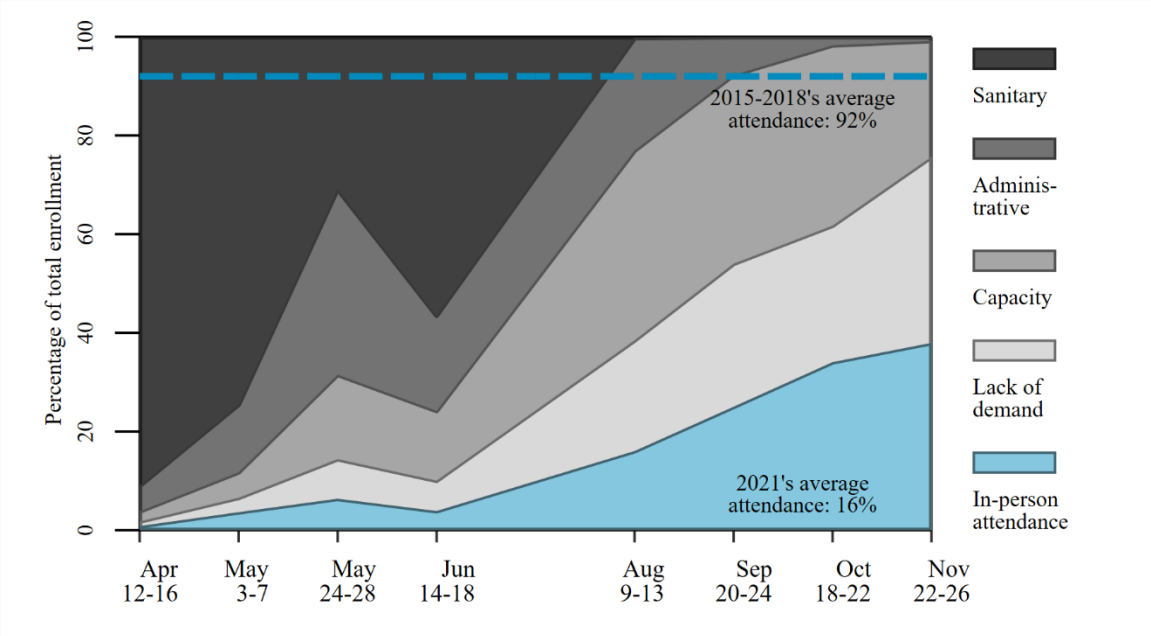

Figure 1. Average student attendance, supply restrictions (sanitary, administrative, capacity) and lack of demand for in-person instruction in 2021. Own elaboration based on the weighted sample. "Sanitary", "Administrative" and "Capacity" represent sanitary restriction (percentage of schools in Phase 1), administrative restriction (percentage of closed schools in Phase 2 or higher), and capacity restriction (the percentage that cannot attend in person due to school's capacity reductions) respectively. "2015-2018's attendance" corresponds to the average annual attendance across that period.

The significant decrease in infection rates on the national scale, the transition of all municipalities to Phase 2 or higher, and the mandatory reopening since August caused a substantial increase in school reopening during the second semester. In the third week of September, 92% of the students had their school open, extending to 98% in October. Despite the mass reopening of the school system, capacity restrictions prevented a large percentage of students from participating in daily in-person instruction. Nearly 38% of the students did not attend daily due to capacity restrictions between August and

October. This figure dropped to 24% in November, after the new school capacity policy was enacted. This policy eliminated the capacity restrictions in classrooms where at least 80% of students completed the first vaccination scheme (two doses separated by 28 days).

As the school system transitioned into a mass reopening and gradually eliminated supply restrictions, the daily attendance rate did not reach the allowed capacity. Daily attendance was 16% in the second week of August, progressively increasing to 38% in the fourth week of November, when 76% of the students were allowed to attend simultaneously. Consequently, after a school year severely affected by in-person instruction's supply restrictions, the students' and their families' decision not to participate in person turned into a critical aspect in the lack of students' exposure to in-person instructions. Between September and November, 47% of the absence of in-person exposure can be attributed to students' lack of demand for in-person instruction. On average, 67% of enrolled students did not attend in-person instruction between those months.

There are high disparities in attendance trends according to socio-economic level. Figure 2 shows the same decomposition as Figure 1 by socio-economic groups: low (Panel a), medium (Panel b), and high (Panel c). First, let us compare the attendance between socio-economic groups. We can observe that the trajectory of high-SES schools (9.4% of school system enrollment) diverges significantly from those of low- and medium-SES schools, which do not exhibit considerable differences. When sanitary restrictions decreased in May and throughout the second semester, attendance at high-SES schools exceeded the other schools, accumulating more in-person instruction experiences throughout 2021. On average, during 2021, student attendance in high-SES schools (39% on average during 2021), equals three times the average attendance of students in medium-SES schools (13%) and 2.6 times the attendance of students in low-SES schools (15%).

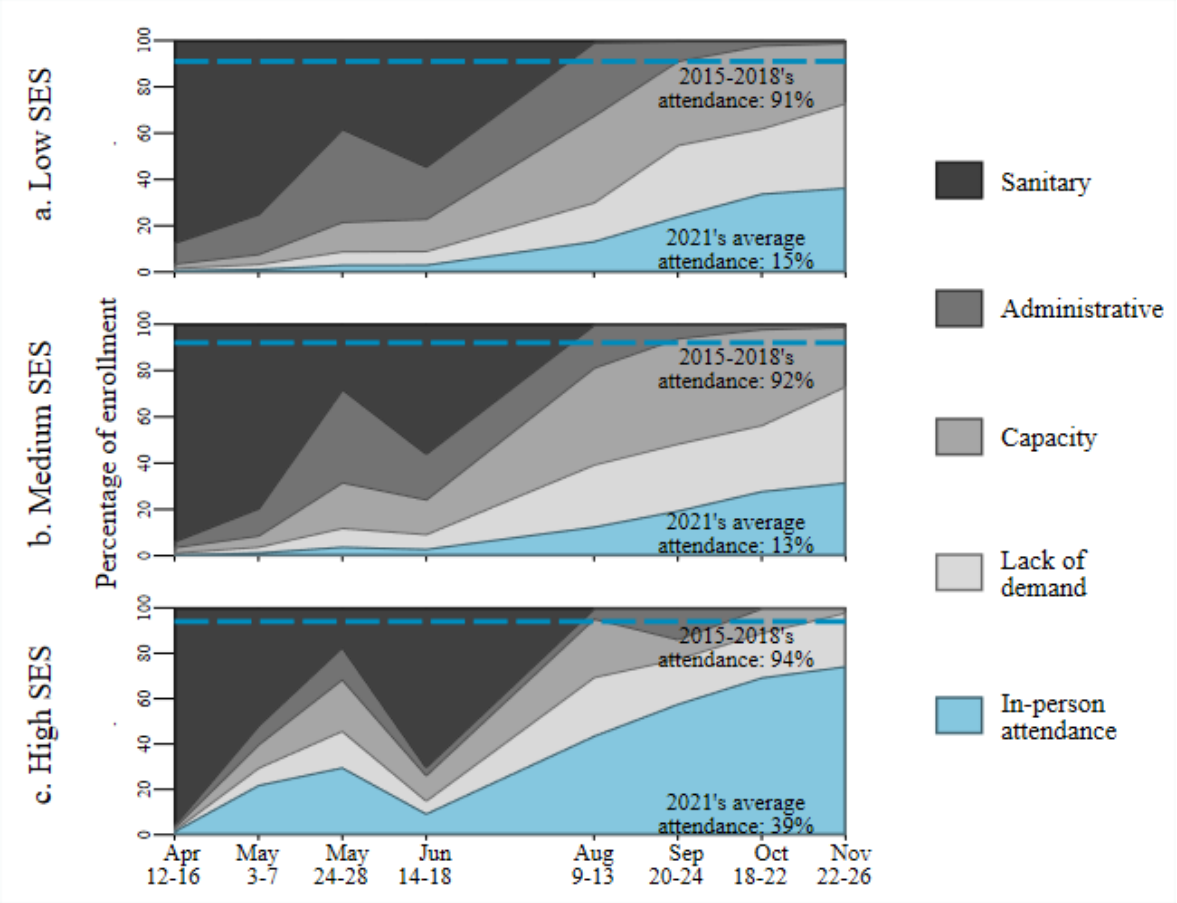

Figure 2. Average student attendance, supply restrictions (sanitary, administrative, capacity) and lack of demand for in-person instruction in 2021 by socio-economic groups. SES denotes socio-economic status. Own elaboration based on the weighted sample. "Sanitary", "Administrative" and "Capacity" represent sanitary restriction (percentage of schools in Phase 1), administrative restriction (percentage of closed schools in Phase 2 or higher), and capacity restriction (percentage that cannot attend in person due to school's capacity reductions) respectively. "2015-2018's attendance" corresponds to the average annual attendance across that period.

Next, we examine the factors associated with each trajectory. Sanitary restrictions were equally important for the three socio-economic groups throughout the year, although there was greater volatility for high-SES schools during the first semester. On the other hand, administrative restrictions played a pivotal role in the low attendance of students in lower-SES schools, particularly during the first semester, while they were not very relevant in high-SES schools. Specifically, 22% and 19% of students in low- and medium-SES schools, respectively, could not attend an average day of the first semester because their schools did not open when they could, which is a much higher percentage than the 7% of students in high-SES schools. These inequalities in administrative restrictions were due to a

great extent to a major segment of public schools (dependent on local governments in each municipality) whose authorities decided not to carry out in-person instruction during the first semester (Kuzmanic, et al., 2022). Sanitary and administrative restrictions were eliminated for all schools in the second semester. However, the latter were eliminated significantly slower in August for medium-SES schools (19% of enrollment without opening when they could) and, more importantly, low-SES schools (32% of enrollment without opening when they could).

Between September and November, supply-side restrictions kept operating differentiated by the school's SES, but now through capacity restrictions. On average, 34% of the students in low-SES schools could not attend daily during the second semester due to their school's capacity restrictions, representing 37% of their pre-pandemic attendance level. Similarly, in medium-SES schools, capacity restrictions represented 42% of their pre-pandemic attendance level during the second semester. This figure equals 13% in high-SES schools. Even with the mass reopening of the school system, students in high- and medium-low-SES schools faced entirely different possibilities to attend in-person instruction regularly due to unequal infrastructure that restricted the capacities in their schools.

Our results show a consistent lack of demand for in-person instruction. The lack of demand remained above 20% of the enrollment for the three socio-economic groups throughout the second semester. However, demand was lower in medium- and low-SES schools, especially in November, considering the partial elimination of capacity restrictions by the end of the year due to mass child vaccinations (Supplementary Material). In the last week of November, 42% and 36% of the students in medium- and low-SES schools did not attend in-person instruction when they could, compared to 24% of students in high-SES schools.

Next, we analyzed how much of the socio-economic differences result from inequalities in each supply-related restriction and how much of those result from families' unequal participation (demand). Figure 3 shows the socio-economic differences in supply restrictions and lack of demand. Panel a shows the gap between low- and high-SES schools, Panel b shows the gap between medium-

and high-SES schools, and Panel c shows the gap between medium- and low-SES schools. When added together, these gaps equal the in-person attendance gap (see equation (6)). Therefore, the differences in Figure 3 let us know how much of this gap comes from each factor. First, although epidemiological conditions imposed substantial restrictions on school reopening, these restrictions do not differ significantly across socio-economic groups. In total, only 11% of the gaps can be attributed to sanitary restrictions.

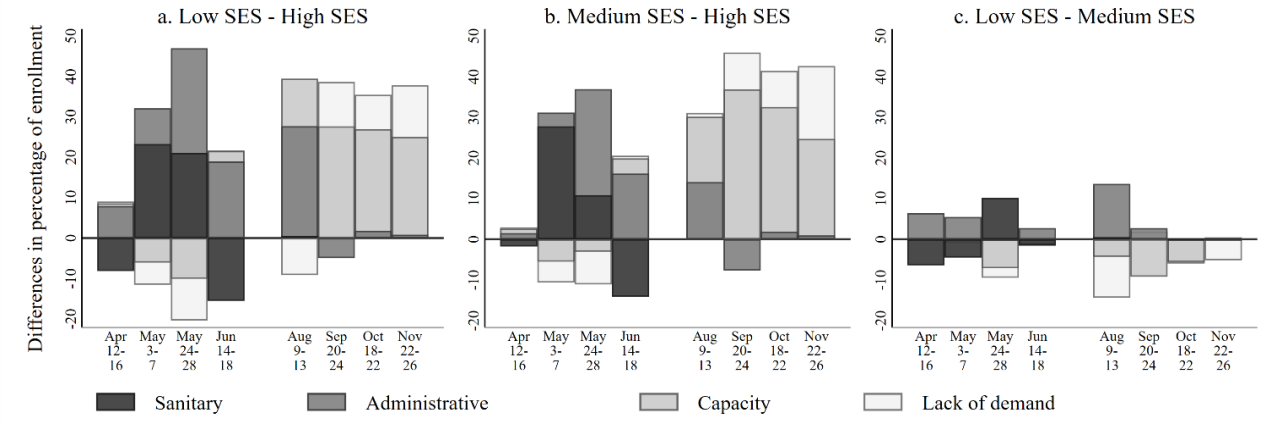

Figure 3. Socio-economic differences in supply restrictions and lack of demand. SES denotes socio-economic status. Own elaboration based on the weighted sample. "Sanitary", "Administrative" and "Capacity" represent sanitary restriction (percentage of schools in Phase 1), administrative restriction, (percentage of closed schools in Phase 2 or higher), and capacity restriction (percentage that cannot attend in person due to school's capacity reductions), respectively.

The gap between low- and high-SES schools is explained significantly by the administrative restrictions that left low-SES students without in-person instruction between May and August when their schools were allowed to reopen but decided not to open. In total, this factor explains 45% of the gap between high- and low-SES schools in 2021. Together with sanitary and capacity restrictions (40%), 96% of the socio-economic gap was caused by greater supply restrictions in low-SES schools. However, these restrictions are centered on the first half of the year. During the second semester, particularly between September and November, between 24% and 34% of the gap between high- and

low-SES schools (34-38 percentage points) was because lower-SES students participated proportionally less when supply restrictions declined.

Similar trends emerge when we decompose the gap between high- and medium-SES. Nonetheless, capacity restrictions (50% of 2021's gap) are now more critical than administrative restrictions (27% of the gap). The greater importance of administrative restrictions in low-SES schools and capacity restrictions in medium-SES schools is also observed when we analyze the narrow gap between these school groups in Panel c of Figure 3.

Discussion

This study analyzed the process of returning to in-person instruction in the Chilean school system in 2021, after almost all schools were closed in 2020, as in most Latin America and the Caribbean. Student attendance to in-person classes was meager in 2021. On average, 22% of enrolled students attended in-person instruction. Before the pandemic, this percentage was 92%. Reduced in-person learning opportunities during the pandemic were intensified because most schools reopened in 2021 with a shorter school day than before the pandemic. Even when schools reopened, they offered only 50% of the weekly hours before 2020 (Claro, et al., 2022). By including this component, the average time spent by students in in-person instruction during 2021 represented about a tenth of the time they spent before the pandemic.

In Chile, school closures as a pandemic control measure were extended until mid-2021, substantially longer than in other countries with similar incomes and OECD members (World Bank, 2022). In 2021, nearly 30% of students could not attend school in person due to restrictions associated with the epidemiological situation in their municipalities. The sanitary restrictions implemented by political and health authorities were among the leading causes of the low exposure to in-person instruction during the first two years of the pandemic in Chile. Research in 2020 already showed that schools could keep SARS-CoV-2 transmission under control with adequate sanitary protocols (Ehrhardt, et

al., 2020; Ertem, et al., 2021; Fukumoto, et al., 2021; Hershow, et al., 2021). Schools reopened late and gradually in Chile, with substantial differences by SES.

The second factor associated with low levels of in-person instruction in 2021 was that school reopening was slower than national authorities intended. Schools' local authorities resumed in-person instruction later than they could. This delay occurred mainly in the first semester and the beginning of the second semester, with more significant delays in public schools administered by municipal authorities (Kuzmanic, et al., 2022). As a result, on average, 17.3% of the students could not receive in-person instruction in 2021 because their school was not open, even if there were no other restrictions.

Beyond school reopening, returning students to classrooms is the main challenge to recovering learning and socioemotional wellbeing. In Chile, even when schools reopened, students' return was significantly restricted by the limited number of students that could be received in person to comply with distancing in school. During the second semester, after the mass reopening of the school system, only two-thirds of the students were allowed to attend due to school capacity restrictions. This situation was aggravated by the decision of many students and their families not to return to in-person classes. Families that could send their children in person did so gradually, which explains nearly half of the daily students' absenteeism in their classroom between September and November when most schools were opened.

In this context, students with lower SES were affected the most. Our results show that these students had significantly fewer in-person instruction opportunities than high-socioeconomic-level students. Lower SES students' schools took longer to reopen and had worse infrastructure conditions, which forced these schools to define smaller capacities when reopening to comply with distancing protocols. Similarly, lower-socioeconomic-level families participated proportionally less in in-person instruction once the supply restrictions became more flexible, which became an increasingly important factor throughout the year to explain the socio-economic gap in the exposure to in-person instruction.

Faced with great uncertainty and potential risks generated by an unknown respiratory virus, authorities worldwide decided to close schools as a non-pharmaceutical intervention to gain time while scientists learned more about SARS-CoV-2. However, as the results for Chile suggest, school reopening and the return to in-person instruction was a prolonged process, unable to properly balance the potential benefits of school closures with the costs for students' learning and development and their families. This tension between the urgency to resume in-person instruction and the delay of school communities to respond under uncertainty was observed among authorities, school managers, and families. Following an extended period of school closure, many families were unsure about sending their children to in-person instruction. The reluctance of students and their parents to attend school in person hints at the complex decision-making process under uncertainty and fear. This result suggests a critical path for future research to improve emergency response strategies in school contexts.

The large impact of prolonged school closures, particularly among vulnerable populations, underscores the importance of striking a balance between interventions that reduce sanitary risks and the protection and fostering of student development. A more balanced assessment of the trade-offs between the costs and benefits of large-scale non-pharmaceutical interventions to control the pandemic, such as school closures, needs to be reviewed with participation from authorities, scientists, and the educational community. One lesson from this pandemic is that reopening schools is challenging, and this major disruption in education will have long-term effects on students' education, income, and employment opportunities. Now we know that schools should be the last to close and the first to reopen, ensuring that the conditions for this are met in every school, particularly those in vulnerable communities. We hope that the Chilean experience sheds light on the possible reasons for students' limited in-person instruction in other countries in the region.

References

Asahi, K., Undurraga, E. A., Valdes, R., & Wagner, R. (2021). The effect of COVID-19 on the economy: evidence from an early adopter of localized lockdowns. *Journal of Global Health, 11*, 05002.

Azevedo, J. P., Hasan, A., Goldemberg, D., Geven, K., & Iqbal, S. A. (2021). Simulating the potential impacts of COVID-19 school closures on schooling and learning outcomes: A set of global estimates. *The World Bank Research Observer, 36*, 1-40.

Bacher-Hicks, A., Goodman, J., & Mulhern, C. (2021). Inequality in household adaptation to schooling shocks: Covid-induced online learning engagement in real time. *Journal of Public Economics, 193*, 104345.

Baron, E. J., Goldstein, E. G., & Wallace, C. T. (2020). Suffering in silence: How COVID-19 school closures inhibit the reporting of child maltreatment. *Journal of Public Economics, 190*, 104258.

Bello. (2022). Latin America's silent tragedy of empty classrooms. In *The Economist,* .

Betthäuser, B. A., Bach-Mortensen, A., & Engzell, P. (2022). A systematic review and meta-analysis of the impact of the COVID-19 pandemic on learning. *SocArXiv, April 20*.

Claro, S., Valenzuela, J. P., Undurraga, E. A., Kuzmanic, D., & Cerda, D. (2022). Encuesta para monitoreo de colegios abiertos en tiempos de pandemia. In Centro de Políticas Públicas UC (Ed.), *Propuestas para Chile. Concurso de Políticas Públicas 2021* (pp. 71-115). Santiago: Ediciones UC.

Contini, D., Di Tommaso, M. L., Muratori, C., Piazzalunga, D., & Schiavon, L. (2021). The COVID-19 Pandemic and School Closure: Learning Loss in Mathematics in Primary Education. *IZA Discussion Paper, 14785*.

Cooper, H., Nye, B., Charlton, K., Lindsay, J., & Greathouse, S. (1996). The effects of summer vacation on achievement test scores: A narrative and meta-analytic review. *Review of educational research, 66*, 227-268.

Curriculum Associates. (2021). Understanding Student Learning. In (pp. 40). North Billerica, MA: Curriculum Associates LLC.

Domingue, B., Dell, M., Lang, D. N., Silverman, R. D., Yeatman, J., & Hough, H. (2021). The effect of COVID on oral reading fluency during the 2020-2021 academic year. *EdArXiv, 28 Sept*.

Dreesen, T., Akseer, S., Brossard, M., Dewan, P., Giraldo, J.-P., Kamei, A., Mizunoya, S., & Ortiz, J. S. (2020). Promising practices for equitable remote learning: Emerging lessons from COVID-19 education responses in 127 countries. *Innocenti Research Brief, 10*.

Ehrhardt, J., Ekinci, A., Krehl, H., Meincke, M., Finci, I., Klein, J., Geisel, B., Wagner-Wiening, C., Eichner, M., & Brockmann, S. (2020). Transmission of SARS-CoV-2 in children aged 0 to 19 years in childcare facilities and schools after their reopening in May 2020, Baden-Württemberg, Germany. *Eurosurveillance, 25*, 2001587.

Engzell, P., Frey, A., & Verhagen, M. D. (2021). Learning loss due to school closures during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences, 118*, e2022376118.

Ertem, Z., Schechter-Perkins, E. M., Oster, E., van den Berg, P., Epshtein, I., Chaiyakunapruk, N., Wilson, F. A., Perencevich, E., Pettey, W. B. P., Branch-Elliman, W., & Nelson, R. E. (2021). The impact of school opening model on SARS-CoV-2 community incidence and mortality. *Nature Medicine, 27*, 2120-2126.

Fuchs-Schündeln, N., Krueger, D., Kurmann, A., Lale, E., Ludwig, A., & Popova, I. (2021). The fiscal and welfare effects of policy responses to the covid-19 school closures. *NBER Working Paper, 29398*.

Fukumoto, K., McClean, C. T., & Nakagawa, K. (2021). No causal effect of school closures in Japan on the spread of COVID-19 in spring 2020. *Nature Medicine, 27*, 2111-2119.

Gassman-Pines, A., Ananat, E. O., Fitz-Henley II, J., & Leer, J. (2022). Effect of daily school and care disruptions during the COVID-19 pandemic on child behavior problems. *Developmental psychology, 58*, 1512-1527.

George, D. S. (2021). Some families of color remain wary of returning to classrooms as new school year begins. In *The Washington Post,* . Washington DC.

Gil, D., Domínguez, P., Undurraga, E. A., & Valenzuela, E. (2021). Employment Loss in Informal Settlements during the Covid-19 Pandemic: Evidence from Chile. *Journal of Urban Health, 98*, 622-634.

Haderlein, S. K., Saavedra, A. R., Polikoff, M. S., Silver, D., Rapaport, A., & Garland, M. (2021). Disparities in Educational Access in the Time of COVID: Evidence From a Nationally Representative Panel of American Families. *Aera Open, 7*, 23328584211041350.

Haeck, C., & Lefebvre, P. (2020). Pandemic school closures may increase inequality in test scores. *Canadian Public Policy, 46*, S82-S87.

Halloran, C., Jack, R., Okun, J. C., & Oster, E. (2021). Pandemic schooling mode and student test scores: Evidence from US states. In: National Bureau of Economic Research.

Hansen, B., Sabia, J. J., & Schaller, J. (2022). Schools, Job Flexibility, and Married Women's Labor Supply: Evidence From the COVID-19 Pandemic. *NBER Working Paper, 29660*.

Hanushek, E. A., & Woessmann, L. (2020). The economic impacts of learning losses. *OECD Education Working Papers, 225*.

Hartney, M. T., & Finger, L. K. (2020). Politics, markets, and pandemics: Public education's response to COVID-19. *Perspectives on Politics*, 1-17.

Henderson, M. B., Peterson, P. E., & West, M. R. (2021). Pandemic Parent Survey Finds Perverse Pattern: Students Are More Likely to Be Attending School in Person Where Covid Is Spreading More Rapidly: Majority of students receiving fully remote instruction; private-school students more likely to be in person full time. *Education Next, 21*, 34-48.

Hershow, R. B., Wu, K., Lewis, N. M., Milne, A. T., Currie, D., Smith, A. R., Lloyd, S., Orleans, B., Young, E. L., & Freeman, B. (2021). Low SARS-CoV-2 Transmission in Elementary Schools—Salt Lake County, Utah, December 3, 2020–January 31, 2021. *Morbidity and Mortality Weekly Report, 70*, 442.

Hevia, F. J., Vergara-Lope, S., Velásquez-Durán, A., & Calderón, D. (2022). Estimation of the fundamental learning loss and learning poverty related to COVID-19 pandemic in Mexico. *International Journal of Educational Development, 88*, 102515.

Hsiang, S., Allen, D., Annan-Phan, S., Bell, K., Bolliger, I., Chong, T., Druckenmiller, H., Huang, L. Y., Hultgren, A., Krasovich, E., Lau, P., Lee, J., Rolf, E., Tseng, J., & Wu, T. (2020). The effect of large-scale anti-contagion policies on the COVID-19 pandemic. *Nature, 584*, 262-267.

Jain, R., & Dupas, P. (2022). The effects of India's COVID-19 lockdown on critical non-COVID health care and outcomes: Evidence from dialysis patients. *Social Science & Medicine, 296*, 114762.

Jara, A., Undurraga, E. A., Flores, J. C., Zubizarreta, J. R., Gonzalez, C., Pizarro, A., Ortuño-Borroto, D., Acevedo, J., Leo, K., & Paredes, F. (2022). Effectiveness of an Inactivated SARS-CoV-2 Vaccine in Children and Adolescents: A Large-Scale Observational Study. *The Lancet Regional Health - Americas*, http://dx.doi.org/10.2139/ssrn.4035405.

Jara, A., Undurraga, E. A., Zubizarreta, J. R., González, C., Acevedo, J., Pizarro, A., Vergara, V., Soto-Marchant, M., Gilabert, R., Flores, J. C., Suárez, P., Leighton, P., Eguiguren, P., Ríos, J. C., García-Escorza, H., & Araos, R. (2022). Effectiveness of CoronaVac in children 3 to 5 years during the SARS-CoV-2 Omicron outbreak in Chile. *Nature Medicine, 28*, 1377-1380.

Jaume, D., & Willén, A. (2019). The long-run effects of teacher strikes: evidence from Argentina. *Journal of Labor Economics, 37*, 1097-1139.

Kaffenberger, M. (2021). Modelling the long-run learning impact of the Covid-19 learning shock: Actions to (more than) mitigate loss. *International Journal of Educational Development, 81*, 102326.

Karweit, N., & Slavin, R. E. (1982). Time-on-task: Issues of timing, sampling, and definition. *Journal of educational psychology, 74*, 844.

Kaufman, J. H., & Diliberti, M. K. (2021). Divergent and Inequitable Teaching and Learning Pathways during (and Perhaps Beyond) the Pandemic. Key Findings from the American Educator Panels Spring 2021 COVID-19 Surveys *Data Note RAND*, RR-A168-166.

Kidman, R., Margolis, R., Smith-Greenaway, E., & Verdery, A. M. (2021). Estimates and projections of COVID-19 and parental death in the US. *JAMA pediatrics, 175*, 745-746.

Kogan, V., & Lavertu, S. (2021). The COVID-19 pandemic and student achievement on Ohio's third-grade English language arts assessment. *Ohio State University, January, 27*.

Kuhfeld, M., Soland, J., & Lewis, K. (2022). Test score patterns across three COVID-19-impacted school years. *EdWorkingPaper: 22-521*, 37-62.

Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the potential impact of COVID-19 school closures on academic achievement. *Educational Researcher, 49*, 549-565.

Kuzmanic, D., Valenzuela, J. P., Claro, S., Canales, A., Undurraga, E., & Cerda, D. (2022). Socioeconomic disparities in the reopening of schools during the pandemic in Chile *Unpublished Manuscript*.

Lichand, G., Dória, C. A., Neto, O. L., & Cossi, J. (2021). The Impacts of Remote Learning in Secondary Education: Evidence from Brazil during the Pandemic. *IDB Technical Note, 2214*.

Maldonado, J. E., & De Witte, K. (2020). The effect of school closures on standardised student test outcomes. *British Educational Research Journal, 48*, 49-94.

Marshall, D. T., & Bradley-Dorsey, M. (2020). Reopening America's schools: A descriptive look at how states and large school districts are navigating fall 2020. *Journal of School Choice, 14*, 534-566.

Ministerio de Ciencia, T., Conocimiento, e Innovación,. (2022). Base de datos COVID-19. In (Vol. 2022). Santiago de Chile: Ministerio de Ciencia, Tecnología, Conocimiento, e Innovación,.

Ministerio de Educación. (2021). Protocolo de alerta temprana en contexto de COVID-19 para establecimientos educacionales. In (Vol. 2021). Santiago, Chile: Mineduc.

Ministerio de Salud. (2020). Paso a Paso Nos Cuidamos. Plan de Acción Coronavirus Covid-19. In (Vol. 2021). Santiago: Ministerio de Salud, Gobierno de Chile.

Oster, E., Jack, R., Halloran, C., Schoof, J., McLeod, D., Yang, H., Roche, J., & Roche, D. (2021). Disparities in learning mode access among K–12 students during the COVID-19 pandemic, by race/ethnicity, geography, and grade level—United States, September 2020–April 2021. *Morbidity and Mortality Weekly Report, 70*, 953.

Parolin, Z., & Lee, E. K. (2021). Large socio-economic, geographic and demographic disparities exist in exposure to school closures. *Nature Human Behaviour, 5*, 522-528.

Pereda, N., & Díaz-Faes, D. A. (2020). Family violence against children in the wake of COVID-19 pandemic: a review of current perspectives and risk factors. *Child and adolescent psychiatry and mental health, 14*, 1-7.

Renaissance Learning, E. (2021). Understanding progress in the 2020/21 academic year: Complete findings from the autumn term. *London: Department for Education*.

Rose, S., Twist, L., Lord, P., Rutt, S., Badr, K., Hope, C., & Styles, B. (2021). Impact of school closures and subsequent support strategies on attainment and socio-emotional wellbeing in Key Stage 1. In. Berkshire: National Foundation for Educational Research.

Sáenz, R., & Sparks, C. (2020). The inequities of job loss and recovery amid the COVID-19 pandemic. *Carsey Research National Issue Brief, 150*.

Schult, J., Mahler, N., Fauth, B., & Lindner, M. A. (2022). Did students learn less during the COVID-19 pandemic? Reading and mathematics competencies before and after the first pandemic wave. *School Effectiveness and School Improvement*, In press.

Schweig, J. D., McEachin, A., Kuhfeld, M., Mariano, L., & Diliberti, M. (2022). Allocating resources for COVID-19 recovery: A comparison of three indicators of school need. *Educational Assessment, 27*, 152-169.

Shepherd, D., & Mohohlwane, N. (2021). The impact of COVID-19 in education–more than a year of disruption. *National Income Dynamics (NIDS)-Coronavirus Rapid Mobile Survey (CRAM) Wave, 5*.

Singh, S., Roy, D., Sinha, K., Parveen, S., Sharma, G., & Joshi, G. (2020). Impact of COVID-19 and lockdown on mental health of children and adolescents: A narrative review with recommendations. *Psychiatry research, 293*, 113429.

Tomasik, M. J., Helbling, L. A., & Moser, U. (2021). Educational gains of in-person vs. distance learning in primary and secondary schools: A natural experiment during the COVID-19 pandemic school closures in Switzerland. *International Journal of Psychology, 56*, 566-576.

UNESCO. (2021). COVID-19 Education Response. In (Vol. 2021).

UNESCO. (2022). Dashboards on the Global Monitoring of School Closures Caused by the COVID-19 Pandemic. In (Vol. 2022). NY: UNESCO Institute for Statistics.

UNICEF. (2021a). 3 de cada 5 niños y niñas que perdieron un año escolar en el mundo durante la pandemia, viven en América Latina y el Caribe. In (Vol. 2021). Santiago, Chile.

UNICEF. (2021b). #ReopenSchools. There's no time to lose. In (Vol. 2021). New York: UNICEF.

Valliant, R., & Dever, J. A. (2011). Estimating propensity adjustments for volunteer web surveys. *Sociological Methods & Research, 40*, 105-137.

Van Lancker, W., & Parolin, Z. (2020). COVID-19, school closures, and child poverty: a social crisis in the making. *Lancet Public Health, 5*, e243-e244.

Walker, P. G. T., Whittaker, C., Watson, O. J., Baguelin, M., Winskill, P., Hamlet, A., Djafaara, B. A., Cucunubá, Z., Olivera Mesa, D., Green, W., Thompson, H., Nayagam, S., Ainslie, K. E. C., Bhatia, S., Bhatt, S., Boonyasiri, A., Boyd, O., Brazeau, N. F., Cattarino, L., Cuomo-Dannenburg, G., Dighe, A., Donnelly, C. A., Dorigatti, I., van Elsland, S. L., FitzJohn, R., Fu, H., Gaythorpe, K. A. M., Geidelberg, L., Grassly, N., Haw, D., Hayes, S., Hinsley, W., Imai, N., Jorgensen, D., Knock, E., Laydon, D., Mishra, S., Nedjati-Gilani, G., Okell, L. C., Unwin, H. J., Verity, R., Vollmer, M., Walters, C. E., Wang, H., Wang, Y., Xi, X., Lalloo, D. G., Ferguson, N. M., & Ghani, A. C. (2020). The impact of COVID-19 and strategies for mitigation and suppression in low- and middle-income countries. *Science, 369*, 413-422.

Walter, E. B., Talaat, K. R., Sabharwal, C., Gurtman, A., Lockhart, S., Paulsen, G. C., Barnett, E. D., Muñoz, F. M., Maldonado, Y., & Pahud, B. A. (2022). Evaluation of the BNT162b2 Covid-19 vaccine in children 5 to 11 years of age. *New England Journal of Medicine, 386*, 35-46.

Willyard, C. (2021). COVID and schools: the evidence for reopening safely. *Nature, 595*, 164-167.

World Bank. (2022). Two years after. Saving a generation. In. Washington DC: The World Bank.

World Bank, UNESCO, & UNICEF. (2021). The State of the Global Education Crisis: A Path to Recovery. In. Washington D.C., Paris, New York: The World Bank, UNESCO, and UNICEF.

Supplementary Material

Chilean School System

The Chilean school system comprises 12 years of compulsory education, divided into eight years of elementary education and four of secondary education. There are also two years of non-compulsory pre-school education. The education system has two administration modes: 91% is covered by public funding, administered either by governmental institutions (35.5%) or not-for-profit organizations (55.5%). The remaining 9% is private education without state funding (Ministerio de Educación, 2021c). Public and private-subsidized schools are financed primarily through monthly payments based on the students' average attendance. Payments per student vary by socioeconomic status and learning disabilities. The amounts paid by students and their attributes do not differ between state-funded public and private schools. However, in the context of the pandemic and primarily- remote schooling, funding was not based on attendance but on historical enrollment.

Municipalities, the smallest administrative subdivision in Chile, were responsible for public education until 2017. Starting in 2018, with a gradual implementation until 2025, public education is run by 70 Public Education Local Services (SLEP). SLEPs are an administrative organization linked to the central government through the National Office of Public Education, dependent on the Ministry of Education. In 2021, 30.7% of enrolled students attended municipal schools, whereas only 4.8% of students attended SLEP-dependent schools.

Schools during the Covid-19 pandemic in Chile

On March 3, 2020, the Chilean Ministry of Health reported the first detected Covid-19 case in Chile (Ministerio de Salud, 2022). The government implemented several measures to mitigate the pandemic, including school closures on March 16 (two weeks after the first case) and stay-at-home orders at the municipal level based on the local epidemiological conditions. On July 19, 2020, the Ministry of Health implemented a gradual five-phase program, *Paso a Paso*, with local quarantines

only in Phase 1 (Ministerio de Salud, 2020). In August 2020, the government authorized schools in Phase 2 or higher to resume in-person instruction. Schools had to comply with a strict sanitary protocol to reopen (Ministerio de Educación, 2021a). The protocol included differentiated schedules for starting and ending classes, mandatory masks, adequate ventilation, frequent hand-washing, and distance rules of at least one meter (3.2 ft.) between students. Mandatory distancing forced schools to restrict the number of students allowed in a classroom (*capacity restrictions*). By the end of 2020, approximately 10% of schools had in-person instruction, although most of them had low attendance and taught only some educational levels. Schools receiving students in person continued with remote instruction and intermittent closures depending on the epidemiological situation at the municipal level. A brief description of the Chilean educational system is shown in the Supplementary Material.

On February 2, 2021, the government began a mass vaccination campaign against Covid-19, prioritizing the elderly, people with Covid-19-related comorbidities, and health and education workers (Jara, et al., 2021). Partly due to a successful vaccination campaign and other non-pharmaceutical interventions to control de pandemic, on March 1, 2021, the Ministry of Education prioritized in-person activies for the 2021 school year. Under a strict sanitary protocol, the reopening of schools and attendance were voluntary, and remote education was maintained (Ministerio de Educación, 2021b). Each school put together an operation plan for 2021, combining various schedules and shifts to comply with the maximum capacity that allowed students to keep the proper distance. Some schools declared not being prepared for in-person instruction.

During the first school semester of 2021, there were substantial sanitary restrictions for reopening because many municipalities were in Phase 1 of the *Paso a Paso* plan. However, mass vaccination of children led to a gradual decrease in restrictions. On March 31, 2021, the Chilean Public Health Institute authorized the vaccination of adolescents from 12 to 16 years old. On July 15, 2021, all schools were allowed to open, even during Phase 1 of *Paso a Paso*. The Institute authorized the vaccination of children from 6 to 11 years old on September 6, 2021, while the authorization for children older than three years old was effective on November 25, 2021 (Jara, et al., 2022). On October 1, 2021, the

Ministry of Health eliminated the capacity restrictions in schools with more than 80% vaccinated students (https://vacunacionescolar.mineduc.cl/). In November, about three-quarters of the schools reported having at least one class with 80% of vaccinated students. Compared to high-income schools, lower-income schools reopened later at the elementary and pre-school levels (Claro, et al., 2022).