New estimation confirms out-of-school population is growing in sub-Saharan Africa

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It is estimated that 244 million children and youth between the ages of 6 and 18 worldwide were out of school in 2021. The results are based on a new, improved way of measuring, which combines administrative and survey data, following a similar approach to the one applied before in the estimation of flagship health indicators. The estimates confirm that, even before the onset of COVID-19, progress in reducing the out-of-school population had slowed down. At the same time, the results suggest a different distribution of this population by age group, while they fill gaps in the case of about 50 countries whose administrative data have been incomplete or lacking.

The focus of the Education for All programme on the number of out-of-school children provided the momentum to organize education management information systems and helped improve international data comparability. As a result, it became the flagship education indicator under the Millennium Development Goals in 2000. New policies in the decade that followed led to rapid increases in education access, which can also be credited to the attention paid to monitoring these efforts with a quantitative measure. However, already before the end of the decade, there were clear signs that the momentum was fading. The out-of-school rate appeared to remain stable after 2008 at the primary level, 2012 at the lower secondary level and 2013 at the upper secondary level.

One question was whether this trend was genuine or whether it might have been the artefact of measurement and data quality. For instance, while the primary adjusted net enrolment rate in sub-Saharan Africa based on administrative data, increased by just 3 percentage points in 10 years, from 76% in 2008 to 79% in 2018, the primary completion rate based on household survey data increased by 9 percentage points over the period, from 52% to 61% (UNESCO, 2020). One explanation may be countries had gradually improved school system efficiency, ensuring that fewer children repeated classes and more children completed among those enrolled. But an alternative explanation that needed to be tested was whether the discrepancy was the consequence of persistent challenges in administrative data collection in some countries with large out-of-school populations, which prevented a more accurate, up-to-date picture from emerging. More data had been collected during this time from household surveys but such data has not yet been mainstreamed in official estimates.

The use of multiple sources was advocated by the United Nations in 2015, when it called for a data revolution. This paper summarizes results from an effort by the UNESCO Institute for Statistics and the Global Education Monitoring Report to develop a model that makes more efficient and effective use of information from multiple sources to support SDG 4 monitoring (Box 1). The model adapts to education principles previously used to accommodate multiple data sources to estimate flagship health indicators, such as child and maternal mortality.

The results are available at the Visualizing Indicators of Education for the World (VIEW) website (www.education-estimates.org) and complement a similar recent effort that consolidated data sources to estimate a consistent time series of the completion rate. VIEW introduces the model and visualizes the results to help make the approach more accessible to countries. The graphs highlight trends but also the sources that enter into the calculation of national estimates.

As the model relies primarily on administrative data, the new estimates do not dramatically change the overall picture. However, the model offers some important nuances and helps fill some important gaps in our knowledge. First, the total out-of-school population is estimated to be 13 million or 5% lower than previous estimates based exclusively on administrative data.

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Second, a different picture emerges with respect to the distribution of the out-of-school populations between the three age groups, both currently and over time. It suggests that the primary out-of-school rate has been declining faster than previously thought, even if the rate of decline has slowed down. Third, new information provides a fuller account of the contributions of some countries to the global out-of-school population for which administrative data have been incomplete or lacking. On the other hand, while the model improves our understanding of the past, it is not as sensitive to capture the recent impact of COVID-19 on enrolment, which will require more and sustained information over time to be properly assessed.

Model estimates offer a nuanced picture of global out-of-school levels and trends

The out-of-school rate, which is SDG thematic indicator 4.1.4, is defined as the 'proportion of children and young people in the official age range for the given level of education who are not enrolled in pre-primary, primary, secondary or higher levels of education' (UIS, 2022).

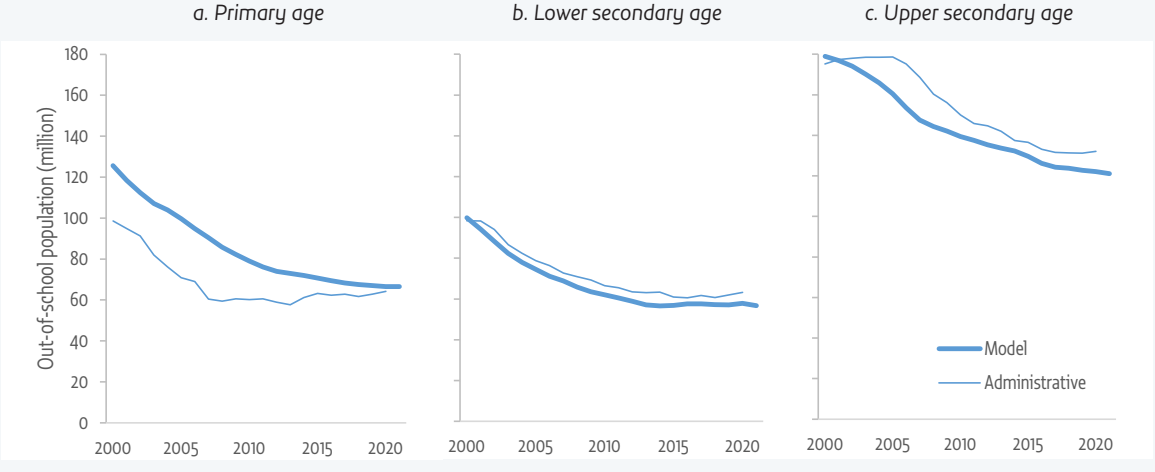
Historically, estimates of out-of-school rates have been derived from administrative enrolment counts, produced by education ministries, and corresponding population data, mostly from the UN World Population Prospects. These estimates, however, have two weaknesses. First, in many countries with high out-of-school rates, reported data are often incomplete, inaccurate or absent. Second, as the enrolment and population data series are sourced separately, mismatches are frequent: during the development of the model, it emerged that population data were smaller than enrolment data, resulting in negative out-of-school rate values, in 23% of country-year-age observations.

Some of these challenges can be mitigated by supplementing administrative data with survey and census data, which are increasingly being used throughout global development monitoring. But survey data, in turn, can suffer from sampling errors, inconsistent ways in which education attendance questions are asked and other problems.

Administrative data was produced using UIS enrolment counts: they account for 83.5% of all observations used in the model. The remaining 16.5% of data points were sourced from Demographic and Health Surveys, Multiple Indicator Cluster Surveys, census data from the Integrated Public Use Microdata Series and several national household surveys, also analysed for the Database on Education (WIDE) (www.education-inequalities.org).

FIGURE 1

Global number of out-of-school children, adolescents and youth, by method of estimation, 2000–2021



Source: UIS and GEM Report model estimates and UIS database.

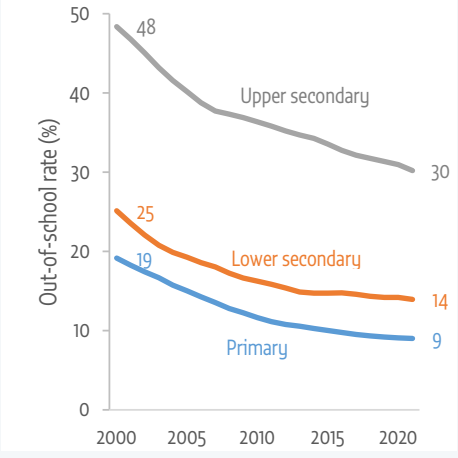
In total, estimates of out-of-school rates for 192 countries since 2000 were produced. It is estimated that the out-of-school population stood at 244 million in 2021, including 67 million children of primary school age (about 6 to 11 years), 57 million adolescents of lower secondary school age (about 12 to 14 years) and 121 million youth of upper secondary school age (about 15 to 17 years) **(Figure 1).**

With five out of six observations in the model drawing on the same administrative data as the official UIS estimates, no major differences should be expected from the model. Yet, compared to the estimates based exclusively on administrative data, there are some points of departure. In the case of primary school age children, the model matches the rapid rate of decline in the early 2000s but concludes that this decline did not stop in 2008 as the UIS estimates suggested; rather, it continued at the same pace until 2012 and has not come to a total halt since. In the case of upper secondary school age youth, the model also documents a slowdown in the latter half of the 2010s but not one as strong as that suggested by the administrative data.

The two estimates differ mainly in the distribution of the out-of-school population between age groups. The model has estimated a higher population of out-of-school children and a lower population of out-of-school youth for most of this period. This discrepancy reflects differences in the quality of age information in administrative data and household surveys. Survey data, which collect age information directly from family members, have been recording significantly higher percentages of overage school attendance than administrative data.

FIGURE 2

Global out-of-school rate, by age group, 2000–2021

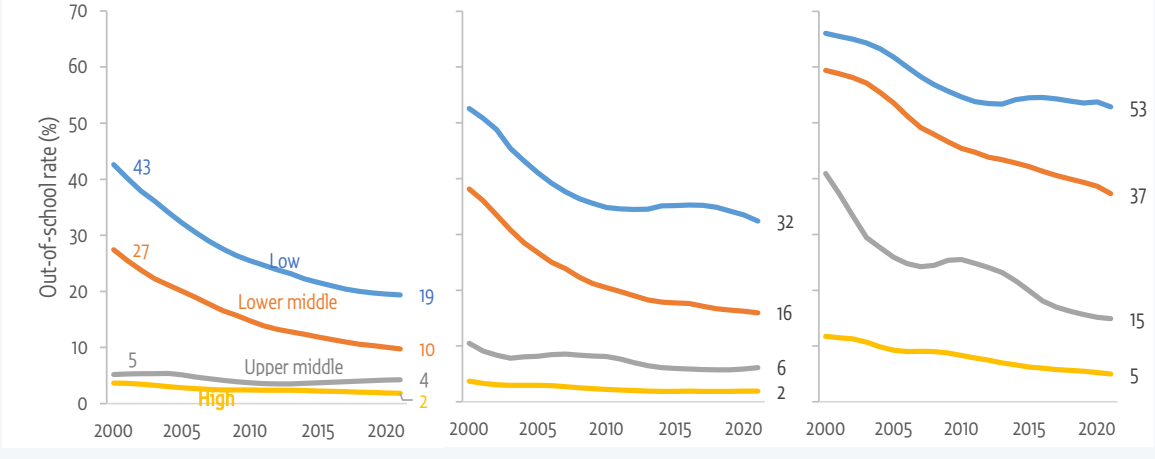


Source: UIS and GEM Report model estimates.

FIGURE 3

Out-of-school rate, by country income group, 2000–2021

a. Primary age *b. Lower secondary age* *c. Upper secondary age*



Source: UIS and GEM Report model estimates.

Overall, 9% of primary school age children, 14% of lower secondary school age adolescents and 30% of upper secondary school age youth remain out of school. The decline in the out-of-school rate appears to have slowed down earlier and more visibly among adolescents of lower secondary school age: while the rate fell by nine percentage points in the 2000s, it has only fallen by two percentage points in the 2010s **(Figure 2)**. Low-income countries have continued bringing down the out-of-school rate among children of primary school age but have struggled in the 2010s to reduce the out-of-school rates among those of secondary school age: one in three adolescents and more than one in two youth remain out of school **(Figure 3)**. Many of those who are in school in fact still attend primary school.

TABLE 1

Out-of-school rate, by SDG region, 2021

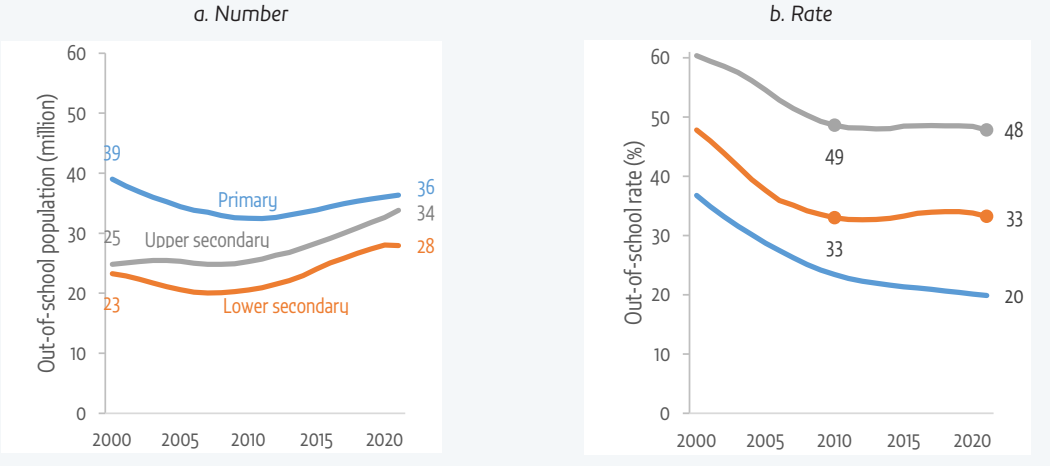
Region	Primary school age (%)	Lower secondary school age (%)	Upper secondary school age (%)
Sub-Saharan Africa	19.9	33.2	47.8
Northern Africa and Western Asia	8.7	9.9	23.4
Central and Southern Asia	7.2	13.0	38.9
Eastern and South-eastern Asia	3.9	7.0	16.0
Oceania	6.6	4.1	20.2
Latin America and the Caribbean	3.6	6.7	19.7
Europe and Northern America	2.2	2.8	8.6
World	9.0	13.9	30.2

Source: UIS and GEM Report model estimates.

Sub-Saharan Africa is not only the region with the highest out-of-school population **(Table 1)** but also the only region where this population is growing. Since 2009, the out-of-school population has increased by 20 million, reaching 98 million in 2021 **(Figure 4a)**. Out-of-school rates among primary school age children have been consistently declining, albeit by only 0.3 percentage points per year in the 2010s with the result that one in five children are still not enrolled. But the main challenge is among adolescents and youth whose out-of-school rates have stagnated since 2010 at 33% and 48%, respectively **(Figure 4b)**.

FIGURE 4

Out-of-school number and rate, by age group, sub-Saharan Africa, 2000–2021

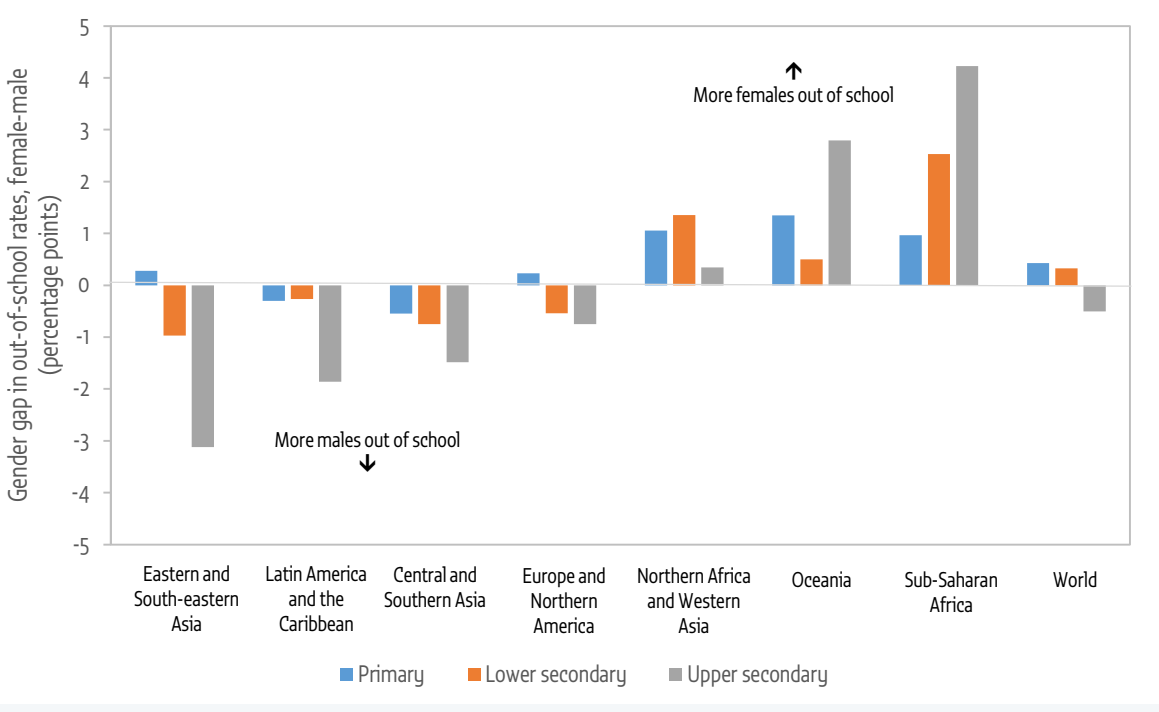


Source: UIS and GEM Report model estimates.

While gender disparity at the global level has disappeared, there are persistent gaps in both directions in individual regions, especially among upper secondary school age youth. The female out-of-school rate is 4.2 percentage points higher than the male rate in sub-Saharan Africa, but 3.1 percentage points lower in Eastern and South-eastern Asia **(Figure 5)**.

FIGURE 5

Out-of-school rate gender gap (female–male), by age group and SDG region, 2021



Source: UIS and GEM Report model estimates.

Model estimates also propose out-of-school levels and trends for countries with persistent data gaps

The primary objective of the model is to improve regional and global estimates. It does not aim to replace the country out-of-school estimates that the UIS reports twice a year. However, there are several countries with persistent data gaps. A secondary objective of the model is therefore to propose estimates for these countries, draw attention to the challenges that prevent national reporting, and mobilize efforts in order to overcome them.

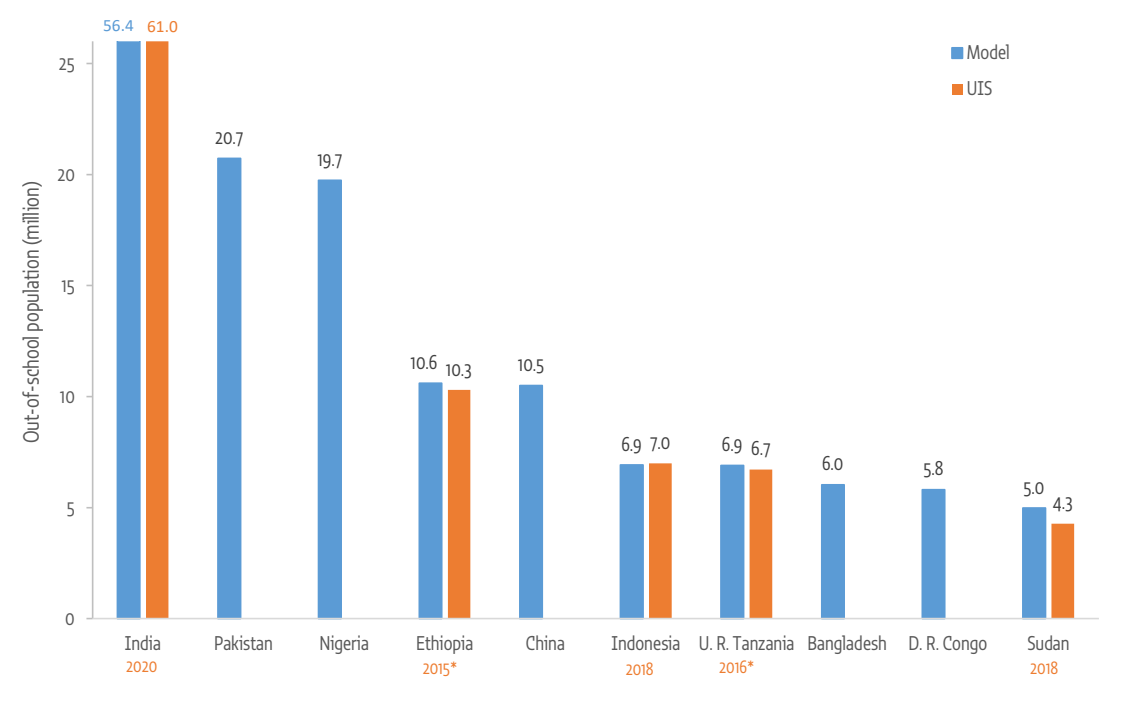
There are about 50 countries for which it has been difficult to develop consistent and up to date time series on out-of-school rates and populations for each of the three age groups based solely on administrative data. Challenges are linked to factors including deficient data collection throughout or in parts of the education system, imprecise information on age and education levels, and missing or inaccurate population data. Incorporating survey and census data goes some way towards filling gaps, to the extent such data are complete and of good quality.

Several of these countries weigh heavily in global out-of-school population estimates. Among them are 6 of the 10 countries with the largest out-of-school populations for which the UIS has not provided an estimate after 2015.

Before turning to those, it is instructive to compare the model and UIS estimates for the other 4 countries. The model estimate of the out-of-school population in India is 7% lower than the corresponding official UIS estimate in 2020; by contrast, the model estimate of the out-of-school population in Sudan in 2020 is 16% higher than the corresponding official UIS estimate in 2018. But model estimates are very close to the UIS estimate for Indonesia and the United Republic of Tanzania, albeit for different years. Model results are also consistent for Ethiopia for which UIS made an estimate in 2015 **(Figure 6)**.

FIGURE 6

Number of out-of-school children, adolescents and youth, top 10 countries, 2020 model estimates and latest UIS estimate since 2015



Note: The asterisk signifies that the out-of-school population was estimated by the UIS.
Source: UIS and GEM Report model estimates.

The model estimates out-of-school rate and population time series for these six countries. For instance, Pakistan (20.7 million) and Nigeria (19.7 million) have the second and third largest out-of-school populations. Ethiopia and China (about 10.5 million) have the fourth and fifth largest out-of-school populations. Bangladesh (6 million) and the Democratic Republic of the Congo (5.8 million) have the eighth and ninth largest out-of-school populations.

Their trends highlight cases of spectacular progress. For instance, in China the out-of-school rate of upper secondary school age youth fell from 48% in 2000 to 8% in 2020, leading to a decline in the out-of-school population of this age group by 87%, from 31 to 4 million. There was also rapid progress in out-of-school rates of primary school age children in Ethiopia and Pakistan. In Ethiopia, the rate fell from 61% to 18% between 2000 and 2017, leading to a 54% decline of the corresponding out-of-school population, from 6.7 to 3 million, although progress stalled more recently. In Pakistan, the rate fell from 54% to 23% between 2000 and 2010, leading to a 53% decline of the corresponding out-of-school population, from 10.9 to 5.2 million, although progress stalled in the 2010s, with only a 0.5 million further decline in the number of out-of-school children **(Figure 7 and Figure 8)**.

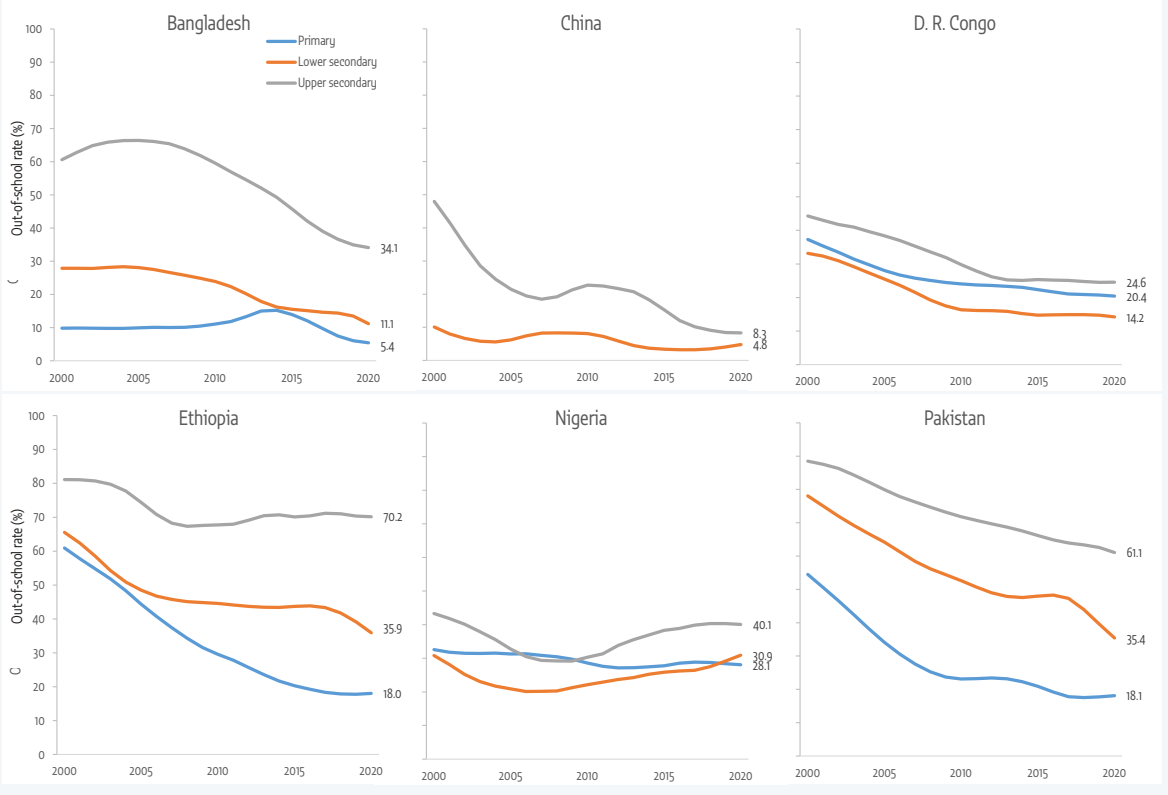
In Nigeria, out-of-school rates among adolescents and youth of secondary school age have hardly changed in 20 years with the result that the out-of-school population in this age group increased by 61%, from 6.3 to 10.1 million. The number of out-of-school children of primary school age also increased by 50% from 6.4 to 9.7 million, as the out-of-school rate has remained constant at 28% since 2010.

Model estimates cannot correct for countries with deficient data, notably those affected by conflict. However, available evidence suggests notable cases of countries where more than one in two children of primary school age are out of school: the Central African Republic (50%), Equatorial Guinea (55%), Eritrea (51%) and South Sudan (62%). The Central African Republic (73%) is also one of the four countries with the largest out-of-school rates of upper secondary school age, alongside Niger (85%), Uganda (74%) and the United Republic of Tanzania (87%).

Although the model incorporates administrative data from the 2021 school year, there is not yet enough evidence to capture the impact of COVID-19, which disrupted not only school attendance but also education management information systems all over the world. The model structure requires extensive information to capture sudden changes in long-term trends. Preliminary evidence suggests that while primary and lower secondary education enrolment might not have been affected, there might be some impact on upper secondary enrolment. More information will be needed in the coming year to assess the short- and long-term impact.

FIGURE 7

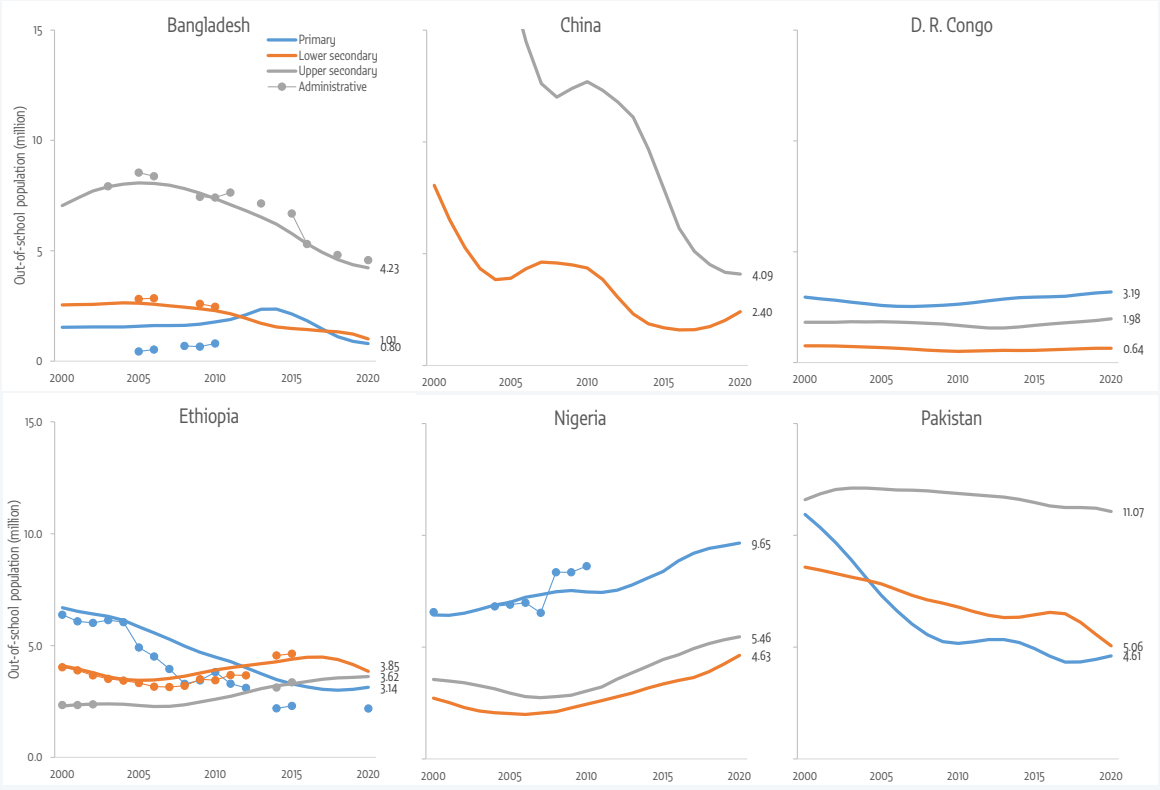
Out-of-school rates, adolescents and youth, selected countries, 2000–2020



Source: UIS and GEM Report model estimates.

FIGURE 8

Number of out-of-school children, adolescents and youth, selected countries, model and UIS estimates, 2000–2020



Source: GEM Report model estimates and UIS database.

BOX 1

A brief introduction to the out-of-school estimation model

Estimates of out-of-school rates were produced within a Bayesian hierarchical framework, which allows information sharing between countries, years and types of data to improve estimates in the context of low data availability. A choice was made to model out-of-school rates by individual age rather than by education level, as children enter and exit the school system at every age resulting in substantial within-level variability. In making this decision, the model is therefore designed to capture age-to-age patterns experienced by student cohorts as they progress through their school cycles.

The modelling process is divided into three main steps:

1. Baseline out-of-school rates: The starting point to estimate out-of-school rates for each country-year-age is the entry-age out-of-school rate. This is the percentage of students not in education at the official entry age dictated by national policy. This is modeled as a smoothed random walk with drift.

2. Cohort progression: Building on the baseline out-of-school rates, the out-of-school rates at each subsequent age are modelled using a cohort process. Net changes in out-of-school rates from grade-to-grade are estimated using vector-valued splines. Each vector corresponds to a cohort out-of-school rate first difference curve, adjusted to ensure that the resulting cohort trajectory forms a smooth curve. Further, the vectors themselves are adjusted over time so that transitions between patterns are smooth in time as well. The out-of-school rates are then recovered from the changes in out-of-school rates by starting with the baseline out-of-school rate for a given cohort and accumulating all of the changes until the appropriate age is reached.

3. In the final step, observed data interact with the underlying out-of-school rates generated in the previous two steps, depending on the data source.

    - Administrative data are assumed to be unbiased but subject to potentially large errors. These errors are shared regionally to capture similarities in data infrastructure and globally to reflect the minimum plausible error on administrative data resulting from the two-source mismatch challenge. The error structure is designed such that negative observations can be accepted into the model, but since the underlying out-of-school rates are constrained to the [0, 1] interval, they trigger expansion of the regional and global variances. This variance expansion propagates to the rest of the data, thus reflecting the true level of uncertainty in the positive observations. This is a departure from the status quo where negative observations are either dropped or set to zero, consequently discarding important error information.
    - Survey data are subject to a survey bias term, sampling variance, and non-sampling variance. Sampling variances are estimated prior to modelling whereas the other two terms are estimated within the modelling framework.

The model stages above are a short summary of the adopted methodology. A comprehensive discussion of the modelling methodology can be found in a companion technical report to this note (UIS and GEM Report, 2022).

After executing the models and extracting estimated age-specific out-of-school rates, post-processing steps are also taken. First, age-specific out-of-school rates are aggregated by the corresponding school ages to produce out-of-school rates by education level. Then, the level-specific out-of-school rates are aggregated into regional, income level and other groups using population-weighted averages. Finally, each out-of-school rate is converted into an excluded children and youth population by multiplying by the appropriate population figures.

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