Smart Lockdowns and Learning Outcomes: Insights from 10th-Grade Examination Results in Pakistan

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Our study finds that smart lockdowns in Lahore did not have a significant effect on 10th-grade examination results; students possibly turned to alternative learning options outside school. This suggests their potential for balancing health and education disruptions but leaves COVID-19 spread unexplored as an epidemic control strategy.

Introduction

The COVID-19 pandemic had a profound impact on global education, affecting millions of students worldwide. In April 2020, UNESCO reported that 1.57 billion learners across 190 countries experienced school closures, including Pakistan. The closure of schools directly impacted approximately 40 million students, exacerbating the pre-existing challenges in the country's education system, especially for girls (ASER, 2021). Previous crises, such as the 2005 Pakistan earthquake, demonstrated the long-lasting negative effects of school closures (Andrabi et al., 2021), emphasizing the need to comprehensively assess the impact of COVID-19 containment measures on education, particularly in developing countries.

As part of its COVID-19 containment policy, Pakistan implemented full and partial lockdowns. Between March 2020 and September 2021, Pakistan faced four COVID-19 waves, each averaging over 300,000 cases with a case fatality rate exceeding 2%. Following multiple discussions between policymakers, public health officials, and other stakeholders, the Prime Minister of Pakistan, Imran Khan announced a smart lockdown both at the federal and provincial level on June 13th, 2020. The government implemented smart lockdowns, aiming to buy time for infrastructure setup and reduce impacts on vulnerable populations, employing random testing to identify high-risk areas where the ratio of positive diagnostic test results was over 5% . It is pertinent to note, researchers from CERP's health project "SCALE" introduced a localized framework for COVID-19 containment, emphasizing real-time testing and tailored policy adjustments. They recommended implementing smart lockdowns in areas with high case numbers and projected spread. Representatives from the SCALE team advised the Punjab government on COVID-19, utilizing smart testing and data analysis, and also proposed that the government should continue random or quasi-random testing with a set of predefined protocols to identify true infection rates (Andrabi et al., 2020).

In terms of implementation, the smart lockdown strategy involved identifying infection hotspots through testing and contact tracing, leading to localized lockdowns in affected areas. In the event of a positive test,

Figure 1: Notification regarding Hotspot areas

HOTSPOT AREAS - DISTRICT LAHORE

Sr. No.	Areas / Localities	Town/ Tehsil
1.	Street from House No 162-E to 165-E, EME Society	Allama Iqbal
2.	Street from House No 418 to 425, Block L, Johar Town	Allama Iqbal
3.	Street from House No 361 to 417, C-Block, Green City	Aziz Bhatti
4.	Street from House No. 06 To 09-B, Shami Road	Cantt
5.	Street from House No 100 to 130, A-Block, Muslim Town	Samanabad
6.	Street from House No 40 to 95, PNT Colony	Samanabad
7.	Street from House No 300 to 405, Umar Block	Samanabad
8.	Street from House No 60 to 65, I-Block, Wahdat Colony	Samanabad
9.	Street from House No 200 to 250, A-Block, Gulshan-e-Ravi	Samanabad
10.	Sheikh Zaid Residential Colony	Samanabad
11.	Street from House No 100 to 145, B-Block, Muslim Town	Samanabad
12.	Street from House No 140 to 180, H-Block, Model Town	Gulberg
13.	Street 174, Mohalla Aman Park, College Road	Shalimar

healthcare workers gathered patient information and placed them in quarantine centers or hospitals. High case numbers in specific city areas could trigger a two-week smart lockdown by local authorities.

These lockdowns identified exempted individuals and businesses like grocery stores, pharmacies, clinics, and hospitals. Further restrictions included the closure of markets, shopping malls, restaurants, and offices, as well as a ban on gatherings. Various Pakistani cities, such as Multan and Lahore, implemented smart lockdowns, with Lahore experiencing six instances lasting two weeks each, ranging from pinpointing individual blocks to whole housing colonies. There is mixed evidence on how fully smart lockdowns were implemented across the country. According to the news, commercial areas in hotspot regions of Lahore were completely closed, but there were no restrictions imposed on the free movement of individuals. The figure below shows the notification with respect to smart lockdowns issued by Primary & Secondary Healthcare Department, Lahore. The detailed notification can be found here. However, even with the implementation of smart lockdowns, the suspension of face-to-face instruction for schools in "high risk areas" led to serious concerns about its impact on student learning. The data suggests substantial learning loss in Pakistan due to COVID-19 pandemic disruption as a whole, although these studies have focused on primary school age children only, with little discussion of secondary schooling.

Other concerns for policymakers with school closures include missed midday meals, availability of childcare for working parents, and limited resources for online learning. The targeted nature of "smart" lockdowns clearly reduces the geographic scope of the potential impact compared to generalized lockdowns. Is this reflected in mitigating the learning loss expected from lockdown measures?

To assess the value of the smart lockdown policy as compared to more disruptive measures - such as generalized lockdowns or school closures - or less disruptive measures - such as masking mandates - both costs and benefits must be taken into account. There is extensive research on the impacts of broader measures such as generalized lockdowns - some focusing on the benefits (reduction in COVID spread) and others quantifying the costs (economic impacts (loss of 137 million full time jobs according to ILO), education (learning loss in high and low income countries), and other areas such as mental health). School closures and lockdowns significantly affected education in high-income countries, causing learning declines despite remote learning infrastructure (Moscoviz & Evans, 2022). For instance, the Netherlands saw an 0.08 standard deviation learning decline in 8- to 11-year-olds during an eight-week closure (Engzell et al., 2021). In low- and middle-income countries, impacts varied; most studies showed no learning loss (Moscoviz & Evans, 2022). Surveys in countries involving fifth- or sixth-grade students like Burkina Faso, Burundi, Côte d'Ivoire, Senegal, and Zambia generally showed no learning loss (UNESCO Institute for Statistics, 2022). We anticipate that older students (15-16) may experience milder consequences than younger ones (8-11) due to greater self-reliance and

technology access, as suggested by the ASER study's findings of more pronounced learning losses in class 3 compared to class 5. However, to our knowledge the much finer geographically targeted or "smart" lockdowns strategy used in Pakistan has not been quantitatively evaluated. In this note, we evaluate the impact of "smart" lockdowns on secondary education; further research with alternative data sources would be needed to evaluate their effectiveness in controlling COVID spread.

Punjab, the largest province of Pakistan, where the study is carried out, has the highest participation rates among school-age children. There are currently about 60,000 government schools and 35,000 private schools in the province, spread across 36 districts. Education is organized into five levels: primary (grades one through five); middle (grades six through eight); high (grades nine and ten, culminating in matriculation); intermediate (grades eleven and twelve), and university programs (including undergraduate and advanced degrees). For this study, we focus on the educational outcomes for 10th grade exams for institutes in the city of Lahore, the largest city of Punjab province. Our emphasis is on the outcomes of 10th-grade examinations, as these exams are high-stakes, occurring annually, and they hold significant importance in one's pursuit of higher education. In the year 2022, 167,195 students participated in the 10th-grade examinations through 2,731 (combination of both public and private) education institutes, with an additional 85,746 students opting for private exam registration.

Methodology

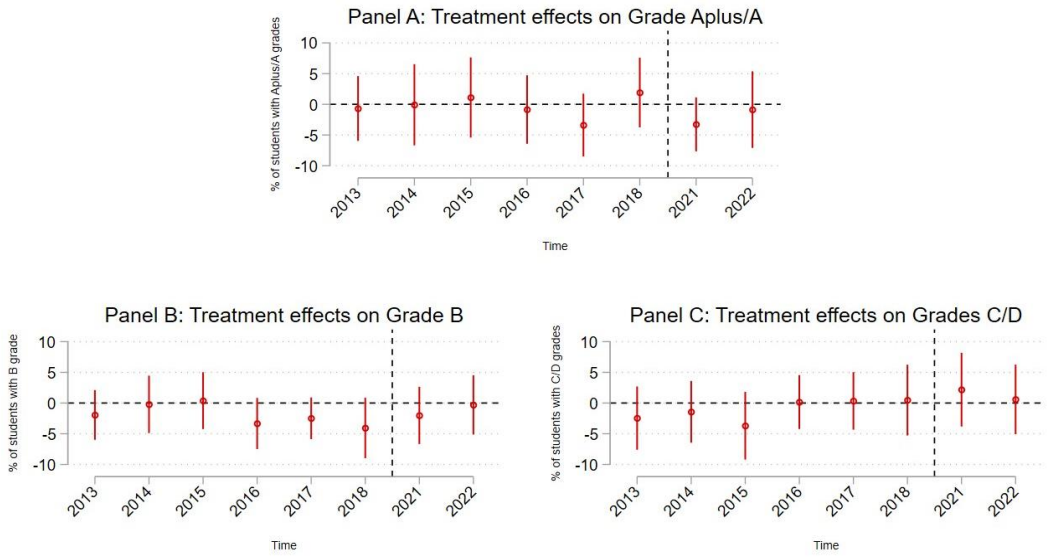
We gathered data from two main sources to study the impact of smart lockdowns on educational outcomes in Lahore's institutes. Firstly, we obtained information about smart lockdown dates and areas by extracting and geocoding official notifications from the Primary & Secondary Healthcare Department's website. We obtained educational outcomes data for individual institutions from annual reports published by the Board of Intermediate and Secondary Education, Lahore. These reports cover the results of public exams aimed at obtaining a secondary school certificate (SSC), which is typically a two-year program, consisting of SSC Part 1 (grade 9) and SSC Part 2 (grade 10). These exams are conducted annually by government boards, known as Boards of Intermediate and Secondary Education (BISE). They usually take place in March and April, with results announced around June or July. Students between ages of 14-16 are required to take SSC exams in multiple subjects, including compulsory subjects like Mathematics, English, Urdu, and Pakistan Studies. Additionally, they can choose elective subjects based on their interests and career goals. These exams consist of written papers, divided into objective (multiple-choice) and subjective (short and long essay-type questions) sections. Grading is based on letter grades (e.g., A, B, C, D) and grade points, with a minimum passing grade, typically a D or higher, required to proceed to higher education, admission to colleges. As part of our study, we analyze SSC Part 2 (grade 10) exam results from the annual reports spanning 2013 to 2019 and 2021 to 2022 with focus on data on student registrations, exam participation, and grade distributions.

After concluding data collection, we mapped the locations of smart lockdowns to those of educational institutions generating a treatment variable to assess lockdown effects. We tag a school as treated if the distance between the lockdown geotags and the school location was 0.25 km or less. To estimate the impact of smart lockdowns on the educational outcomes of 10th grade examinations, we employ an event study methodology. About 46 schools were closed due to smart lockdowns affecting over 2000 students.

Research Findings

The results indicate that implementing a smart lockdown has null treatment effects on the results of 10th-grade examinations. This is visually depicted in Figure 2, which presents the effects of the treatment on the percentage of students receiving grades ranging from A to D.

Figure 2: Treatment effects of Smart Lockdown on 10th Grade Examination Results



Notes: Point estimates are displayed along with their 95% confidence intervals. The independent variable takes positive values if the distance between the lockdown and education institute is 0.25 km or less and 0 otherwise. The baseline (omitted) base period is 1 year prior to the implementation of smart lockdowns in Lahore (2019), indicated by the dashed vertical line in the plot. The control include institute level and year fixed effects. Standard errors are clustered at geographic cluster level.

This result is in line with UNESCO reports of no evidence of learning loss due to generalized lockdowns for countries such as Burkina Faso, Burundi, Côte d'Ivoire, Senegal, and Zambia. There could be few potential explanations for this result. One possibility is that while the schools themselves were closed by a local "smart" lockdown, students who attended them could seek private tutoring to catch up on missed school lessons. This is consistent with the common practice among Pakistani students of relying on both school-based and private tutoring for high-stakes exams. Furthermore, students taking these yearly exams between ages of 15-16 years tend to be more self-reliant in their studies, in contrast to younger children who may depend more on school support. The ASER study of primary school outcomes indicates that during the early years of schooling, COVID learning losses were more pronounced, with greater declines in learning outcomes observed among Class 3 students compared to those in Class 5.

Policy Impact and Moving Forward

This study reveals that smart lockdowns do not significantly affect educational outcomes at the institutional level. However, we also have no rigorous evidence on the impact of smart lockdowns on COVID-19 spread. If smart lockdowns were effective in reducing COVID-19 cases in Pakistan, adopting such a finely geographically targeted approach, was likely an optimal approach, given the evidence against negative impacts on education - and could be used instead of larger scale population movement control in future epidemic situations.

References

Abbas, A., & Mannan, A. (2022). Reasons behind declining of cases during the COVID-19 wavelets in Pakistan: Public Healthcare System or government smart lockdown policy? *Ciência & Saúde Coletiva*, *27*(8), 2973–2984. https://doi.org/10.1590/1413-81232022278.06012022

Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2022). The impact of the Coronavirus Lockdown on Mental Health: Evidence from the United States. *Economic Policy*, *37*(109), 139–155. https://doi.org/10.1093/epolic/eiac002

Ahmad, T. (2020) Pakistan: "*Smart Lockdown" Imposed across Cities of Pakistan as Covid-19 Cases Grow Rapidly.* [Web Page] Retrieved from the Library of Congress, https://www.loc.gov/item/global-legal-monitor/2020-06-25/pakistan-smart-lockdown-imposed-across-cities-of-pakistan-as-covid-19-cases-grow-rapidly/.

Andrabi, T., Andrews, M., Cheema, A., Das, J., Khan, A. Q., Khwaja, A. I., ... & Syed, M. (2020). Smart containment with active learning (scale): A proposal for a data-responsive and graded response to covid-19 working draft. *Technical report*.

Andrabi, T., Daniels, B., & Das, J. (2021). Human capital accumulation and disasters: Evidence from the Pakistan earthquake of 2005. *Journal of Human Resources*, 0520-10887R1

ASER. (2021). Measuring the Impact of Covid-19 on Education in Pakistan. https://aserpakistan.org/document/aser/2021/ASER_2021_Measuring_the_Impact_of_COVID_19_on_Education_in_Pakistan_FINAL_REPORT.pdf

Ayouni, I., Maatoug, J., Dhouib, W., Zammit, N., Fredj, S. B., Ghammam, R., & Ghannem, H. (2021a). Effective public health measures to mitigate the spread of COVID-19: A systematic review. *BMC Public Health*, *21*(1). https://doi.org/10.1186/s12889-021-11111-1

Blainey, K., & Hannay, T. (2021). *The Impact of School Closures on Autumn 2020 Attainment.* RS Assessment from Hodder Education.

Cheema, U. (2020, June 20). *In Lahore, smart lockdown means only shutter down*. thenews. https://www.thenews.com.pk/print/675165-in-lahore-smart-lockdown-means-only-shutter-down

Crawfurd, L., Hares, S., & Minardi, A. L. (2021). New data on learning loss in Pakistan. *Center for Global Development.* https://www.cgdev.org/blog/new-data-learning-losspakistan#:~:text=The%20research%20is%20clear%3A%20children,well%2Deducated%20parents%20at%20home

Dongyu, Q. (2020, April 10). *Coronavirus could worsen hunger in the developing world*. World Economic Forum. https://www.weforum.org/agenda/2020/04/coronavirus-worsen-hunger-developing-world/

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*(17). https://doi.org/10.1073/pnas.2022376118

Giannini, S., Jenkins, R., & Saavedra, J. (2020, May 13). *Reopening schools: When, where and how?*. UNESCO.org. https://www.unesco.org/en/articles/reopening-schools-when-where-and-how

GL Assessment. (2021). *Impact of Covid-19 on Attainment: Initial Analysis.*

ILO. (2021, October 27). *ILO Monitor: COVID-19 and the world of work. Eighth edition Updated estimates and analysis*. ILO. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_824092.pdf

Juniper. (2021). *The Impact of the Covid-19 Pandemic on Primary School Children's Learning.* https://21e8jl3324au2z28ej2uho3t-wpengine.netdna-ssl.com/wp-content/uploads/ juniper_folder/Juniper-Education-National-Benchmark-Dataset-Report.pdf

Lagasok, D., & Yam, E. (2020, August 17). *Reopening schools too early could spread covid-19 even faster – especially in the developing world*. International Growth Centre. https://www.theigc.org/blogs/covid-19/reopening-schools-too-early-could-spread-covid-19-even-faster-especially-developing

Lodhi, A. (2021, August 26). *Decision on school closure delayed*. The Express Tribune. https://tribune.com.pk/story/2317114/decision-on-school-closure-delayed

Lichand, G., Doria, C. A., Fernandes, J. P. C., & Leal-Neto, O. (2022a). Association of COVID-19 incidence and mortality rates with school reopening in Brazil during the COVID-19 pandemic. *In JAMA Health Forum*, 3(2), e215032–e215032. American Medical Association.

Moscoviz, L., & Evans, D. K. (2022). Learning loss and student dropouts during the covid-19 pandemic: A review of the evidence two years after schools shut down. *CGD Working Paper 609. Washington*.

Sharma, N. (2020, June 5). *Torn safety nets: How covid-19 has exposed huge inequalities in global education*. World Economic Forum. https://www.weforum.org/agenda/2020/06/torn-safety-nets-shocks-to-schooling-in-developing-countries-during-coronavirus-crisis/

UNESCO Institute For Statistics. (2022). C*OVID-19 in Sub-Saharan Africa: Monitoring Impacts on Learning Outcomes.* https://milo.uis.unesco.org/wp-content/uploads/ sites/17/2022/01/MILO-Summary-Full-Report

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