

# Right to Education Index 2018

## Methods Consultation Notes

November 2017

RESULTS Educational Fund is a non-profit 501(c)(3) grassroots advocacy organization founded in 1981 that creates the public and political will to end poverty by empowering individuals to exercise their personal and political power for change. RESULTS focuses its advocacy efforts on policies that protect and expand access to health and nutrition, create economic mobility, and provide education for all. RESULTS organizational strategy uses a combination of policy analysis and research, coordinated grassroots advocacy, media engagement, congressional outreach, high-level engagement, and international partnerships to achieve its goals. Its model has been replicated in eight other countries — Australia, Canada, Japan, Kenya, Mexico, South Korea, the UK, and Zambia.

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# Summary

RTEI is a global index built on the international right to education framework that monitors national progress towards its fulfillment using indicators<sup>1</sup> specifically derived from international agreements and law. A cross-country index for the right to education can measure countries individual performance and hold governments accountable as duty bearers to guarantee quality educational opportunities to their citizens. RTEI's methodology development is iterative and ongoing from 2015 to the current Index methods. Each biennial data collection cycle requires revisits and future changes. The RTEI 2018 Consultations which occurred between July and September 2017 collected information from over 20 stakeholders, including members of the RTEI advisory group, and experts in education, statistics, and research-based advocacy. This document summarizes the results of those consultations and the recommendations for RTEI 2018 to create statistically sound analyses to increase cross-country comparability of the Index.

Building a composite index for cross-country comparisons presents challenges and concerns related to validity and reliability. Concerns include statistical and mathematical methodological soundness, indicator selection, to what extent indicators are context specific, the relative importance of the indicators (assigning weights), the most appropriate set of weights, the aggregation method, and the Index's ability to allow for objective cross-country comparisons. The goal of 2018 methodology planning is to increase RTEI's statistical robustness while maintaining relevancy to the complicated, often qualitative, satisfaction, fulfillment, and respect for the right to education worldwide. The following methodological revisions emphasize adapting the RTEI Questionnaire, identifying if and which variables could be consolidated, handling missing data and not applicable responses, checking for redundancy, responding to progressively realized rights, data weighting and aggregation, and identifying Index sensitivity and robustness.

Overall feedback from the consultations focused on how to communicate the methods to wide audiences, how to use the Index results, and specific recommendations for each revision described below (variable consolidation, handling missing data and not applicable responses, redundant variables, progressively realized obligations, data weighting and aggregation, and robustness).

## Communicating RTEI Methods

One of the most salient feedback to the overall RTEI process and methods is that the analysis must be distilled to clearly represent how the Index scores are calculated and what they imply for advocacy and policy development (see Appendix 1).

## Using RTEI results

Several consultations highlighted that country ranking could inaccurately present the state of the right to education in a country compared across borders. It is important that civil society organizations, advocates, and policy makers who use RTEI scores consider the disaggregated data as well as the overall Index score. The overall score shows a relative measure of the satisfaction of the right to education, but actual policy recommendations are found by digging into the data and uncovering where

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<sup>1</sup> In RTEI, indicators refer to specific questions in the Questionnaire as well as some data points within each question. For instance, question "1.1.1 Is the State party to the following United Nations treaties?" is comprised of 8 data points that are individually calculated in the Index score. In this document, we use "indicator" and "question" interchangeably.

policy is lacking, why some subtheme and theme scores are comparably lower, and what data is missing to fully reflect the actual practice of the right to education in country.

CSOs interested in using RTEI results have many ways to search for data on rtei.org, identify specific indicators relevant to their work, draw on subtheme and theme scores to support their policy recommendations, and use (and develop their own) cross-cutting themes to emphasize locally relevant issues. For instance, RTEI results can be used in SDG 4 monitoring, to identify gaps in SDG 4 implementation and present avenues for further policy and national data collection (See Appendix 2 for SDG 4 related indicators).

In addition to cross-cutting themes, RTEI 2018 results will include the UNDP's Education Index variable for users who wish to compare Index scores, or calculate their own, using the Human Development Report (UNDP, 2015). Similarly, as described below in the benchmarks section, RTEI uses international benchmarks to calculate overall scores for indicators that are not measurable on a 0 to 100 percent scale. In RTEI 2018, benchmarks for countries based on income level (high income countries, upper-middle income countries, lower-middle income countries, and lower income countries) will also be available for users to identify regional comparisons.

## Next steps

RTEI is an iterative ongoing research-to-advocacy project using open, consultative action-research approach both with CSO partners who complete the Questionnaire, the RTEI advisory group, and external researchers and practitioners interested in the Index development. As the Index develops, future external methodological review will be explored.

Programmatically, RTEI is currently focusing on outcomes from 2017 advocacy campaigns and similarly will emphasize country specific reporting in 2018 and how national results are relevant to pertinent issues for national policy makers and advocates.

## Questionnaire edits

The Questionnaire is the main tool for data collection, based on a non-exhaustive list of indicators monitoring the international right to education framework. To ensure that RTEI becomes a longitudinal dataset useful for research and advocacy purposes, Questionnaire edits are minimal from year to year. However, throughout data collection, partners, peer reviewers, and advisors contribute feedback to the Questionnaire (see Appendix 3 for the list of questions contained in the RTEI Questionnaire).

Consultations indicated the following recommendations to be incorporated into the RTEI 2018 Questionnaire:

- A. Include guidelines for decentralized countries. For questions where decentralization resulted in a NA response in 2016, ask for proportion of the frequency that laws are in place.
- B. Revise National Plan questions to be inclusive of countries that have already achieved free and compulsory primary education (e.g. 1.3.1).
- C. Remove question 1.5.1 and replace with two questions: one measuring the percent of the national budget allocated to education and the other measuring the public expenditure per pupil in relation to average income by education level.
- D. Revise 1.5.4 to be based on GNI PPP per capita (constant 2011 dollars) rather than GDP per capita.
- E. Include question in Availability about computer access, internet access, and information technology.
- F. Remove the percentage of schools with toilets question (2.2.3)
- G. Edit the question about teacher training curriculum related to disability to include inclusive schools rather than solely accommodation.
- H. Include measures for hard-to-reach populations, like homeless children.

## Benchmarks

Per recommendations from consultations, RTEI 2018 will use revised benchmarks for questions that are not measurable on a 0-100 percent scale. The new benchmark guide is available in Appendix A and includes overall international benchmarks and by income group: High Income Country, Upper Middle Income Countries, Lower Middle Income Countries, and Low Income Countries. National benchmarks will be compared against international and income level benchmarks so that there will be one international RTEI score and then income level scores to compare countries within income groups.

## Implications

The implications of Questionnaire edits are three-fold:

1. RTEI more accurately includes relevant questions based on feedback from partners who completed the Questionnaire.
2. Minor edits to the Questionnaire alter RTEI's longitudinal quality and must be considered in relation to the 2016 results and 2015 pilot Questionnaires.
3. International benchmarks place indicators on the same scale regardless of national resources or comparability between income level. Income group benchmarks create more specific comparisons of national scores as compared to other countries within the same income group.

## Consolidate variables

2016 methods – Variables about whether countries were a signatory to different treaties and whether national assessments, curriculum, and teacher training following international standards were calculated individually. Gross Enrollment Rate was included in Index scores but capped at 1.

Ordinal variables were calculated individually on a scale of 0 to 1, with even gaps between each value.

2018 proposed changes – Average responses related to assessments, curriculum, and teacher training. Remove gross enrollment rate from calculations.

Ordinal variables were reassessed to consolidate or recode to more accurately reflect real values.

## Implications

Implications of consolidation include:

1. Consolidating like variables, such as attributes of curriculum, teacher training, and assessment content will ensure that these indicators are not over emphasized
2. Variables for gross enrollment rates were also excluded in 2018 proposed calculations because rates may be over 100 percent and depend on incomparable demographics for each country. For instance, higher gross enrollment rates could indicate more dropouts in early school ages, inconsistent school access, or improved policies bringing out-of-school learners into school.
3. RTEI contains ordinal variables with different frequencies that were assigned values based on their distance from each other, but not based on on-the-ground realities. For example: 1.4.3 How often is data on primary school net enrollment rate collected nationally? Has 5 possible responses while 5.2.1 Are there mobile schools for children of nomads? Has 4 possible responses. In 2018, ordinal variables will be revisited to identify the most accurate calculation based on frequency of response within indicators and within country income groups if appropriate.

2018 Consolidated variables include:

- 3.2.1 Do national laws forbid discrimination in education on the following grounds?
- 4.1.1 Do national laws or policies direct education towards the following aims?
- 4.1.2 Does the national curriculum direct education towards the following aims?
- 4.1.3 Does the required training for teachers include improving the skills necessary for teaching towards the full development of the following aims?
- 4.1.5<sup>2</sup> Does national curriculum include the following topics?
- 4.3.1 Do national assessments or exams attempt to evaluate pupils progress towards the following aims?
- 4.3.2 Do national assessments or exams evaluate pupil's understanding of the following topics?

Remove gross enrollment, "3.3.1 What is the gross enrollment rate?", from calculation.

## Ordinal variables

RTEI 2018 has several strategies to code ordinal variables. In some cases, 1 could become the full satisfaction and everything else would be coded as 0. However, this may bias towards countries who

<sup>2</sup> Note variables 4.13 and 4.15 were dropped in the final analysis due to missing categorical data.

have more resources, centralized legal structures, or other external variables. Another alternative is to identify the confidence interval for each ordinal variable compared to an average of the other ordinal variables or identify the exponential difference between country ordinal variable responses. This would help identify if country responses are comparable to each other but would not be included in Index calculations. Finally, scaling ordinal variables using a larger scale or putting all ordinal variables on the same scale (ie. 0-100, with 0 being a 'no' response, '100' being a fully satisfied response, and a qualitative assessment from researchers of where their country system lies in between) could more accurately capture ordinal values.

## Missing data and Not Applicable responses

2016 methods – For each country, missing data was skipped in calculating national Index scores. Questions missing more than 50% of their responses were excluded from Index calculation across all respondents.

Data availability was calculated as a Governance subtheme (1.6) equal to the response rate multiplied by the percent of data from government sources.

Questions that were not applicable to respondents were excluded from Index calculation for that respondent but retained in Index calculation for respondents for whom the question was applicable, resulting in different sample sizes.

2018 proposed changes – Questions with more than 20% of responses missing are dropped. Questions with less than 20% responses missing are retained, and later used to estimate the standard error for the RTEI's country-scores.

RTEI 2018 could use an alternative analysis using single imputation for indicators with less than 20% responses missing. The analysis imputes values for missing data based on the average scores for the region and income-group that each country belongs to.

Data availability equals the percent of questions responded to, our response rate, and is a weight applied to Governance, similar to a subtheme.

Not applicable questions are removed from the Index calculation for all countries. Not applicable questions are revised in the Questionnaire when possible to be relevant to all countries.

### Missing data

Missing data are variables without observations or questions without answers (SPSS, n.d.). Causes of missing data vary but for RTEI, it reflects a gap in governance that should monitor and protect the right to education. The optimal goal is to have as complete a dataset as possible, or to minimize those missing values. But when data is missing, RTEI 2018 proposes two alternative methods to deal with missing data, inclusion of missing data and imputation of missing data. Both methods start with omitting any questions that are missing more than 20 percent of responses. Then, the remaining questions with less than 20 percent missing data can be handled in two alternative ways. First, RTEI 2018 includes them to calculate the Index scores, then, uses the missing data to estimate a margin of error in the Index scores. The larger the amount of missing data, the larger the likelihood of making an error in estimating country scores. Alternatively, single imputation could create values for missing continuous variables that have an infinite number of possibilities (ranging from 0 to 1), rather than those that are solely 0 or 1 (categorical), for example. To create more relevant imputed data, RTEI 2018 calculates the mean values for only the region and income group to which the country with missing data belongs, then replaces the missing values with the average of those two means (see table 4). All imputed variables will be noted in the dataset so researchers can access both the dataset both prior to and after imputation in 2018.

RTEI 2018 scores will not include imputed data, rather a standard error for Index scores will be calculated.

Table 4: Imputation grouping

|           | Income Level | Region                |
|-----------|--------------|-----------------------|
| Australia | High-income  | East Asia and Pacific |
| Canada    | High-income  | North America         |



|             |                     |                                 |
|-------------|---------------------|---------------------------------|
| Chile       | High-income         | Latin America and the Caribbean |
| DRC         | Low-income          | Sub-Saharan Africa              |
| Ethiopia    | Low-income          | Sub-Saharan Africa              |
| Honduras    | Lower-middle income | Latin America and the Caribbean |
| Indonesia   | Lower-middle income | East Asia and Pacific           |
| Korea       | High-income         | East Asia and Pacific           |
| Nigeria     | Lower-middle income | Sub-Saharan Africa              |
| Palestine   | Lower-middle income | Middle East and North Africa    |
| Philippines | Lower-middle income | East Asia and Pacific           |
| Tanzania    | Low-income          | Sub-Saharan Africa              |
| U.S.        | High-income         | North America                   |
| UK          | High-income         | Europe and Central Asia         |
| Zimbabwe    | Low-income          | Sub-Saharan Africa              |

## Using the government's missing data frequency as a weight

Controlling for missing data by excluding variables with missing data from Index calculation does not account for the impact of missing data on governance. The Governance theme's score must include a measure for missing values because data availability is integral to thorough and transparent governance that respects, fulfills, and satisfies the right to education. RTEI 2018 uses the percentage of available government data as a weight to adjust the Governance theme score.

## Not Applicable responses

Not applicable (NA) answers in RTEI are Missing At Random (MAR), where the missing data is missed because it depends on other variable/question, such as if a country is a member of a region, then it ratifies certain regional treaties. For 2018 methods variables that include not applicable data are omitted from the Index calculation. MAR variables are only found in "1.1.5 Is the State party to the following regional treaties?" and omitted from the Index scores.

## Implications

1. Missing data imputation: Imputing variables risks creating false values for countries missing extensive data. Variables with less than 20 percent missing data are included in the Index score calculations, then, those missing values can identify the margin of error of the scores and indicate the potential reliability of the scores.
2. Excluding variables with more than 20 percent missing: Including variables with more than 20 percent missing in the index's calculation skew the analysis by creating a considerable difference in the sample size for each observation, which biases the results.
3. Data availability as a Governance weight: the simple average (arithmetic mean) is highly sensitive to outliers, so a very large or small value is sufficient to shift the arithmetic mean value upwards or downwards. This deviation could negatively influence the robustness of the method and results. The vulnerability to outliers, also described as high level of compensability (OECD, 2008), signifies that one country could offset its low score on the Data Availability subtheme if it has better scores on the other Governance subthemes.
4. Not applicable responses: When calculating scores of each subtheme, those variables should be skipped, otherwise countries with NA answers will have different sample sizes than those with applicable data.

# Indicator selection and multivariate analysis to check for redundancy

2016 methods – Did not test for correlation: correlated variables were included in calculation.

2018 proposed changes – Test for correlation: include correlated variables in calculation but note them for further analysis.

## Implications

A simple multivariable analysis, “the correlation matrix,” identifies highly correlated variables. The correlation matrix is a simple model to test the correlations between the variables and presents this in a percentage form; the higher the percentage, the higher the correlation. Based on that, RTEI analyses can be sensitive to highly correlated variables and identify those correlations in findings. The correlation matrix should be run every year of data collection as correlations may change or patterns may emerge in correlated variables in the Index. Highly correlated variables may show advocates and policymakers unique issues in country analyses and international comparisons for researchers.

In 2016, correlated variables, with above 80 percent correlation, were:

| Table 8: Correlated variables   |   |
|---|---|
| 90 percent correlated and above   |   |
| 1.2.1d Do national laws protect the right to education? Higher education/ University  | 1.2.1c Do national laws protect the right to education? Technical and vocational training   |
| 1.2.1b Do national laws protect the right to education? Secondary education   | 1.2.1a Do national laws protect the right to education? Primary education   |
| 3.1.1 Do national laws provide for free and compulsory primary education?   | 4.1.1_mean Do national laws or policies direct education towards the following aims?<br>a. The full development of the child’s personality, talents, and mental and physical abilities?<br>b. The development of respect for human rights and fundamental freedoms?<br>c. The development of respect for the child’s parents, cultural identity, language, and values, as well as respect for the values of the child’s country and other civilizations?<br>d. The development of the child’s responsibilities in a free society, including understanding, peace, tolerance, equality, and friendship among all persons and groups?<br>e. The development of respect for the natural environment? |
| 3.3.1ba What is the gross enrollment rate? Overall secondary schools<br>5.4.2 What percent of women are married by the age of 18? | 3.3.2ba What is the net enrollment rate? Overall secondary schools  |
| 80 percent correlated and above   |   |

|  |  |
|--|--|
| <p>3.2.1 mean Do national laws forbid discrimination in education on the following grounds? a. Race and color (ethnicity)?<br/> b. Sex?<br/> c. Language?<br/> d. Religion?<br/> e. Political or other opinion?<br/> f. National or social origin?<br/> g. Property?<br/> h. Birth?<br/> i. Sexual orientation and gender identity?<br/> j. Disability?<br/> k. Age?<br/> l. Nationality?<br/> m. Marital and family status?<br/> n. Health status?<br/> o. Place of residence?<br/> p. Economic and social situation?</p> | <p>1.1.1 Is the State party to the following United Nations treaties?<br/> a. The International Covenant on Economic, Social, and Cultural Rights (ICESCR)<br/> b. The Convention on the Rights of the Child (CRC)<br/> c. The International Convention on the Elimination of All Forms of Racial Discrimination (ICERD)<br/> d. The Convention on the Rights of Persons with Disabilities (CRPD)<br/> e. The International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families (ICRMW)<br/> f. The Convention relating to the Status of Refugees<br/> g. The International Covenant on Civil and Political Rights (ICCPR)<br/> h. The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)</p> <p>1.1.2 Is the State party to the following UNESCO treaty?<br/> The UNESCO Convention against Discrimination in Education</p> <p>1.1.3 Is the State party to the following ILO conventions?<br/> a. The ILO Minimum Age Convention<br/> b. The ILO Worst Forms of Child Labour Convention<br/> c. The ILO Indigenous and Tribal Peoples Convention</p> <p>1.1.4 Is the State party to the following Geneva conventions?<br/> a. The Geneva Convention III relative to the Treatment of Prisoners of War<br/> b. The Geneva Convention IV relative to the Protection of Civilian Persons in Time of War<br/> c. Protocol I to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts<br/> d. Protocol II to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of Non-International Armed Conflicts</p> |
| <p>5.4.3 Is the legal minimum age of employment 15 or above?</p>   | <p>1.1.1 to 1.1.4</p>  |
| <p>2.4.1c Is there a minimum standard in place setting the number of pupils per available textbook? Secondary school</p>   | <p>2.4.1a Is there a minimum standard in place setting the number of pupils per available textbook? Primary school</p>   |
| <p>3.3.1da What is the gross enrollment rate for tertiary schools? Overall</p>   | <p>2.1.2b What is the pupil-classroom ratio? b. for secondary schools</p>  |

# Progressively realized obligations

2016 methods – GDP PPP Per capita was used to rescale progressively realized obligations.

2016 formula:

$$1 - (1 - x) (\log \text{GDPpercapitaPPPnational} / \mu \log \text{GDPpercapitaPPPRTEI16Countries})$$

2018 proposed changes – GNI PPP Per capita would be used to rescale progressively realized obligations by adapting the 2016 weighting formula.

2018 proposed formula:

$$\mathbf{RRSS} = 1 - ((1 - x) * \left( \frac{\ln \text{GNI ppp percapita country}}{\ln \text{GNI ppp percapita world}} \right)^n)$$

## Implications

RTEI evaluates countries' satisfaction of the right to education based on international human rights law. The satisfaction of the right to education depends on two elements: (a) the initial enjoyment level of the rights, and (b) the available resources for each country to fully satisfy the rights (Fukuda-Parr, Lawson-Remer, & Randolph, 2008). Since the initial level of enjoyment and the available resources are diverse among countries represented in RTEI, all countries do not have the same capacity to fulfill their obligations. Consequently, it would be inaccurate and biased for low and middle-income countries to be expected to perform the same as the richest ones. The right satisfaction scores related to progressively realized rights -- defined by the Right to Education Project, CESCR General Comment No 13 (para. 57), and ICESCR Article 13 (de Beco, 2009)<sup>3</sup> -- should be rescaled using a proxy that can, to an extent, capture the discrepancy in available resources among countries. GNI is a more accurate measure of resource availability than GDP because it considers more income sources, including those measured in GDP.

Continuous<sup>4</sup> Progressively realized indicators for 2018 calculations:

- 2.1.2b
- 2.2.2c
- 2.2.3b
- 2.2.4b
- 2.3.1b
- 2.3.3b
- 2.3.4
- 2.4.2b
- 3.1.4
- 3.3.2ba
- 3.3.3ba
- 3.3.3ca
- 3.3.3da
- 4.3.3da
- 4.3.3ea
- 4.3.3fa
- 5.1.3a, b, & c
- 5.2.3b
- 5.4.2

<sup>3</sup> Minimum standards in the right to education are not subject to resource weighting, these include free and compulsory quality primary education, among other standards (de Beco, 2009).

<sup>4</sup> Categorical and Ordinal progressively realized indicators are not weighted using the progressively realized formula because although you can apply any formula to any variable as long as its represented by a numeric value (number), categorical and ordinal variables, have no intrinsic numerical value. We use numbers to code these variables in the dataset for data processing purposes. For example, you could code "Is education available in prison? a. Yes, it is universally available. b. Yes, it is generally available. c. Yes, but availability is rare or uncommon. d. No" as a=1, b=.66, c=.33, and d=0 but these codes have no intrinsic relationship with the values or distance between them but are rather useful for quantifying a qualitative assessment of education availability in prison.

# Data Weighting Schemes and Aggregation Method

2016 methods – No weighting was applied, resulting in some indicators and subthemes having more influence on scores than others.

2018 proposed changes – Using equal weighting scheme:

- A. Indicators could be equally weighted within each theme, which would keep each theme weighted at 20 percent of the final Index score.
- B. Subthemes could be equally weighted, which would result in data points in subthemes with fewer questions being given more strength than those in subthemes with more questions.

## Applying equal weights

Each theme is weighted equally to present 20 percent of the right to education's satisfaction, respect, and fulfillment. However, RTEI 2016's aggregation method of using average of averages is only valid when the number of subthemes and data points under all the themes are equal. Instead, we propose the weighted arithmetic average to replace the arithmetic average of averages. In RTEI 2018, each data point must be weighted the same within each theme so as not to preference one element of the right to education over another. For instance, each data point in Governance could be weighted a .6 percent of the final score, in Availability each indicator would be 1.3333 percent, an individual Accessibility indicator would be 1.25 percent, etc. Equal indicator weighting within each theme is recommended in RTEI 2018.

Alternatively, data points could be weighted within each subtheme, although this would heavily preference smaller subthemes over larger ones. For instance, each data point within International Framework would be worth a fraction of Plan of Action data points.

## Implications

Weighting each indicator equally implies that all aspects of the right to education monitored in RTEI have the same value. RTEI 2018 will first test weighting each indicator equally within each theme, then within each subtheme. RTEI 2018 can also include an analysis weighting each indicator derived from the same aspect of the right to education equally. In this way, the final RTEI 2018 results will depend on data collected and testing different weighting systems, but equal indicator weighting is an underlying assumption in 2018. RTEI 2018 may also consider using the geometric mean per consultations to better capture inequality within scoring (UNDP, 2010).

# Sensitivity Analysis and Robustness Check

2016 methods – No sensitivity analysis or robustness check was performed.

2018 proposed changes – Sensitivity analysis and robustness check was tested to identify if results were accurate based on proposed changes.

## Implications

Robustness and sensitivity analysis show that Index scores are not overly sensitive to changes in parameters, so changing methods for RTEI 2018 does not invalidate previous findings.

## Testing

Confidence levels, sensitivity analysis, and robustness are used to test the validity of outcomes of the RTEI 2018 statistical model. Robustness tests of rankings such as RTEI's composite scores compare the variations in weighting and calculations described above. RTEI ranks are "robust" if scores are "not reversed for any weighting vector in the set" (Foster, McGillivray, & Seth, 2012, p. 2). In RTEI, we focus on several uncertainties, including imputation of the missing values, inclusion/exclusion of variables, and different weighting schemes.

RTEI 2018 uses four robustness techniques: inferential statistics, rank robustness analysis to test the ranks sensitivity to changes in parameters, sensitivity analysis of country scores, robustness analysis to identify if the country-scores are outliers (e.g., Iglewicz-Hoaglin method that applies to deviations from the mean in small samples [e.g. NIST/ SEMATECH, 2012]).

The following tests were run using a base-model<sup>5</sup> that included:

- Consolidated variables
- Imputed variables if missing less than three responses
- Redundant variables excluded
- No weighting for progressive realization

*Inferential statistics (Standard error, significance level & confidence interval).* One way to check for robustness is by comparing the original Index score for each country to the mean of a set of alternate index's scores for the same country. The original RTEI score for country would be treated as an independent observation with standard deviation from a sample mean. The sample is obtained by calculating the Index score multiple times, and each time corresponds to a change in a parameter specification. Through multiple calculations, we obtain a sample with a mean ( $\bar{x}$ ) and a standard deviation (S). Then we calculate the standard deviation of the original Index score and compare it to the mean. If the standard deviation is relatively large in comparison to the mean, then this estimator is not robust. We estimated individual country scores multiple times based on different parametric modifications (n=39 samples). Then we estimated the sample mean of those country scores and the standard deviation between the base-model score and the country sample mean. We calculated the ratio of standard deviation of the base-model to the sample mean for each country. The outcomes, as expressed in table

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<sup>5</sup> The baseline model is an analytic tool and was not selected as the primary recommended analysis. Further study using 2016 results or other parameters as the baseline model are necessary.

1, suggest that the base-model country scores are robust to changes because the standard deviation is significantly small in comparison to the sample mean. There is no large variation between the base-model score and the sample mean.

Table 1: Sample Standard Deviation

| Countries   | Country scores | Sample mean | Standard deviation of the base-model | Ratio of the base-model's Standard deviation to the sample mean |
|-------------|----------------|-------------|--------------------------------------|---|
| Australia   | 0.7705         | 0.783269    | 0.012769                             | 0.016302  |
| Canada      | 0.765094       | 0.738474    | 0.02662                              | 0.036048  |
| Chile       | 0.743315       | 0.719832    | 0.023483                             | 0.032622  |
| DRC         | 0.602649       | 0.609923    | 0.007274                             | 0.011925  |
| Ethiopia    | 0.798424       | 0.821693    | 0.023269                             | 0.028319  |
| Honduras    | 0.81893        | 0.792065    | 0.026865                             | 0.033917  |
| Indonesia   | 0.740205       | 0.742651    | 0.002446                             | 0.003293  |
| Nigeria     | 0.707014       | 0.713756    | 0.006742                             | 0.009446  |
| Palestine   | 0.748313       | 0.71517     | 0.033143                             | 0.046342  |
| Philippines | 0.820284       | 0.827685    | 0.007401                             | 0.008942  |
| South Korea | 0.735463       | 0.74432     | 0.008856                             | 0.011899  |
| Tanzania    | 0.709017       | 0.718465    | 0.009447                             | 0.013149  |
| UK          | 0.691113       | 0.709534    | 0.018421                             | 0.025963  |
| US          | 0.615104       | 0.593769    | 0.021336                             | 0.035933  |
| Zimbabwe    | 0.739491       | 0.721199    | 0.018292                             | 0.025363  |

z-scores. Z-scores are commonly used to detect outliers. Assuming a standard normal distribution, an outlier value would have a z-score  $> |3|$  (located more than 3 standard deviations from the mean). We use z-scores to verify that RTEI's scores are not outliers or extreme values. Table 2 below shows no z-score greater than  $|3|$ , which verifies that RTEI's base-model scores are not outliers and are consequently robust.

Table 2: z-scores

| Countries   | Country scores | Sample mean | Sample standard deviation | z-scores |
|-------------|----------------|-------------|---------------------------|----------|
| Australia   | 0.7705         | 0.783269    | 0.044131                  | -0.28934 |
| Canada      | 0.765094       | 0.738474    | 0.047268                  | 0.563177 |
| Chile       | 0.743315       | 0.719832    | 0.042622                  | 0.550957 |
| DRC         | 0.602649       | 0.609923    | 0.04                      | -0.18184 |
| Ethiopia    | 0.798424       | 0.821693    | 0.05045                   | -0.46124 |
| Honduras    | 0.81893        | 0.792065    | 0.038056                  | 0.70592  |
| Indonesia   | 0.740205       | 0.742651    | 0.048165                  | -0.05078 |
| Nigeria     | 0.707014       | 0.713756    | 0.046829                  | -0.14398 |
| Palestine   | 0.748313       | 0.71517     | 0.04284                   | 0.773637 |
| Philippines | 0.820284       | 0.827685    | 0.040677                  | -0.18195 |
| South Korea | 0.735463       | 0.74432     | 0.036399                  | -0.24331 |
| Tanzania    | 0.709017       | 0.718465    | 0.034804                  | -0.27144 |
| UK          | 0.691113       | 0.709534    | 0.039869                  | -0.46205 |
| US          | 0.615104       | 0.593769    | 0.055198                  | 0.386534 |
| Zimbabwe    | 0.739491       | 0.721199    | 0.04128                   | 0.443114 |

Modified z-scores (Iglewicz-Hoaglin method [NIST/ SEMATECH, 2012]). Although z-scores are widely used to check for outliers, they assume normality or that outliers are less likely. Z-scores also might produce inaccurate estimates in cases of small sample sizes (NIST/SEMATECH, 2012). If the M-score takes an

absolute value more than 3.5, it is an outlier (NIST/SEMATECH, 2012). The table below shows no M-score value above 3, which verify that RTEI scores are not outliers within the sample and are consequently robust.

Table 16: M-Scores

| Countries   | Country scores | Sample median | MAD      | M-scores |
|-------------|----------------|---------------|----------|----------|
| Australia   | 0.7705         | 0.779442      | 0.012046 | -0.50071 |
| Canada      | 0.765094       | 0.748809      | 0.03245  | 0.338515 |
| Chile       | 0.743315       | 0.726934      | 0.052507 | 0.210423 |
| DRC         | 0.602649       | 0.609664      | 0.169778 | -0.02787 |
| Ethiopia    | 0.798424       | 0.829609      | 0.056683 | -0.3711  |
| Honduras    | 0.81893        | 0.788894      | 0.014815 | 1.367507 |
| Indonesia   | 0.740205       | 0.747853      | 0.032017 | -0.16112 |
| Nigeria     | 0.707014       | 0.718424      | 0.061018 | -0.12613 |
| Palestine   | 0.748313       | 0.712955      | 0.066487 | 0.358702 |
| Philippines | 0.820284       | 0.831287      | 0.053399 | -0.13898 |
| South Korea | 0.735463       | 0.740917      | 0.038547 | -0.09544 |
| Tanzania    | 0.709017       | 0.719537      | 0.059905 | -0.11845 |
| UK          | 0.691113       | 0.710768      | 0.068674 | -0.19305 |
| US          | 0.615104       | 0.595526      | 0.183916 | 0.071802 |
| Zimbabwe    | 0.739491       | 0.727889      | 0.051553 | 0.151795 |

Rank Robustness Analysis. Rank robustness tests intend to assess the extent to which a ranking of a country, part of a set of countries, is maintained while the values of some parameter change (Alkire, et al., 2015). It tests the elasticity of the Index scores with respect to the change in one of the model's parameters. The robustness of a ranking is assessed through the Spearman rank correlation coefficient ( $R^p$ ). The Spearman rank correlation coefficient was chosen due to its ease of use and its breadth of application in such analyses. Furthermore, the original ranking for set of countries is  $r'$ , where the alternative ranking after changing a parameter is denoted  $r'_i$ . The change is the parametric specification could be such as changing the weighting scheme. Assuming we run a Spearman rank correlation between  $r'$ , and  $r'_i$ , we should expect one of three outcomes:

1. A correlation coefficient = 1, meaning that the alternative ranking is identical to the original before that, or perfectly positively correlated; which means that 100 percent of the pairwise comparisons are robust to changes in a parameter (Alkire, et al., 2015).
2. A correlation coefficient = -1, meaning that the alternative ranking is perfectly negatively associated with the original ranking, which means that 0 percent of the pairwise comparisons are robust to changes in a parameter (Alkire, et al., 2015).
3. A correlation coefficient between -1 and 1; the closer to 1, the more positively correlated and robust to changes the ranking and vice versa.

Table 17: Spearman correlation rank

| <i>Alternate model's specifications</i>   | <i>Spearman correlation rank</i> |
|---|----------------------------------|
| Alternate model 1: 2016 results compared with proposed imputation if data was missing for one country                                   | 0.534                            |
| Alternate model 2: Compared imputation without other proposed changes (progressive realization, consolidation, etc.) without imputation | .746                             |
| Alternate model 3: 2016 results compared with proposed changes excluding imputation   | 0.915                            |

$r_s = .92, p < .05$



Spearman coefficients can be interpreted as the percentage of pairwise country comparisons that were robust to the change in model specifications (their ranking has not shifted due to the parametric modifications) (Alkire, et al., 2015). For instance, comparing countries' ranking from the alternate model (1) to the ranking outcome from the base-model suggests that only 53 percent of the countries retained the same ranking after modifying the parameter. That suggests that, sorting the countries based on their scores is highly sensitive to the change in the parameters.

The ranking suggests that alternative model 3 is the most robust if we do not include imputation in 2018 methods.

# Appendix 1: Communicating RTEI Methods

## Summary

The Right to Education Index (RTEI) is a global accountability initiative, which aims to ensure that all persons can enjoy their right to education. The global index tracks progress towards the fulfilment of the right to education worldwide. Built on a legal framework on the right to education, it includes a relevant but not exhaustive list of human rights law instruments, such as the Universal Declaration of Human Rights, the International Covenant on Economic, Social and Cultural Rights or the UNESCO Convention against Discrimination in Education. RTEI monitors national progress using specific indicators measuring the fulfilment of the right to education. Through an interactive methodology, RTEI is continuously adapted to necessary changes. The index offers information on the status quo and areas of improvement to citizens, civil society, researchers and governments.

The Index has grown from five countries in 2015 to 15 in 2016 with expansion planned to 25 in 2018. Current countries represented in RTEI are: Australia, Canada, Chile, the DRC, Ethiopia, Honduras, Indonesia, Nigeria, Palestine, the Philippines, South Korea, Tanzania, the United Kingdom, the United States, and Zimbabwe. National civil society organizations in each country complete the RTEI Questionnaire after applying to participate and being vetted by RTEI staff and advisors with expertise on the right to education. Civil society organizations have robust experience in domestic advocacy and interest in gaining research skills to further their work on national educational issues.

### Methodology

RTEI is an action research process with civil society organizations and scholars invested in the process and product. Civil society research partners, advisors, and other stakeholders shape RTEI's iterative development to improve confidence in the methods and data collected. In RTEI, calculation decisions include how indicators are weighted, how missing data is handled, what variables are included, and how the Index scores are aggregated. Action research methods help ensure that the Index reflects how advocates, researchers, and policymakers understand right to education monitoring internationally and in national contexts.

RTEI is based on five themes – Governance, Availability, Accessibility, Acceptability, and Adaptability – that reflect national satisfaction of international agreements and responsibilities. The Questionnaire is structured along these five themes and each theme is divided into subthemes. The subthemes include the different questions, for which the states receive scores that are calculated into the RTEI overall score. Each indicator is measured on a 0 to 1 scale with 0 being the absence of the right to education and 1 being full satisfaction of the right to education. Each indicator in each theme is weighted equally and each theme totals 20 percent of the final score.

Because there are different types of questions, indicator scores are calculated in different ways. For example, yes or no questions are coded as 1 if they support the attainment of the right to education and 0 if they do not. Questions providing more complex answers than yes or no but still use categories that signify satisfaction of the right to education are coded on a scale from 0 to 1. And some responses that are already a percentage out of 100 are not coded at all. To compare indicators between diverse countries, RTEI controls for resource availability using GNI as a weight for progressively realized rights, such as secondary education, higher education, and education for children with disabilities.

Subtheme scores are averages of coded indicator responses but do not affect the overall Index score. These are used to identify specific areas within themes that require further attention.

Through the average of the question scores in a theme, RTEI 2018 presents the theme score. The Index score is an average of the themes so that each theme influences that overall score by 20 percent. Each theme can be analysed as its own Index within RTEI. The overall Index score expresses the overall progress towards the right to education in a given country.

In the end, the overall RTEI score provides an index score ranging from 0 (right to education absent) to 100 (right to education being fully respected, protected and fulfilled) and allowing comparison between different countries.

Nevertheless, the right to education is too complex to be measured solely in a quantitative Index. RTEI includes qualitative information about each indicator score on the Questionnaire with citations provided by civil society researchers, experts in the right to education nationally, and policy makers. Although the Index scores provide a *general* measure of the right to education in a country, RTEI is not a *comprehensive, definitive* measure of the right to education nationally.

## RTEI Developments

Although the questionnaire edits should be minimal to ensure a longitudinal dataset useful for research and advocacy purposes, methodological changes have been proposed for the RTEI 2018:

Consolidate variables: RTEI 2018 consolidates variables that ask about teacher training curriculum, assessment aims, and other similar measures. In addition, gross enrolment, which does not fall on a 0 to 1 scale, is removed from calculations.

Missing data: The percent of available data in RTEI 2018 is accounted for as a weight on Governance after subthemes are calculated. Advocates and policy makers can interpret data availability scores in comparison to other countries to improve reporting processes and identify what areas in RTEI have more missing data than others nationally.

Progressively realized obligations: Progressively realized obligations within the right to education are those that require further proactive engagement from the government to satisfy. Beyond primary and basic education, indicators like secondary and tertiary education access, quality, and availability are included in progressively realized obligations. To compare these indicators, RTEI 2018 weights each response that is a percent of 100 (not 0 or 1 responses) by the national GNI per capita PPP to highlight resource availability in diverse countries participating in the Index.

Data weighting: The overall Index score is calculated by weighting the five themes equally as 20 percent each of the final score. Indicators within each theme are also weighted equally to create the theme scores, which can be used as specific indices addressing legislation, curriculum, outcomes, and the reach of educational systems, among other policy concerns.

Statistical checks: RTEI 2018 includes analyses that check different ways of calculating the Index scores to identify if the final results are robust or sensitive to changes in the calculations. These tests can help policymakers and advocates check our data to ensure that the overall scores are reflective of the data collected.

## Summary

RTEI methods are continually under development with collaboration from education advocates, experts, and policy makers. The methods in 2018 help ensure the reliability and validity of the data and how results can be used by those unfamiliar with the Index's construction.

## Appendix 2: SDG 4 Cross Cutting theme indicators

|   |
|---|
| <b>SDG 4: SDG 4.1 Free and equitable</b>  |
| 4.3.3aa: What percent of students received a passing score on the national assessment/ exam? (Overall primary)  |
| 4.3.3ba: What percent of students received a passing score on the national assessment/exam? (reading primary)   |
| 4.3.3ca: What percent of students received a passing score on the national assessment/exam? (math primary)      |
| 4.3.3da: What percent of students received a passing score on the national assessment/exam? (overall secondary) |
| 4.3.3ea: What percent of students received a passing score on the national assessment/exam? (reading secondary) |
| 4.3.3fa: What percent of students received a passing score on the national assessment/exam? (math secondary)    |
| Primary school out of school rate: Net enrollment (1 - 3.3.2aa)   |
| Secondary school out of school rate: Net enrollment (1 - 3.3.2ba)   |
| Overage learners in primary school: Gross enrollment - Net enrollment (3.3.1aa - 3.3.2aa)                       |
| Overage learners in secondary schools: Gross enrollment - Net enrollment (3.3.1ba - 3.3.2ba)                    |
| 3.3.2aa: What is the net enrollment rate for primary schools? (Overall)   |
| 3.3.2ba: What is the net enrollment rate for secondary schools? (Overall)                                       |
| 3.3.3aa: What is the primary school completion rate? (Overall)  |
| 3.3.3ba: What is the secondary school completion rate? (Overall)  |
| 3.1.1: Do national laws provide for free and compulsory education?  |
| <b>SDG 4: SDG 4.3 Beyond K - 12</b>   |
| 3.3.1ca What is the gross enrollment rate for technical and vocational training? (Overall)                      |
| 3.3.1da What is the gross enrollment rate for tertiary schools?   |
| <b>SDG 4: SDG 4.5 Inequality and inaccessibility</b>  |
| 3.3.2a Net primary school enrollment gender parity  |
| 3.3.2b Net secondary school enrollment gender parity  |
| 3.3.2a Net primary school enrollment residential parity   |
| 3.3.2b Net secondary school enrollment residential parity   |
| 3.3.2a Net primary school enrollment income parity MLP  |
| 3.3.2a Net primary school enrollment income parity HMP  |
| 3.3.2b Net secondary school enrollment income parity MLP  |
| 3.3.2b Net secondary school enrollment income parity HMP  |
| 3.3.2a Net primary school enrollment disability parity  |
| 3.3.2b Net secondary school enrollment disability parity  |
| 5.2.3a: What percentage of students are not taught in their mother tongue? (primary)                            |
| 5.2.3b: What percentage of students are not taught in their mother tongue? (secondary)                          |
| 1.5.1: What is the current public expenditure per pupil as a percentage of GDP per capita?                      |
| <b>SDG 4: SDG 4.6 Adult literacy and lifelong learning</b>  |
| 4.3.4ab: What is the literacy rate for male youth?  |
| 4.3.4ac: What is the literacy rate for female youth?  |
| 4.3.4bb What is the literacy rate for male adults?  |
| 4.3.4bc: What is the literacy rate for female adults?   |
| 4.3.4aa: What is the literacy rate? Youth Overall?  |
| 4.3.4ba: What is the literacy rate? Adult Overall?  |

|  |
|--|
| 3.1.6 Is basic education publicly provided for adults who have not completed primary education?  |
| <b>SDG 4: SDG 4.7 Sustainability</b>   |
| 4.1.1b: Do national laws or policies direct education towards the following aims? The development of respect for human rights and fundamental freedoms.  |
| 4.1.1c: Do national laws or policies direct education towards the following aims? The development of respect for the child's parents, cultural identity, language, and values, as well as respect for the values of the child's country and other civilizations?                       |
| 4.1.1d: Do national laws or policies direct education towards the following aims? The development of the child's responsibilities in a free society, including understanding, peace, tolerance, equality, and friendship among all persons and groups?                                 |
| 4.1.1e: Do national laws or policies direct education towards the following aims? The development of respect for the natural environment?  |
| 4.1.2b: Does the national curriculum direct education towards the following aims? The development of respect for human rights and fundamental freedoms.  |
| 4.1.2c: Does the national curriculum direct education towards the following aims? The development of respect for the child's parents, cultural identity, language, and values, as well as respect for the values of the child's country and other civilizations?                       |
| 4.1.2d: Does the national curriculum direct education towards the following aims? The development of the child's responsibilities in a free society, including understanding, peace, tolerance, equality, and friendship among all persons and groups?                                 |
| 4.1.2e: Does the national curriculum direct education towards the following aims? The development of respect for the natural environment?  |
| 4.1.5b Does national curriculum include the following topics? Human rights   |
| 4.3.1b Do national assessments or exams attempt to evaluate pupils progress towards the following aims? The development of respect for human rights and fundamental freedoms.  |
| 4.3.1c Do national assessments or exams attempt to evaluate pupils progress towards the following aims? The development of respect for the child's parents, cultural identity, language, and values, as well as respect for the values of the child's country and other civilizations? |
| 4.3.1d Do national assessments or exams attempt to evaluate pupils progress towards the following aims? The development of the child's responsibilities in a free society, including understanding, peace, tolerance, equality, and friendship among all persons and groups?           |
| 4.3.1e Do national assessments or exams attempt to evaluate pupils progress towards the following aims? The development of respect for the natural environment?  |
| 4.3.2b Do national assessments or exams evaluate pupil's understanding of the following topics?<br>Human Rights  |
| <b>SDG 4: SDG 4.a Safe learning environment</b>  |
| 2.2.4a: What is the percentage of schools with potable water? For primary schools?   |
| 2.2.4b: What is the percentage of schools with potable water? For secondary schools?   |
| 5.1.2: Are reasonable accommodation measures available for children with disabilities in mainstream schools?   |
| 4.2.4: Does corporal punishment occur in practice?   |

## Appendix 3: 2016 Questionnaire Structure

| GOVERNANCE               |   |
|--------------------------|---|
| INTERNATIONAL FRAMEWORK  | 1.1.1 Is the State party to the following United Nations treaties?  |
|                          | 1.1.2 Is the State party to the following UNESCO treaty?  |
|                          | 1.1.3 Is the State party to the following ILO conventions?  |
|                          | 1.1.4 Is the State party to the following Geneva conventions?   |
|                          | 1.1.5 Is the State party to the following regional treaties?  |
| NATIONAL LAW             | 1.2.1 Do national laws protect the right to education?  |
|                          | 1.2.2 Do national laws protect the liberty of individuals to establish private schools?   |
|                          | 1.2.3 Do national laws protect the minorities' right to establish their own schools?  |
|                          | 1.2.4 Do national laws expressly recognize the liberty of parents to choose the religious and moral education of their children in conformity with their own convictions? |
| PLAN OF ACTION           | 1.3.1 Is there a national education plan that aims to achieve free and compulsory primary education?  |
|                          | 1.3.2 Are there targeted implementation dates for each stage of the progressive implementation of the plan?   |
|                          | 1.3.3 Does the national education plan include measures to encourage regular attendance at schools and reduce drop-out rates?   |
| MONITORING AND REPORTING | 1.4.1 Are there minimum educational standards applicable to all schools, including private schools?   |
|                          | 1.4.2 Is there a State body responsible for monitoring the education system?  |
|                          | 1.4.3 How often is data on primary school net enrollment rate collected nationally?   |
|                          | 1.4.4 Is data on primary school net enrollment rate made publicly available?  |
| FINANCING                | 1.5.1 What is the current public expenditure per pupil as a percentage of GDP per capita?   |
|                          | 1.5.2 What is the government expenditure on education as reported as the percentage of GDP allocated to education?  |
|                          | 1.5.3 What percent of the national education budget comes from foreign aid sources (bilateral and multilateral)?  |
|                          | 1.5.4 What is the percentage of GDP allocated to foreign aid in relation to education? [donor countries]  |
|                          | 1.5.5 What is the percentage of the total national education budget allocated to each level of education?   |
|                          | 1.5.6 What is the percentage of the total national education budget allocated to the following components?  |
|                          | 1.5.7 What percentage of the approved budget for education was actually executed?   |

## AVAILABILITY

|            |   |
|------------|---|
| CLASSROOMS | 2.1.1 Is there a minimum standard in place setting the numbers of pupils per classroom?         |
|            | 2.1.2 What is the pupil-classroom ratio?  |
| SANITATION | 2.2.1 Is there a minimum standard in place setting the number of pupils per toilet?             |
|            | 2.2.2 What is the pupil-toilet ratio?   |
|            | 2.2.3 What is the percentage of schools with toilets?   |
|            | 2.2.4 What is the percentage of schools with potable water?                                     |
| TEACHERS   | 2.3.1 What is the percentage of teachers that are appropriately trained?                        |
|            | 2.3.2 Is there a minimum standard in place setting the number of pupils per trained teacher?    |
|            | 2.3.3 What is the pupil-trained teacher ratio?  |
|            | 2.3.4 What is the mean teacher salary relative to the national mean salary?                     |
| TEXTBOOKS  | 2.4.1 Is there a minimum standard in place setting the number of pupils per available textbook? |
|            | 2.4.1 What is the pupil-textbook ratio?   |

## ACCESSIBILITY

|                |   |
|----------------|---|
| FREE EDUCATION | 3.1.1 Do national laws provide for free and compulsory primary education?   |
|                | 3.1.2 Is primary education free in practice?  |
|                | 3.1.3 What percent of household spending is spent on primary education?   |
|                | 3.1.4 What percent of household spending is spent on secondary education?   |
|                | 3.1.5 Are tuition fees charged for public university/higher education?  |
|                | 3.1.6 Is basic education publicly provided for adults who have not completed primary education?                                     |
| DISCRIMINATION | 3.2.1 Do national laws forbid discrimination in education on the following grounds?   |
|                | 3.2.2 Is the expulsion of girls from school because of pregnancy or for having a baby explicitly forbidden in national legislation? |
|                | 3.2.3 In practice, are girls expelled from school because of pregnancy or for having a baby?  |

3.2.4 Do migrant, refugee, or internally displaced children have to present documents stating their legal status to enroll in school?

## PARTICIPATION

3.3.1 What is the gross enrollment rate?

3.3.2 What is the net enrollment rate?

3.3.3 What is the completion rate?

## ACCEPTABILITY

## AIMS OF EDUCATION

4.1.1 Do national laws or policies direct education towards the following aims?

4.1.2 Does the national curriculum direct education towards the following aims?

4.1.3 Does the required training for teachers include improving the skills necessary for teaching towards the full development of the following aims?

4.1.4 Are there established mechanisms to ensure that textbooks used in both public and private schools are aligned with the curriculum guidelines provided by the Ministry of Education?

4.1.5 Does national curriculum include the following topics?

4.1.6 Do national laws include children in the decision-making process of school curricula, school policies, and codes of behavior?

## LEARNING ENVIRONMENT

4.2.1 Has the national government adopted specific measures to protect children from violence and abuse in school?

4.2.2 In practice, are children in schools free from violence and abuse?

4.2.3 Do national laws prohibit corporal punishment?

4.2.4 Does corporal punishment occur in practice?

## LEARNING OUTCOMES

4.3.1 Do national assessments or exams attempt to evaluate pupil's progress towards the following aims?

4.3.2 Do national assessments or exams evaluate pupil's understanding of the following topics?

4.3.3 What percent of students received a passing score on the national assessment/exam?

4.3.4 What is the literacy rate?

## ADAPTABILITY

## CHILDREN WITH DISABILITIES

5.1.1 Do national laws recognize the right to education for children with disabilities?

5.1.2 Are reasonable accommodation measures available for children with disabilities in mainstream schools?

5.1.3 What is the percentage of teachers trained to teach children with disabilities?



|                            |  |
|----------------------------|--|
| CHILDREN OF<br>MINORITIES  | 5.2.1 Are there mobile schools for nomadic children?   |
|                            | 5.2.2 Do national laws provide for language of instruction to be in the child's mother tongue?                     |
|                            | 5.2.3 What percentage of students are not taught in their mother tongue?   |
| OUT OF SCHOOL<br>EDUCATION | 5.3.1 Is primary education available in retention centers/camps for refugee children?                              |
|                            | 5.3.2 Do refugee children receive education integrated with the general education system (i.e., same curricula)?   |
|                            | 5.3.3 Is education available in prison?  |
|                            | 5.3.4 Do imprisoned children receive education integrated with the general education system (i.e. same curricula)? |
| OUT OF SCHOOL<br>CHILDREN  | 5.4.1 Do national laws prohibit early marriage (below the age of 18)?  |
|                            | 5.4.2 What percent of women are married by the age of 18?  |
|                            | 5.4.3 Is the legal minimum age of employment 15 or above?  |
|                            | 5.4.4 Has the government adopted specific measures to combat child labor?  |
|                            | 5.4.5 What percent of children under the age of 15 work in the labor force?  |
|                            | 5.4.6 Is the legal minimum age of military recruitment 15 or above?  |
|                            | 5.4.7 Are children under the age of 15 recruited by the military in practice?                                      |

## Appendix 4: RTEI 2018 Benchmarks

The following questions could not be measured on a 0 to 100 percent scale so artificial benchmarks were developed. When possible, benchmarks were identified through (1) scholarly literature and research, (2) international governmental and non-governmental reports, and (3) international medians from all internationally available data since 2000 (UNESCO, World Bank, ILO, and other sources).

As RTEI grows beyond 2018, it is likely that each income group will have alternative benchmarks to account for available resources. When applicable, income group benchmarks are provided below for review and revision prior to data collection in 2020.

All data and calculations to identify international medians is available on “RTEI 2018 Benchmarks for Analysis.”

### 1.5.1 What is the percent of the national budget allocated to education?

Question 1.5.1 could not be measured on a 0 to 100 scale but is set at a maximum of 20 percent, the international-agreed upon benchmark for this indicator (GPE, 2016a).

RTEI 2018 uses the international goal but also identified international medians for potential income group analysis. The international median for “expenditure on education as percent of total government expenditure (%)” is 14 percent.

- High income countries: 12%
- Upper-Mid income countries: 14%
- Mid-Low income countries: 16%
- Low-income countries: 17%

### 1.5.2 What is the percentage of the total national education budget allocated to each level of education?

Question 1.5.2 has four parts, focusing on different levels of education (primary, secondary, TVET, and tertiary).

1.5.2a. Primary has an international benchmark set at 50 percent (GCE, n.d.).

To make income level benchmarks, RTEI draws on expenditure data in the World Bank, assuming that allocation and expenditure should be close to equal. The below benchmarks by income-group are identified through the median of all available 2000-2016 data “Expenditure on primary as percent of government expenditure on education (%)” for each income group available in the World Bank (2016a). The international median in this data is 34 percent:

- High income countries: 26%
- Upper-Mid income countries: 37%
- Mid-Low income countries: 40%
- Low-income countries: 50%

1.5.2b Secondary has an international benchmark set at 30 percent (GPE, 2014).

The international median of all available 2000-2016 data “Expenditure on secondary as percent of government expenditure on education (%)” is 34 percent (see table 2, World Bank, 2016b).

- High income countries: 39%
- Upper-Mid income countries: 31%
- Mid-Low income countries: 34%
- Low-income countries: 26%

1.5.2c Vocational and Technical Training have no international benchmarks, so RTEI 2018 uses the median of available data since 2000, 6 percent (World Bank, 2016c).

- High income countries: 9%
- Upper-Mid income countries: 3%
- Mid-Low income countries: 4%
- Low-income countries: 4%

1.5.2d Tertiary is capped at 19 percent using the international median of all available data since 2000 (World Bank, 2016d).

- High income countries: 22%
- Upper-Mid income countries: 18%
- Mid-Low income countries: 16%
- Low-income countries: 20%

### 1.5.3 What is the percentage of the total national education budget allocated to the following components?

1.5.3 has the following maximum benchmarks identifiable in the literature

1.5.3a. Teacher Salaries budget allocations are standardized at 80 percent. Although some sources critique high government spending on teacher salaries, consensus from UNESCO Institute for Statistics (UIS) and World Bank is that 80 percent of education budgets should go towards salaries (Bruns et al, 2011, 143; UIS, 2014). RTEI 2018 uses the 80 percent international benchmark.

The international median of all available data since 2000 is 69 percent (World Bank, 2016e).

- High income countries: 72%
- Upper-Mid income countries: 70%
- Mid-Low income countries: 65%
- Low-income countries: 67%

1.5.3 b. Teaching and Learning Materials (including teacher training) are standardized at 33 percent under the former Fast Track Initiative (UIS, 2016a). We divided the recommended 33 percent with the international median to identify the international benchmark in RTEI 2018, resulting in a benchmark of 22 percent

The international median for “current expenditure other than staff compensation as percent of total expenditure in public institutions (%)” is 19 percent from all available data since 2000 (World Bank, 2016f).

- High income countries: 20%
- Upper-Mid income countries: 20%

- Mid-Low income countries: 15%
- Low-income countries: 17%

1.5.3c. Capital Development (Infrastructure) is capped at 33 percent (UIS, 2016a). We divided the recommended 33 percent with the international median to identify the international benchmark in RTEI 2018, resulting in a benchmark of 11 percent.

The international median for “capital expenditure as percent of total expenditure in public institutions (%)” is 9 percent from all available data since 2000 (UIS, 2016b).

- High income countries: 8%
- Upper-Mid income countries: 7%
- Mid-Low income countries: 10%
- Low-income countries: 13%

1.5.4 What is the government expenditure on education as reported as the percentage of GDP allocated to education?

1.5.4 is set at a maximum of 6 percent (High Level Group on Education for All, 2008).

The international median of all available data since 2000 is 4 percent (World Bank, 2016g).

- High income countries: 5%
- Upper-Mid income countries: 4%
- Mid-Low income countries: 5%
- Low-income countries: 4%

1.5.5 What percent of the national education budget comes from foreign aid sources (bilateral and multilateral)?

The International Commission on Financing Global Education Opportunity (2016) calls for 15 percent of donor countries' GDPs to go to education in ODA. RTEI uses 15 percent as a metric for the amount of the national budget from foreign aid sources that should be allocated to education as an international benchmark.

1.5.6 What is the percentage of GNI PPP allocated to foreign aid in relation to education in the public sector? [donor countries]

Question 1.5.6 is set at an international benchmark of 0.105 percent. The OECD sets the target of ODA at 0.7 percent of donors' national income (OECD, 2017; UN, 2006). Of that 0.7 percent, 15 percent of ODA should go to the education sector from international donors (International Commission on Financing Global Education Opportunity, 2016). The benchmark in RTEI 2018 is thus: 15 percent \* .7 percent = .105 percent

1.5.8 What is the current public expenditure per pupil as a percent of national average income?

Question 1.5.8 could not be measured on a 0 to 100 scale but is measured against international benchmarks identified as the median of per pupil expenditure (World Bank, 2016h; World Bank, 2016i) as a percentage of the median national average income (ILO, 2016).

1.5.8a Primary – 15 percent (World Bank, 2016h).

- i. High income countries: 21%
  - ii. Upper-Mid income countries: 15%
  - iii. Mid-Low income countries: 10%
  - iv. Low-income countries: 4%
- b.
- 1.5.8b Secondary – 20 percent (World Bank, 2016i).
- i. High income countries: 25%
  - ii. Upper-Mid income countries: 16%
  - iii. Mid-Low income countries: 11%
  - iv. Low-income countries: 6%

## 2.1.2 What is the pupil-classroom ratio?

Given that literature has yet to conclusively show the impact of pupil per teacher ratios worldwide (although many scholars argue for small classes, e.g., Finn and Achilles, 1990; Krueger, 1999; Nye, et al., 2000), but class size ratios are frequently used as proxies for education quality (Tomlinson, 1988; United Nations Conference on Trade and Development [UNCTAD], 2016; Whitehurst and Chingos, 2011), 25 to 1 is used as a minimum standard benchmark for primary schools and 20 to 1 for secondary schools if minimum standards are not available. RTEI uses 20 as the artificial benchmark for secondary class size following Grissmer's (1999) overview of the effects of class size internationally. Since Grissmer's study, several studies have found that class size has different effects by culture (Blatchford, Chan, Maurice, Lai, and Lee, 2016; Harfitt, 2015). RTEI also considers the following benchmarks for pupil per classroom ratios:

- High income countries
  - Primary – 14 to 1
  - Secondary – 12 to 1
- Middle income countries
  - Primary – 24 to 1
  - Secondary – 18 to 1
- Low income countries
  - Primary – 40 to 1
  - Secondary – 26 to 1

No minimum benchmark for pupil per teacher ratio exceeds 40 to 1 in line with the Education for All (EFA) Global Monitoring report and Global Partnership for Education's (GPE) (2016b) use of 40 to 1 as a minimum measure of pupil-teacher ratios (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2015, p. 197). The global average is 24.6 to 1 for primary schools (Huebler, 2008a) and 18 to 1 for secondary schools (Huebler, 2008b).

RTEI 2018 simplifies these benchmarks to an average of the figures described above for the sake of calculating countries missing minimum standards.

- Primary: 25 to 1
- Secondary: 20 to 1

Given that international benchmarks often equate teacher-to-student ratios with classroom-to-student ratios, these two are combined when identified as an international benchmark for countries lacking minimum standards. Thus, the pupil-classroom and pupil-teacher ratio's artificial benchmark is coded as "25\*(x/100) where x = response" for primary and "20\*(x/100) where x = response" for secondary schools.

### 2.2.2 What is the pupil-toilet ratio?

International benchmarks for pupil-toilet ratios in all schools, both primary and secondary, generally range from 20-40 pupils per toilet. Specifically, UNICEF (2012) and the WHO (Adams, Bartram, Chartier, and Sims, 2009) calls for 1 toilet for every 25 girls and 1 toilet *and* 1 urinal for every 50 boys in both primary and secondary schools. RTEI simplifies this to 25 pupils per toilet for both primary and secondary schools as an international benchmark when minimum standards are not available.

Thus, the pupil-toilet ratio's artificial benchmark is coded as "25\*(x/100) where x=response" for both primary and secondary schools.

### 2.3.3 What is the pupil-trained teacher ratio?

Given that international benchmarks often equate teacher-to-student ratios with classroom-to-student ratios, these two are combined when identified as an international benchmark for countries lacking minimum standards. Thus, the pupil-classroom and pupil-teacher ratio's artificial benchmark is coded as "25\*(x/100) where x = response" for primary and "20\*(x/100) where x = response" for secondary schools.

- a. Primary schools: The international median of all available data for primary school pupil-trained teacher ratios since 2010 is 26 percent (UNESCO, 2016a).
  - High income countries: 13%
  - Upper-Mid income countries: 23%
  - Mid-Low income countries: 32%
  - Low-income countries: 48%
- b. Secondary schools: The international median of all available data for secondary school pupil-trained teacher ratios since 2010 is 19 percent (UNESCO, 2016a).
  - High income countries: 10%
  - Upper-Mid income countries: 16%
  - Mid-Low income countries: 24%
  - Low-income countries: 34%

### 2.3.4 What is the mean teacher salary relative to the national mean salary?

Question 2.3.4 asks "What is the mean teacher salary relative to the national mean salary?" To calculate the proportion for the score, RTEI divides the ratio reported by 100.

The international median from high income OECD countries is 113 percent (ILO, 2016; OECD, 2015). No other international data is available.

### 2.4.2 What is the pupil-textbook ratio?

International benchmarks for the pupil per textbook ratio are 1 to 1 (UNESCO, 2016b). Thus, no calculation is necessary for missing national benchmarks.

## Appendix 5: Index Comparison

| Index   | Missing Data  | Averaging Variables   | Weighting  | Subtheme/ Structure  | Coding Ordinal Variables  |
|---|---|---|--|--|---|
| RTEI 2016   | Skipped in calculations, over 50 percent missing were dropped. Response rate (multiplied by frequency from government sources) was subtheme 1.6   | Variables averaged in subtheme, subthemes averaged for themes, themes averaged for Index score                                  | NA   | 3 to 6 subthemes within a theme, 5 themes following literature on right to education   | NA  |
| RTEI 2018 (Proposed)                                  | Dropped if greater than 20 percent missing, imputed remaining variables. Response rate applied to Governance theme as a weight  | NA  | Indicator weighted for subtheme (sum) and theme (sum subtheme). Index score = sum theme scores | 3 to 5 subthemes within a theme, 5 themes following literature on right to education   | NA  |
| Human Development Index                               | Missing values estimated using an alternative source or a cross-country regression model. (e.g. Mean Years of Schooling for Andorra using Spain's info).  | Geometric Mean  | Equal Weights  | Indicators on each of the three dimensions make indices that are then averaged to come up with the HDI.  | NA  |
| Multi-dimensional Poverty Index                       | Adjusts for data gaps by reweighting the other component of the sub index   | The MPI is the product of two measures: $MPI = H * A$<br>H: multidimensional poverty headcount ratio<br>A: intensity of poverty | Equal Weights  | Indicators on each of 3 dimensions are multiplied by a poverty measure to come up with the MPI.  | Relies on a counting approach, traditional poverty indices using continuous variables   |
| Open Budget Index                                     | Assigns each country a score from 0 to 100 based on the simple average of the numerical value of each of the responses to the 109 questions in the questionnaire that assess the public availability of budget information. | Simple Average  | Equal Weights  | Pre-Budget Statement, Executive's Budget Proposal and supporting documents, Enacted Budget, Citizens Budget, In-Year Reports, Mid-Year Review, Year-End Report, Audit Report | NA  |
| Corruption Perception Index                           | Imputation. Imputed values are not used as a score for the aggregated CPI.  | Simple Average  | TBD  | Each country's CPI score is calculated as a simple average of all the available rescaled scores for that country   | NA  |
| Global Integrity (2013) Index                         | TBD   | Simple Average  | Equal Weights  | 300 disaggregated indicators organized in 6 dimensions. Each dimension is disaggregated into 3-5 categories  | "In law" indicators are measured on 0-100 scale (0 worst and 100 best)<br>"In Practice" indicators are scored on ordinal scale from 0-100 (As 0, 25, 50, 75, 100) |
| Global competitiveness Index (Schwab, 2017)           | Successive aggregation of data to measure   | Arithmetic mean   | Weighted based on GDP per capita of the country  | Sub themes: Basic requirements, Efficiency enhancers, Innovation and sophisticated factors   | Indicators are converted into 1-7 scale to capture relative ranking among countries   |
| Index of Economic Freedom (Heritage Foundation, 2017) | Measured based on the relative percentile ranking on other sub sectors  | averaged to produce an overall economic freedom score for each economy  | Equally weighted   | Index measures 12 specific components of economic freedom  | Each component is graded on the scale from 0 to 100   |

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