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Long-Run Economic Losses from COVID-Related Preprimary Program Closures in Latin America and the Caribbean

RESEARCH

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ABSTRACT

Hundreds of millions of children are losing learning opportunities, resulting in potentially large losses in their lifetime education, health, income, and productivity. Losses in long-term earnings from preprimary program closures due to COVID-19 can be unprecedented. Acute effects are plausible for such disruptions early in life when brains are rapidly developing and are very sensitive to environmental changes. This study briefly reviews existing literature related to the effects of preprimary programs and builds on this literature to present the first simulations of the long-run earnings losses—when current preschool-age children become adults—due to COVID-19 related preprimary-program closures in Latin America and the Caribbean (LAC). The simulations are available for 26 LAC countries, representing varied contexts in terms of pre-pandemic preprimary-participation rates, income levels, and demographic indicators. Our results suggest that the present discounted value of lifetime losses is considerable, up to 4 percent of current annual GDPs. Timely policies, such as the implementation of remedial strategies, are needed to mitigate the effects of preprimary-program closures.

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1. INTRODUCTION

Due to the COVID-19 pandemic, the world experienced an unprecedented closure of schools, (UNESCO, n.d.) including preprimary programs.[1] Figure 1 presents the average number of days from March 1, 2020 to July 31, 2021, by Sustainable Development Goal (SDG) regions, that schools in each country were in the following categories: "closed due to COVID-19," "fully open," or "partially open."[2] Latin America and the Caribbean (LAC) is the region with the longest closures and the fewest fully opened days in the world (191 and 92 on average, respectively, for the 518-day period that also includes academic breaks). Preprimary closures in LAC during the pandemic affected 22.3 million children between 3 and 5 years old enrolled in those programs. Despite programs' efforts to stay in contact with the children and their families and to continue offering some services remotely (Hincapie, Lopez Boo, and Rubio-Codina 2020), the existing evidence suggests that this situation is likely to seriously undermine children's development, learning, and physical and mental health, resulting in potentially dramatic losses in their lifetime education and earnings.

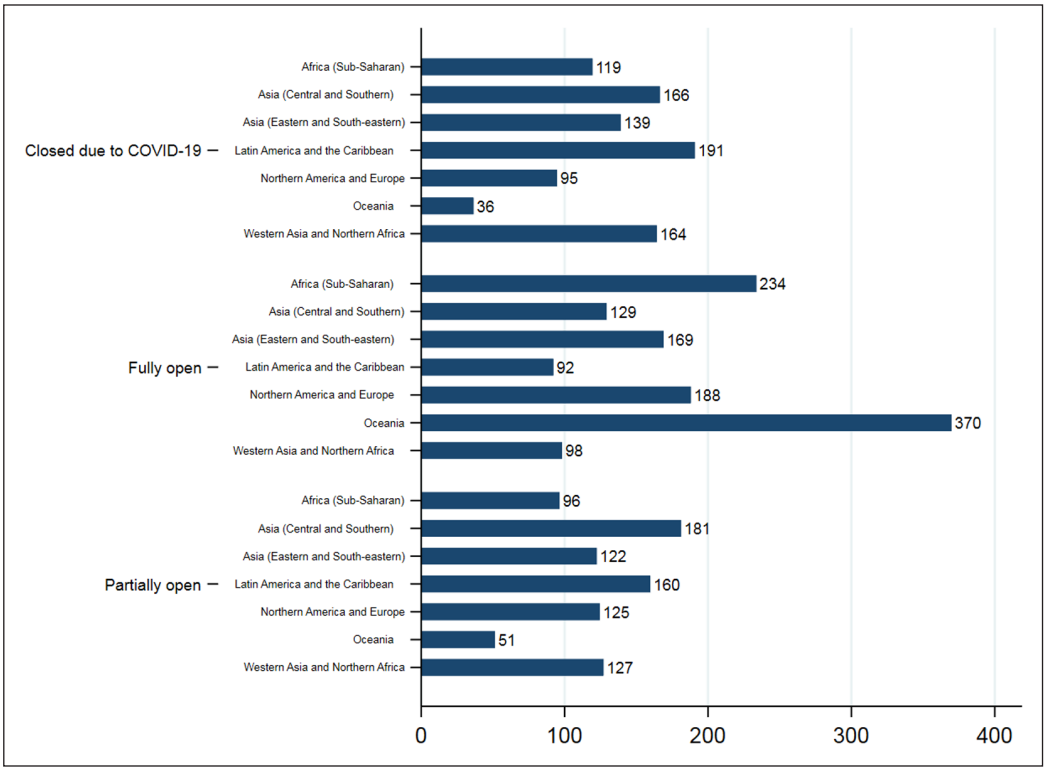

Figure 1 Average Number of Days Schools Were Closed, Fully or Partially Open in Each Country from March 2020 to July 2021 by Region.

NOTE: 208 countries. Source: Own elaboration based on UNESCO map on school closures (https://en.unesco.org/covid19/educationresponse). The period studied is from March 1st to July 31st (518 days). This graph does not include the category "academic breaks", reason why the sum of the categories per region does not add up to 518 days.

COVID-19's potential risks for children are discussed in a recent paper (Yoshikawa et al. 2020). Other studies have examined the substantial negative impact of the pandemic on primary and secondary school-age children (Azevedo et al. 2020; Viner et al. 2020) and earnings loses due to school closures (Psacharopoulos et al. 2020). However, these studies generally make no mention of preprimary programs, which are key for SDG Target 4.2: 'By 2030, ensure that all girls and boys have access to quality early childhood development, care, and preprimary education so that they are ready for primary education,' and have been shown to be important for children's intellectual development, later educational progress, and lifetime earnings (Britto et al. 2017; Richter et al. 2017; Black et al. 2017; Richter et al. 2019; Yoshikawa et al. 2018). The one exception presents global estimates disaggregated by country income groups, but does not present estimates for LAC or the individual countries in LAC (McCoy et al. 2021).

1 The term preprimary corresponds to educational programs available to children aged 3 to the start of primary education (typically, ages 4 to 6 years).

2 Partially open schools are: (a) open in certain regions and closed in others; and/or (b) open for some grades, levels, or age groups and closed for others; and/or (c) open with reduced in-person class time, combined with distance learning.

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We address this gap by reviewing the evidence related to long-run effects of preprimary programs and simulating long-run economic losses of preprimary-program participation reductions due to the pandemic. We simulate for 26 LAC countries with combined populations of around 308 million people the present discounted values of losses in future earnings related to preprimary programs closures due to national and local strategies to contain the pandemic. Our simulations size the effects and inform timely mitigation policies and practices for children, their families, and society.

2. EVIDENCE RELATED TO PLAUSIBLE LONG-RUN IMPACTS OF COVID-19 ON YOUNG CHILDREN

The COVID-19 pandemic may have devastating impacts on young children's physical, mental, and emotional development, both immediately and in the long run. Studies tracking individuals conceived, in utero, through infancy, and through early childhood during pandemics, natural disasters, and famines (e.g., the 1918–1919 influenza pandemic, the 1959–1961 Chinese famine) demonstrate that those exposed can suffer life-long negative consequences (Majid and Behrman 2020). These possibilities have received little attention regarding the COVID-19 pandemic, possibly because of the low rates of COVID-19 observed among very young children.

Child mortality, morbidity, and poverty are estimated to rise as consequences of measures to contain the pandemic. A recent article in *The Lancet* (Roberton et al. 2020) projects a potential rise in worldwide infant mortality for the first time in over 60 years due to the indirect impacts on children's nutrition and access to basic health services. This possible 10 percent to 50 percent increase is driven by acute malnutrition (low weight-for-height) and reduced availability of oral-rehydration solutions for diarrhea and antibiotics for pneumonia and neonatal sepsis. There is also alarming evidence that immunization schedules are being interrupted in many countries.

In addition to its effects on health and living conditions, the pandemic is precluding millions of children from attending preprimary programs. The literature has shown that these programs have long-lasting effects, including impacts on labor-market outcomes, as we present in the following section. In the early years, when developing brains are more sensitive to the lack of responsive environments and the window of opportunity is very age-specific (Nelson et al. 2007), the closure of preprimary programs will not only further multiply current negative impacts by lessening subsequent learning (Cunha and Heckman 2007), it will also amplify the socioeconomic-status gradient in early childhood development (Heckman 2008; Schady et al. 2015; Schady and Berlinski 2015), leading to more pronounced inequalities later on. Even when families and virtual programs may compensate in part for the lack of in-person education, the recent evidence on the impact of school closures on learning outcomes suggests that this possibility is limited. We also review this evidence.

SHORT- AND LONG-RUN EFFECTS OF PREPRIMARY PROGRAMS

Preprimary programs impact outcomes throughout the life cycle. Studies from different disciplines have assessed the short-term impacts of preprimary programs. A recent study by Holla et al. (2021) uses data on impact estimates from 55 (quasi-)experimental studies conducted around the world and meta-regression methods to investigate whether preprimary investments are too low. Average effect sizes indicate significant increases in children's cognitive (0.15 Standard Deviations, SD) and executive functions, social-emotional learning, and behaviors (0.12 SD) during the preprimary period, with no significant differences between low- and middle-income countries (LMICs) and high-income countries (HICs). Disadvantaged children benefit significantly more on average from preprimary interventions. Finally, benefit-to-cost ratios for a subset of studies from Holla et al. (2021) conducted in LMICs range from 1.7 to 103.5. Thus, these results imply high returns from greater investments in preprimary education—and high losses due to preprimary closures induced by the pandemic.

Some studies followed-up children to learn about long-term impacts in youth and adulthood. The Perry Preschool Program (PPP) is a well-known preprimary program that randomly assigned

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preschool-age children to treatment and control groups and followed them into adulthood, and it has been extensively evaluated.[3] The PPP identified short- and long-term effects of high-quality preprimary education for children living in poverty. A sample of 123 low-income African-American children was identified in Michigan, and 58 of them were randomly assigned to a program group that received intensive services delivered by well-trained staff. The remaining 65 were in a control group that received no program. The project collected data on both groups at ages 3 to 11, 14, 15, 19, 27, and 40, with a missing data rate of only 6 percent across all measures. Different studies analyzing these data find positive effects on earnings at age 40 (García et al. 2020; Schweinhart et al. 2005), suggesting that participants earned 13 to 14 percent more than they would have otherwise. Outside the experimental evaluations of high-quality pilots, there are a few studies that use observational data to estimate long-term impacts of broader preprimary programs on labor market outcomes. For example, using population-level administrative data from Denmark, long-term benefits of a preschool program that targeted children from poor households were found (Rossin-Slater and Wüst 2020), although modest when compared to the PPP.

The evidence on the high impact of preprimary programs suggests that these programs are cost-effective. For instance, Engle et al. (2011) simulated that the potential long-term economic effects of increasing preschool enrollment to 25 percent or 50 percent in every LMIC had a benefit-to-cost ratio ranging from 6.4 to 17.6, depending on prior preprimary enrolment rates and discount rates.

SHORT-TERM ACTUAL LEARNING LOSSES DUE TO COVID-19

Children have many fewer learning opportunities due to their disrupted routines and confinement in their homes. For elementary-school-age children, there is an emerging literature on actual learning losses. For instance, a study in the Netherlands, where schools closed for eight weeks, showed that, even with high-quality digital infrastructure for virtual learning, test scores of Dutch primary school children were significantly lower than for previous cohorts (Engzell, Frey, and Verhagen 2020). Maybe not surprisingly, the magnitude of the negative impact was equivalent to 8 weeks of normal school progress, suggesting little or no progress at all during the closure period. Also, the negative effects were over 50 percent larger for the more vulnerable elementary-age children. Early evidence on test scores in England and the US also point to big losses from missed schooling and widening inequalities. (The DELVE Initiative 2020; Rose et al. 2020; Amplify 2020). No published evidence is yet available on losses for younger children, but some preliminary studies from Chile and Uruguay show actual losses hover around 0.20–0.35 SD in the cognitive development domain (Abufhele, Lopez Boo, and Soto-Ramirez 2022; González et al. 2021).

3. SIMULATIONS OF LONG-RUN ECONOMIC LOSSES FROM PREPRIMARY-PROGRAM CLOSURES DUE TO COVID-19

Based on the literature reviewed above, we simulate the long-term economic losses due to preprimary-program closures related to the pandemic for LAC and how they vary across individual countries, in terms of the present discounted value of foregone earnings when current preprimary-age children become adults.

METHODOLOGY

Our model follows a common approach to monetize the benefits of social programs, increasing human capital through their impact on earnings. The long-term impact of preprimary programs on earnings is a key parameter in the simulation and should be estimated carefully. Apart from the Perry Preschool Program, rigorous studies following-up children to learn about the long-term impacts are scarce. For this reason, we combine the impact of preprimary programs on cognitive skills in childhood with the evidence on how improvements in early cognitive skills relate to adult

3 The Abecedarian Project (AP) is another well-known study with randomization of treatment for a small sample followed up for many years. However, the AP started with children as young as six weeks of age and continued through preschool ages, and it is not possible to identify the effects of the preprimary program alone.

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earnings. In Equation (1) the simulated earnings losses due to not attending preprimary programs, adjusted by age-specific survival and employment probabilities, are discounted and summed over the years in which income is expected to be affected for children enrolled in preprimary programs in each country. This is then multiplied by the share of days with schools closed.

$$Losses_i = \left(\sum_{j=a}^{t+a} \frac{PCI_{ij} \times l_i \times r \times w \times s_{ij} \times e_{ij}}{(1+d)^j} \right) \times N_i \times n_i \times z_i$$

Where *t* is the number of years to capture benefits (i.e., the working life), *a* is the number of years after the intervention when children enter the labor market, *d* is the discount rate, *r* is the impact of preprimary on cognitive skills in the preprimary period, *w* is the average effect of a 1 SD increase in preprimary test scores on earnings, *s* is the survival probability by age, *e* is the employment rate, *N* is the total population aged 3 to 5 years, *n* is the preprimary enrollment rate at baseline, *PCI* is gross domestic product per capita, *l* is the labor income share as a proportion of GDP (ILO modelled estimates), *z* is calculated as the number of days schools were closed over the total number of days children are supposed to attend (i.e., excluding academic breaks in each country), the index *j* indicates the year since the intervention, and the index *i* indicates the country. We also assume that children of preprimary age during the pandemic obtain a job at the same rate as other cohorts when they are adults and any decline in cognitive skills will impact the type of job obtained and related earnings.

For our base scenario we considered a relatively low discount rate (d) of 3 percent that is widely used in ex-ante economic evaluations of social programs to discount benefits that accrue in the long term, and a work time horizon (t) of 45 years for all countries. We provide sensitivity analysis for alternative values of these two assumptions.

For the impact of preprimary programs on cognitive skills at childhood (*r*) we rely on the review in section 2. The Holla et al. (2021) meta-analysis suggests an average effect of 0.15 SD on children's cognitive skills. For the relationship between improvements in cognitive skills and earnings in adulthood (w in Equation 1), Kline and Walters (2016) summarize the evidence and conclude that an earnings impact of 13 percent per SD of test scores is a conservative assumption since it is at the bottom of the range of estimates reported in the literature. This benchmark is adjusted to reflect observed patterns in returns to education by economic development (Psacharopoulos and Patrinos 2004): the impacts of preprimary programs on labor market outcomes is expected to vary across countries, with an important dimension being the returns to education. We use the patterns found in Psacharopoulos and Patrinos (2004) to adjust our parameter according to different returns to education by level of economic development. We calculate a factor based on the coefficient estimates on years of schooling by country income groups and use it to proportionally adjust the evidence on *w* in Equation 1, which comes mainly from developed countries.

To set the value of the parameter *a* we use data on the average number of completed grades of schooling by each country's population aged 25 years and older (UNESCO Institute for Statistics, n.d.). Employment rates (*e*) are ILO-modeled estimates, for survival probabilities (*s*) we use UN data, and we use IMF's longest projections on gross domestic product per capita (World Economic Outlook database, October 2019) and, after that, we rely on historical data on long-term average annual growth rate by country.

The model assumptions imply that our estimates on the life-long losses of preprimary-age children due to COVID-19 probably are conservative. First, we do not include other foregone benefits associated with preprimary programs that are hard to monetize (i.e., non-labor market productivities, physical health, mental health, and crime). Second, we assume that there are no other effects on children's education beyond preprimary program closures. Third, we only consider private returns, omitting possible externalities.[4] Finally, using the share of days in which

4 The increased earnings of individuals with higher human capital do not necessary reflect the total benefits to societies as a whole. There may also be benefits in the form of enhanced productivity spillovers to other individuals (i.e., siblings) or other production factors that are not being captured by the beneficiary of the human capital investment.

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schools were closed is conservative since the "partially open" category also implies the reduced participation of a very large number of children (i.e., in federal countries that fall in this category because only a few regions are open), and in particular for the preprimary-age group for whom distance learning is less likely. For this reason, we present an alternative scenario considering both the closed and partially open categories.

4. RESULTS

Table 1 presents our results for individual countries. Columns 1 to 3 present the number of days schools were closed due to COVID-19, fully open and partially open. Columns 4 and 5 present the future earnings foregone when children become adults as percentages of GDP, considering only the days schools were closed. It is important to note that we are comparing discounted losses over a lifetime to one period's GDP, that is, the losses are not annually equal to the share of GDP. Columns 6 through 9 present sensitivity analysis of the results in that scenario for different assumptions regarding the parameters t and d in the model. The last six columns present the results and sensitivity analysis for an alternative scenario considering the declines in preprimary program participation during the days schools were either closed or partially open.

Losses are particularly high in the Andean countries (Bolivia, Peru, and Ecuador). This is due, in part, to larger restrictions to schooling due to COVID-19 and/or greater pre-pandemic preprimary program participation in those countries. Figure 2 gives the median losses in both scenarios for the four sub-regions in LAC following the InterAmerican Development Bank classification (see: https://www.iadb.org/en/about-us/departments): Caribbean (0.7 percent and 1.3 percent of GDP), Central America (1.2 percent and 1.7 percent of GDP), Southern Cone (0.6 percent and 1.6 percent of GDP), Andean countries (2.3 percent and 4 percent of GDP).

MAIN LIMITATIONS

Our methodology has some limitations. First, we do not explicitly consider economy-wide effects in the model. We think that the equilibrium effects are not likely to be large since this cohort of children will be one of 40+ cohorts in the labor force at the same time, so the changes in supplies will have relatively small effects overall. Moreover, there may be partially offsetting changes in demands if, say, more-schooled populations demand more skill-intensive products.

Second, programs may compensate for the lack of access to in-person preprimary programs with, for example, virtual programs or other forms of learning. To tackle this issue, we adjust our estimates by considering possible switches to virtual learning. Given the available evidence on short-term learning losses due to COVID-19, we consider that the degree of substitution between in-person and virtual modalities is not perfect. This seems to be particularly the case for the youngest learners who are the objects of this study. Wide variation in the quantity and quality of virtual programs among schools, countries, and educational levels underlie much of the variation in learning losses. While almost all countries introduced remote learning support for school-age children during COVID-19 school closures, only 60 percent did so for preprimary education (Unicef 2020).

Moreover, internet access also restricts the effectiveness of these efforts to minimize the detrimental effects of the lack of access to in-person preprimary programs. In low-income countries, only 16 percent of the population on average has used the internet in the last 3 months and only 32 percent did so in low-middle-income countries (International Telecommunication Union 2020). Even in high-income countries, there is evidence of a number of children not being reached by remote learning due to a lack of internet connectivity or devices at home (Mascheroni et al. 2021). Figure 3 presents the estimates adjusting results in Table 1 by the factor $(1-x \times \alpha_i)$, where α_i is the proportion of individuals with access to the internet in the country and $x \in [0,1]$ reflects the degree of substitution between in-person and virtual modalities. Taking into account virtual programs reduces the losses, particularly in high-internet-accessibility countries, but they still are considerable.

Table 1 Estimates of the Loss Due to COVID-19-Related Reductions in 2018 Participation Rates in Preprimary Programs.

COUNTRY	NUMBER OF DAYS			LOSSES CONSIDERING DAYS SCHOOLS WERE CLOSED						LOSSES CONSIDERING DAYS SCHOOLS WERE CLOSED OR PARTIALLY OPEN					
	CLOSED	PARTIALLY OPEN	FULLY OPEN	BASE SCENARIO		d = 4%		t = 35		BASE SCENARIO		d = 4%		t = 35	
				MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP
Bahamas	133	235	15	15.6	0.1	11.0	0.1	12.0	0.1	43.1	0.3	30.3	0.2	33.1	0.3
Barbados	141	150	78	16.5	0.3	11.6	0.2	12.7	0.3	34.2	0.7	24.0	0.5	26.1	0.5
Dominican Republic	255	92	18	1,351.6	1.6	949.6	1.1	933.7	1.1	1,839.2	2.2	1,292.2	1.5	1,270.6	1.5
Haiti	128	91	211	39.7	0.3	30.2	0.2	29.9	0.2	67.8	0.4	51.7	0.3	51.1	0.3
Jamaica	99	240	12	74.8	0.5	52.9	0.3	56.2	0.4	256.1	1.6	181.1	1.2	192.3	1.2
Saint Lucia	226	154	40	8.9	0.4	6.4	0.3	6.8	0.3	15.0	0.7	10.7	0.5	11.4	0.6
Saint Vincent and the Grenadines	159	150	117	4.9	0.6	3.5	0.4	3.7	0.5	9.6	1.2	6.7	0.8	7.1	0.9
Trinidad and Tobago	130	244	13	130.9	0.6	90.3	0.4	93.5	0.4	376.7	1.6	259.6	1.1	269.0	1.1
Guyana	188	211	15	69.8	1.5	47.8	1.0	44.1	0.9	148.1	3.1	101.4	2.1	93.7	2.0
Suriname	231	0	191	38.2	1.0	26.6	0.7	26.6	0.7	38.2	1.0	26.6	0.7	26.6	0.7
Caribbean (N = 10)	**169.0**	**156.7**	**71.0**	**175.1**	**0.7**	**123.0**	**0.5**	**121.9**	**0.5**	**282.8**	**1.3**	**198.4**	**0.9**	**198.1**	**0.9**
Belize	210	99	68	10.5	0.6	7.5	0.4	8.0	0.4	15.4	0.8	11.0	0.6	11.8	0.6
Costa Rica	303	125	16	1,560.3	2.5	1,077.0	1.7	995.2	1.6	2,203.9	3.5	1,521.3	2.4	1,405.8	2.3
El Salvador	320	117	10	194.4	0.8	143.7	0.6	147.3	0.6	265.5	1.0	196.2	0.8	201.1	0.8
Guatemala	229	209	15	822.9	1.1	592.7	0.8	564.2	0.8	1,573.8	2.2	1,133.6	1.6	1,079.2	1.5
Honduras	384	61	11	329.6	1.4	244.1	1.0	241.3	1.0	382.0	1.6	282.8	1.2	279.6	1.2
Mexico	374	55	22	9,722.9	0.8	7,019.8	0.6	7,410.3	0.6	11,152.7	0.9	8,052.1	0.7	8,500.1	0.7
Panama	448	0	11	1,058.2	1.6	715.2	1.1	694.5	1.1	1,058.2	1.6	715.2	1.1	694.5	1.1
Central America (N = 7)	**324.0**	**95.1**	**21.9**	**1,957.0**	**1.2**	**1,400.0**	**0.9**	**1,437.3**	**0.9**	**2,378.8**	**1.7**	**1,701.8**	**1.2**	**1,738.9**	**1.1**

(Contd.)

COUNTRY	NUMBER OF DAYS			LOSSES CONSIDERING DAYS SCHOOLS WERE CLOSED						LOSSES CONSIDERING DAYS SCHOOLS WERE CLOSED OR PARTIALLY OPEN					
	CLOSED	PARTIALLY OPEN	FULLY OPEN	BASE SCENARIO		d = 4%		t = 35		BASE SCENARIO		d = 4%		t = 35	
				MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP	MILLION USD	%GDP
Argentina	157	287	15	2,445.3	0.5	1,723.3	0.3	1,854.7	0.4	6,915.4	1.3	4,873.6	0.9	5,245.1	1.0
Uruguay	28	282	62	51.8	0.1	36.7	0.1	37.0	0.1	573.0	0.9	405.8	0.6	409.6	0.6
Brazil	267	154	11	18,080.1	0.9	13,276.0	0.7	13,894.8	0.7	28,508.3	1.5	20,933.3	1.1	21,909.1	1.1
Chile	95	324	15	1,121.7	0.4	769.6	0.3	765.5	0.3	4,947.5	1.7	3,394.2	1.1	3,376.4	1.1
Paraguay	224	170	10	545.1	1.4	380.0	0.9	360.2	0.9	958.8	2.4	668.4	1.7	633.6	1.6
Southern Cone (N = 5)	**154.2**	**243.4**	**22.6**	**4,448.8**	**0.6**	**3,237.1**	**0.5**	**3,382.4**	**0.5**	**8,380.6**	**1.6**	**6,055.1**	**1.1**	**6,314.7**	**1.1**
Colombia	161	249	32	1,051.4	0.3	749.7	0.2	766.9	0.2	2,677.5	0.8	1,909.3	0.6	1,952.9	0.6
Ecuador	274	158	12	2,691.6	2.5	1,846.0	1.7	1,659.3	1.5	4,243.7	4.0	2,910.4	2.7	2,616.1	2.4
Bolivia	298	153	11	1,618.7	4.0	1,121.2	2.8	1,047.2	2.6	2,449.8	6.1	1,696.8	4.2	1,584.9	3.9
Peru	199	216	15	5,650.7	2.5	3,895.7	1.8	3,695.1	1.7	11,784.2	5.3	8,124.3	3.7	7,705.8	3.5
Andean countres (N = 4)	**233.0**	**194.0**	**17.5**	**2,753.1**	**2.3**	**1,903.2**	**1.6**	**1,792.1**	**1.5**	**5,288.8**	**4.0**	**3,660.2**	**2.8**	**3,464.9**	**2.6**

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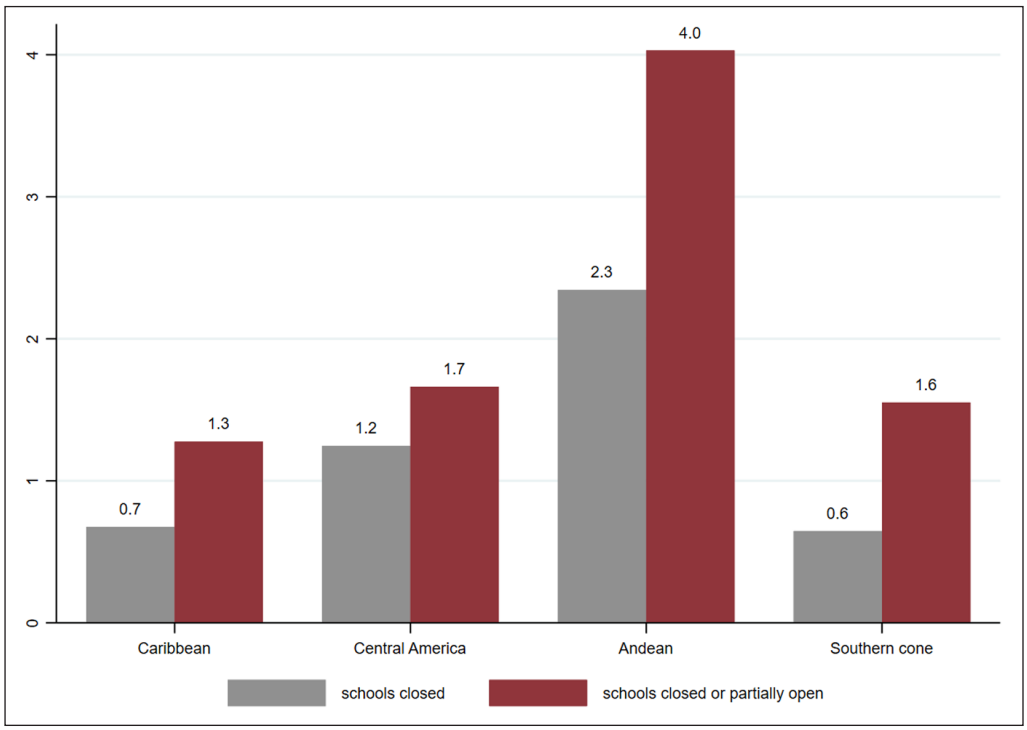

Figure 2 Simulated Percentages of GDP Lost Due to Lower Participation Rates in Preprimary Programs. Medians by Subregions.

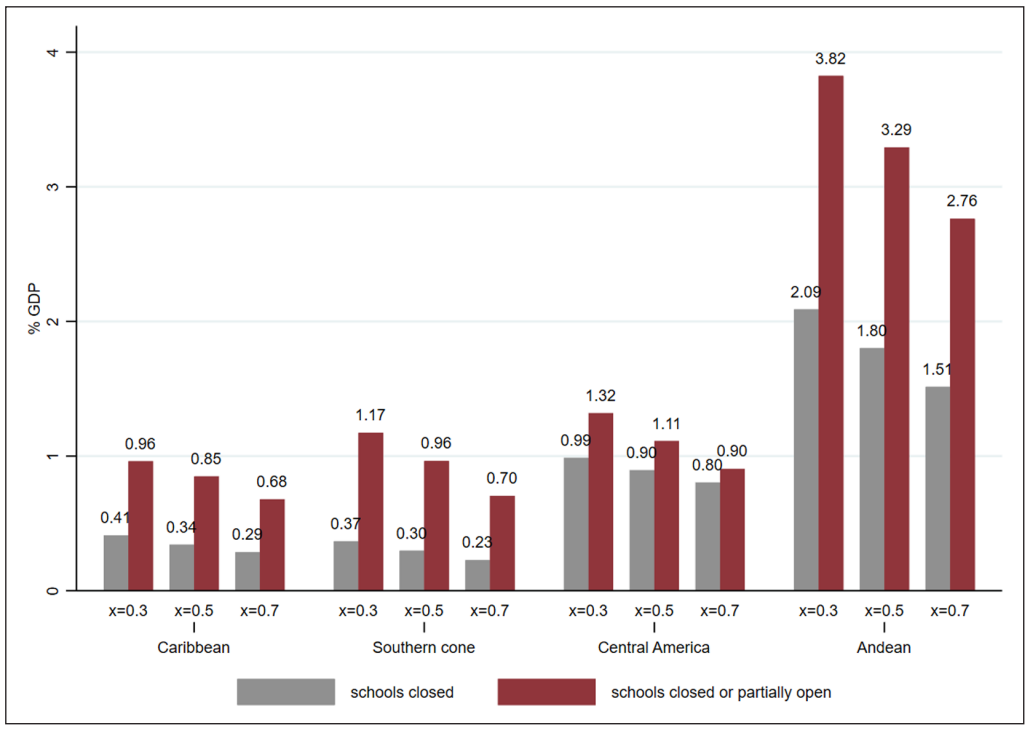

Figure 3 Estimated Percentages of GDP Lost Due to Lower Participation Rates in In-Person Preprimary Programs if Virtual Programs are Implemented, for Different Substitution Rates. Medians by Subregions.

Parents might also compensate for the lack of presential services at home by finding ways to substitute for preprimary programs. However, the evidence of this really happening is very scarce and only seems relevant to affluent parents, mostly in high-income countries (Natanson 2020). Robust evidence on whether that substitution has been effective for buffering the losses is yet nonexistent. Home schooling is an alternative only affordable to very few (i.e., home schooling needs the time of at least one adult, and in the countries we analyzed the majority of parents work either full-time or part time) and is widely prevalent in very few countries (e.g., Australia, Canada, New Zealand, the United Kingdom, and the United States). Moreover, there are no curricula available for "at home" early education (with the exception of the US for the kindergarten level) as far as we know. Supporting learning at home is particularly complex, and caregivers are not trained teachers and need support for reflecting on children's learning and providing feedback. Therefore, it is unlikely that that the substitution of preschool teachers by parents is fully effective for most children.

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CONCLUSIONS

Our estimates quantify some important lifetime economic losses for most preprimary-program-age children in LAC. They imply that tens of millions of children of current preprimary-program ages are likely to suffer considerable earnings losses over their lifetimes due to preprimary-program closures.

We address one important dimension—preprimary program participation—that is affected by the pandemic. We note that, of course, this is not the only possible effect of the pandemic on early childhood outcomes. Children younger than preprimary program ages (aged 0–3) may certainly be affected. The quality of preprimary and other programs may suffer. Families might shift from private programs to public programs and overwhelm the public sector, causing quality to decline. Increased stress, domestic abuse, and violence for children and their caregivers may make families and homes less hospitable environments for early childhood education. Malnutrition may increase due to increased household poverty and loss of nutrition provided by preprimary programs. The pandemic is also affecting the mental health of caregivers due to changes in household dynamics, unequal division of chores and caregiving work, stress from having to juggle childcare and work, job and income losses, and health-related anxieties. There are also likely important impacts on children's socioemotional development. We are not able to incorporate these possible impacts directly in our simulations. Therefore, our results do not capture the total effects of the pandemic on preprimary-age children. But estimates of the effects on children's life-long earnings due to reductions in preprimary participation undoubtedly address an important component of early-life education, and it is valuable to know the extent of these effects. Our simulations suggest that these losses are considerable.

Undeniably, our estimates are not predictions of the future, no matter what happens. They are conditional predictions depending on the assumption that in other respects the pre-pandemic conditions hold. Hopefully, in reality there are and will be important accommodations in households and in educational delivery that at least partially compensate for the reductions in preprimary-program participation. The implementation of remedial strategies are key factors to prevent such human capital crisis in the next generation. Guaranteeing child well-being (by addressing children's needs in health and nutrition, mental health, domestic violence, etc.) and regularly measuring child development and learning to closely monitor these losses and adjust remedial interventions should be a central part of LAC's strategy for recovery after such a long period of closures.

In the absence of substantial adjustments and the above-mentioned policies, however, our simulations suggest that the losses to tens of millions of LAC preprimary-age children over their life cycles and to their societies will be very large.

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COMPETING INTERESTS

The authors have no competing interests to declare.

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