

Appendix A: Additional References

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Appendix B: The Private Sector

This is a list of some of the websites which are supporting private sector collaboration with achieving the SDGs:

- SDG Compass: <http://sdgcompass.org/>
- WBCSD SDG Hub: <http://www.wbcds.org/sdghub.aspx>
- Official UN partnerships <https://sustainabledevelopment.un.org/partnerships/>
- SDG Industry Matrix (does not yet have ICT): <https://www.unglobalcompact.org/library/3111>
- Global Sourcing Council: <http://gscouncil.org/gsc-17-17-sdg-program/>
- UN Global Compact: <https://www.unglobalcompact.org/>

As discussed in the report, the SDG compass has linked the SDGs to existing indicators (principally from Global Reporting Initiative (GRI), which is published on their website. We share the list for SDG 4 here which shows the distinct difference from what we are trying to accomplish with this study.

| SDG Target | Business Theme | Type of Indicator | Indicator Source | Indicator Description | Indicator ID & Info |
|--|------------------------------------|------------------------------------|---|---|------------------------------------|
| 4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes | No indicators have been identified | No indicators have been identified | No indicators have been identified | No indicators have been identified | No indicators have been identified |
| 4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education | Childcare services and benefits | General | UN Global Compact-Oxfam Poverty Footprint | Approximate proportion of young children of working parents who have access to local, affordable and safe childcare service. | PF - 15.2 |
| 4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education | Childcare services and benefits | General | UN Global Compact-Oxfam Poverty Footprint | Average investment for childcare provisions or benefits (per working family) by i) the Company system and ii) other employers in the value chain. | PF - 15.7 |
| 4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education | Childcare services and benefits | General | The Women's Empowerment Principles: Reporting on Progress (aligned with GRI G4) | What is the business' policy and provision of childcare facilities and how many employees, if any, use this facility? | N/A |
| 4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university | Employee training and education | General | GRI G4 Sustainability Reporting Guidelines | Average hours of training per year per employee by gender, and by employee category | G4-LA9 |
| 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship | Employee training and education | General | UN Global Compact-Oxfam Poverty Footprint | i) Approximate proportion of workers (m/w) along the value chain who receive training per year. ii) Average number of | PF - 4.1 |

| | | | | | |
|--|---------------------------------------|------------------------------------|--|--|------------------------------------|
| | | | | hours (or days) of training(s) provided to workers (m/w). iii) Provide details on the type(s) of training(s) provided | |
| 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship | Employee training and education | General | GRI G4 Sustainability Reporting Guidelines | Average hours of training per year per employee by gender, and by employee category | G4-LA9 |
| 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship | Employee training and education | Sector-specific | GRI G4 Electric Utilities Sector Disclosures | Programs and processes to ensure the availability of a skilled workforce | former EU14 |
| 4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations | Employee training and education | General | GRI G4 Sustainability Reporting Guidelines | Average hours of training per year per employee by gender, and by employee category | G4-LA9 |
| 4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy | Media literacy | Sector-specific | GRI G4 Media Sector Disclosures | Actions taken to empower audiences through media literacy skills development and results obtained | M7 |
| 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development | Education for sustainable development | General | GRI G4 Sustainability Reporting Guidelines | a. Report the measures taken to develop and enhance the highest governance body's collective knowledge of economic, environmental and social topics. | G4-43 |
| 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including... | Education for sustainable development | Sector-specific | GRI G4 Event Organizers Sector Disclosures | Number, type and impact of sustainability initiatives designed to raise awareness, share knowledge and impact behavior change, and results achieved | EO11 |
| 4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all | Accessibility of buildings | Sector-specific | GRI G4 Construction and Real Estate Sector Disclosures | Type and number of sustainability certification, rating and labeling schemes for new construction, management, occupation and redevelopment | CRE8 |
| 4.b By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries... | No indicators have been identified | No indicators have been identified | No indicators have been identified | No indicators have been identified | No indicators have been identified |
| 4.c By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries... | No indicators have been identified | No indicators have been identified | No indicators have been identified | No indicators have been identified | No indicators have been identified |

Appendix C: Discussion of Data about ICT

Reasons for Caution

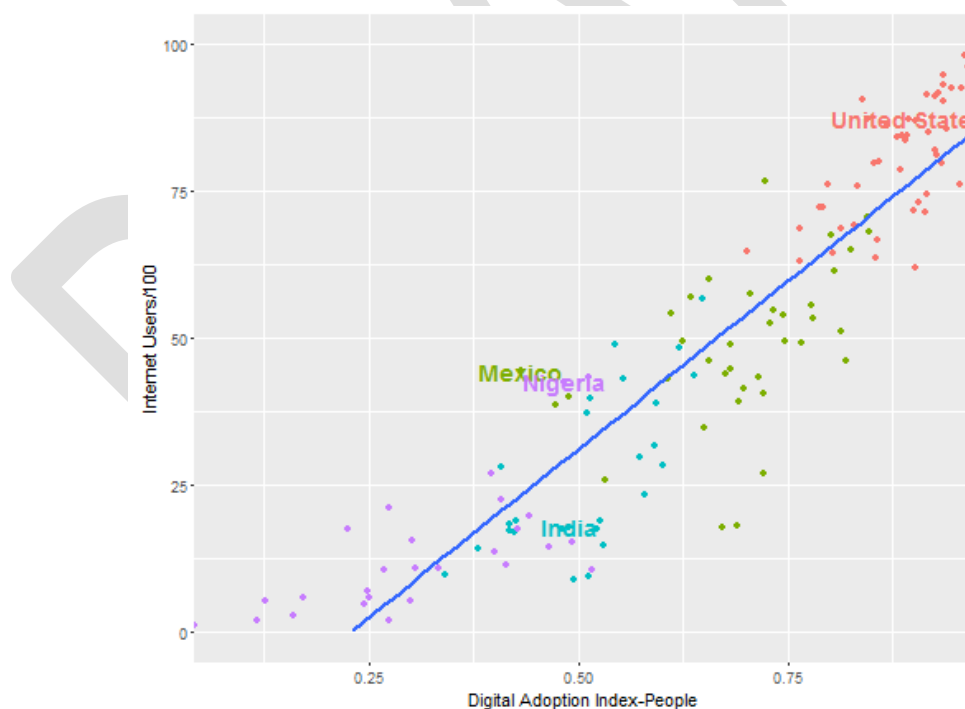
More and better research would do much to help but there are several reasons for caution about claims of ICT solutions for the SDGs:

- **Casual Pathway:** As already mentioned, for all but a handful of the SDGs ICT solutions will be in-direct. Few if any causal pathways in development, particularly bridging from the micro (project) to macro (national) scale are widely agreed upon and even fewer are universal. The more distant on the pathway the proposed solution is from the problem the more caution should be taken in assuming an impact.
- **Matthew Effect:** This term was first used to describe the fact that credit for new scientific discoveries went to those who already had a bigger reputation; the rich get richer phenomenon. Those best positioned to take advantage of the introduction of new ICT solutions are typically those with the resources or pre-existing ICT skills, not those who need it most. Trucano (2013) discusses how the building of computer labs probably benefits mostly the leading students as an example of this phenomenon.
- **Diminishing Returns:** Impactful and positive initial results should only be extrapolated with caution. The first adopters of ICT will be those who can benefit most and the benefits for each new adopter will be smaller (the exception being technologies with network effects, such as cellphones). Online higher education for example will start by recruiting those who are most motivated and able to work independently but each new student will probably be less motivated and/or capable. For well-established solutions we have information about the rate of diminishing return but most ICT solutions are too new for us to be sure, e.g. how many people are really able to get a degree fully online?
- **Comparative Cost Effectiveness:** For any specific problem there will most likely be many possible solutions. An ICT based solution may have a positive impact, as one study in India found that Computer Assisted Learning did, but be less cost effective than in this case, one on one tutoring (Linden, 2008). Given the expense of deploying ICT solutions in many of less developed contexts, cost effectiveness is a key concern.
- **History:** Africa, Latin America and Asia are littered with the technological skeletons of well-intentioned “experts” from the developed world. Typically this came about from applying technological solutions that worked in their country to a new place. Not all have failed (e.g. cellphones), but the vast majority have.

As discussed in section 1.2.2 there is very little publically available country-level data related to ICT. Our best indicator of ICT use in a country appears to be Internet Users

(% of population that have used the internet at least once in the last twelve months). There are other possibilities (broadband access and cellphone subscriptions for example) but the data the results seem too irregular and not directly relevant (eg # of cellphone subscribers has to do more with regulatory structure than connectivity). Hopefully a broad effort will be made to bring more data together and into the public domain but there are a couple other sources which could be used more in the future. This year (2016) in collaboration with Microsoft, the World Bank released the Digital Adoption Index which incorporates various data points to create an index of a country's people, business and government digital adoption, <http://www.digitaladoptionindex.org>. Unfortunately the data does not yet appear to be shared publicly. Some data is available (though with obvious errors) via the World Bank report.. The website could be scrapped to get the data. Of most interest is the DAI People Index which includes two sub-components, cellphone access and internet access at home. The data comes from the Gallop World Poll asking "home has access to internet" and "home has cellular phone". This data is not available to the public but we were able to extract a rough form from the World Bank report.

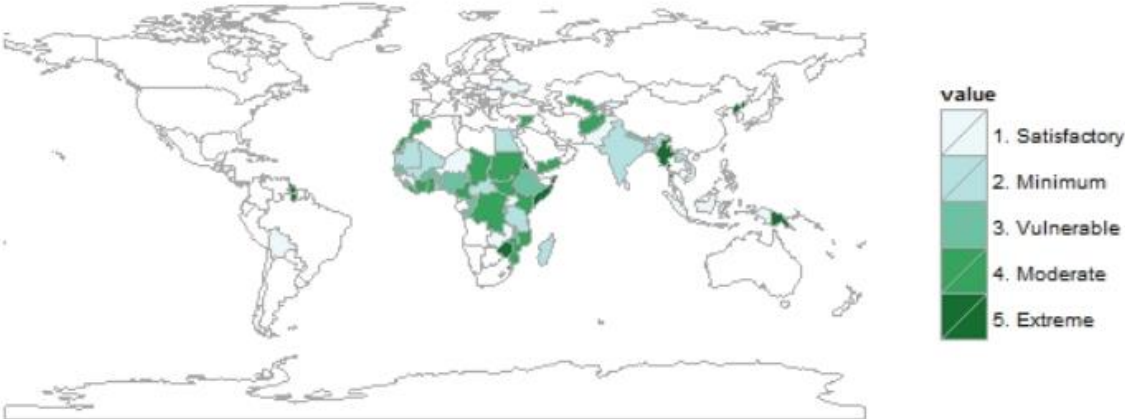
The DAI People Index was plotted against the World Bank Internet Users and they are closely correlated though some of the countries do vary significantly--perhaps because of the addition of cellphone ownership.



The Pew Research Center conducts a survey of smartphone use in forty countries which they published this February (Pew Research Center, 2016). In advanced economies 68% of adults own a smartphone versus 37% in developing or emerging economies. See the map below for specific countries.

ICT solutions. In general it is important to emphasize that these data do not necessarily measure factors relevant to this study.. For example the #SystemsTransformation report features the fact that 70% of sub-Saharan Africans have cellphones when in fact the data states that there are 70 subscriptions per 100 people which is not the same in regions where it may be common to have multiple subscriptions. Weak data collection and analysis can affect reporting major develop trends (Jerven, 2016). Therefore, it is important to scrutinize both the raw data and the interpretation of that data in relation to the indicators. The map bellows shows how much poor data there is for poverty, the biggest data point of them all.

Figure 5 - Poverty Data Deprivation in the Developing World (2003-2012)



Appendix D: Part 1 Data on SDG 4

Quality of Current Data for SDG 4

There is significant gap in both the quantity and quality of data and the current provisional indicators released by the UN. The Center for Global Development (CGD) has made an effort at scoping all the indicators <http://www.cgdev.org/blog/sdg-indicators-serious-gaps-abound-data-availability> and <http://www.cgdev.org/blog/what-sdgs-can-we-track-now>. The UN also assessed the indicators ranking them in 3 tiers. The UN itself found that of their 230+ indicators only 42% have an established methodology and regularly accessible data. The CGD analysis of the indicators found that only a portion of these supposed Tier one indicators have direct, publically accessible data, leaving only 25% of SDG indicators usable today.

In this study, the independent analysis of the indicators for SDG4: Education was conducted. The table below compares the study's rating of the current data available with the rating of the agency which proposed the indicator and then the rating of the UN Secretariat which reviews all the indicators after submission (and tend to be more pessimistic than the proposing agencies).

| Target | Short Name | Review of Current Data | UN Tiers | |
|--------|---|------------------------|----------|-------------|
| | | | Agency | Secretariat |
| 4.1.1 | Proficiency of Primary and Secondary students | Yellow | Green | Red |
| 4.2.1 | Early Childhood Development Index | Yellow | Yellow | Yellow |
| 4.2.2 | Preprimary Enrollment | Green | Green | Green |
| 4.3.1 | Post- Secondary Education | Green | Yellow | Yellow |
| 4.4.1 | ICT Skills | Red | Yellow | Yellow |
| 4.5.1 | Equal access for all | Yellow | Green | Yellow |
| 4.6.1 | Literacy | Yellow | Green | Yellow |
| 4.7.1 | Sustainable Development Knowledge | Red | Green | Red |
| 4.a.1 | School Infrastructure | Red | Yellow | Yellow |
| 4.b.1 | Scholarships | Yellow | Green | Green |
| 4.c.1 | Qualified Teachers | Yellow | Green | Green |

In general the study's ratings line up with what the UN has determined about the indicators with three exceptions.

1. ICT skills (4.4.1) were rated lower than the UN because the skills they propose are already quite outdated,
2. Scholarships (4.b.1) were rated lower because it only includes official development aid for scholarships and not private or other types of scholarships
3. Qualified teachers (4.c.1) was rated because the data is based on national standards which varies enormously (or in the US doesn't exist) and makes comparisons between countries useless.

How good is the data for our four example countries?

The availability and quality of the data available for each country was assessed based on key measurement data for each of the indicators.

| Target | Short Name | USA | Mexico | India | Nigeria |
|--------|---|--------|--------|--------|---------|
| 4.1.1 | Proficiency of Primary and Secondary students | Yellow | Yellow | Yellow | Yellow |
| 4.2.1 | Early Childhood Development Index | Red | Red | Red | Red |
| 4.2.2 | Preprimary Enrollment | Green | Green | Green | Green |
| 4.3.1 | Post- Secondary Education | Green | Green | Green | Yellow |
| 4.4.1 | ICT Skills | Red | Red | Red | Red |
| 4.5.1 | Equal access for all | Green | Green | Green | Green |
| 4.6.1 | Literacy | N/A | Green | Yellow | Yellow |
| 4.7.1 | Sustainable Development Knowledge | N/A | N/A | N/A | N/A |
| 4.a.1 | School Infrastructure | Red | Yellow | Red | Red |
| 4.b.1 | Scholarships | N/A | N/A | N/A | N/A |
| 4.c.1 | Qualified Teachers | Red | Green | Red | Yellow |

What the data tells us about SDG 4 (major analysis)

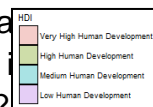
The same analytical process was applied to each of the ten targets of SDG 4:

1. The target and its proposed indicators were summarized and compared with a focus on identifying gaps between them.
2. Publically available data was found that matched the proposed indicator or as close as was possible (if it existed).
3. The match between this data and the proposed indicator was analyzed and the future landscape for indicator data assessed.
4. Finally, the data was analyzed to get a sense of the current global situation, look at trends in our four example countries, explore potential links to ICT and identify outlier countries (both leaders and laggards).

Originally this analysis was going to include an assessment of progress towards proposed thresholds for each indicator but as of now almost none exist for the SDGs and it is unclear whether they will be included in the final indicators or not (e.g. what percentage of tertiary enrollment is considered successful).

The Process

1. **Select Target**
2. **Review SDG Indicator**
 - a. Highlights
 - b. Missing from the indicator
3. **Existing Data**
 - a. What is available now for assessing the current state of the indicator?
 - b. How close does this match to what the indicator metadata describes?
 - c. Is there data for aspects of the target not covered by the indicator?
 - d. Is there a goal(s) for 2030 for target and/or indicator?
 - e. What can we learn from the available data?



Notes on the Process

- 3a: Select indicators for which there is data now
- 3b: Judge how close current data matches specific indicator and estimate timeline for exact indicator data existence
- 3c: Review metrics for the target outside the indicator(s)
- 3e: No indicators had thresholds explicitly included in the metadata but some could be inferred to be 100% based on target or indicator wording.

Approach taken for 3e

- A consistent approach will be used on every target and proposed data set
- The goal is to provide a consistent overview of the data for each target so that they can be qualitatively compared with each other.

This will include:

- Trends in the four countries of focus

- Current global situation
 - Will use most recent available year (from the last five)
 - Countries grouped by Human Development Index
- Exploration of potential links to ICT
 - Plot correlation with internet and cellphone use
 - Regression of whether these predict the indicator (controlling for HDI)
- Outlier countries (leaders and laggards)
 - Identify countries which are further than one standard deviation from the mean for their HDI group

ICT Indicators

Introduction to the ICT Indicators

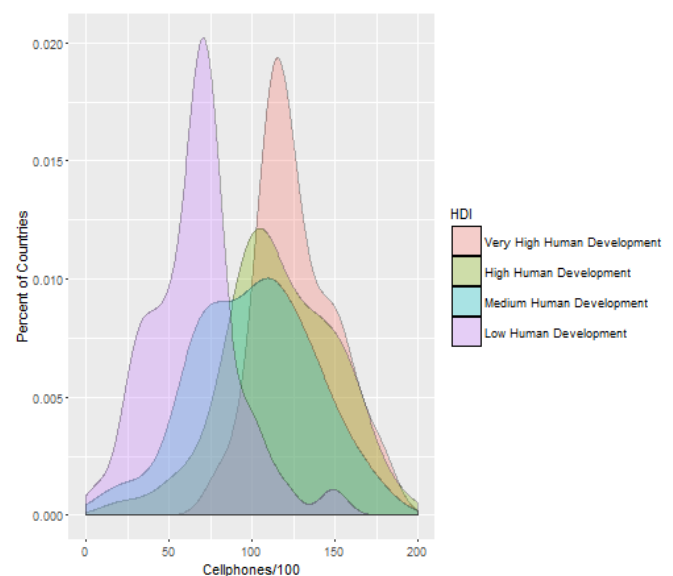
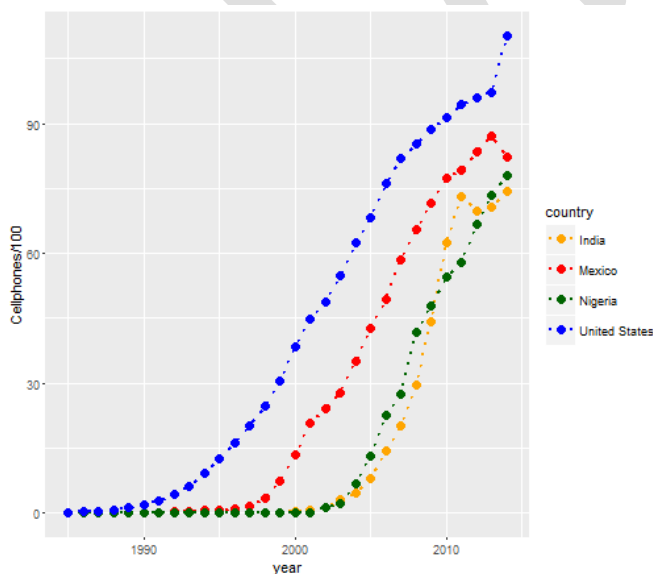
- Mobile cellular subscriptions (per 100 people)

Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service that provide access to the PSTN using cellular technology. The indicator includes (and is split into) the number of postpaid subscriptions, and the number of active prepaid accounts (i.e. that have been used during the last three months). The indicator applies to all mobile cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services. (official indicator description)

- Internet users (per 100 people)

Internet users are individuals who have used the Internet (from any location) in the last 12 months. Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc. (official indicator description)

Mobile cellular subscriptions (per 100 people)

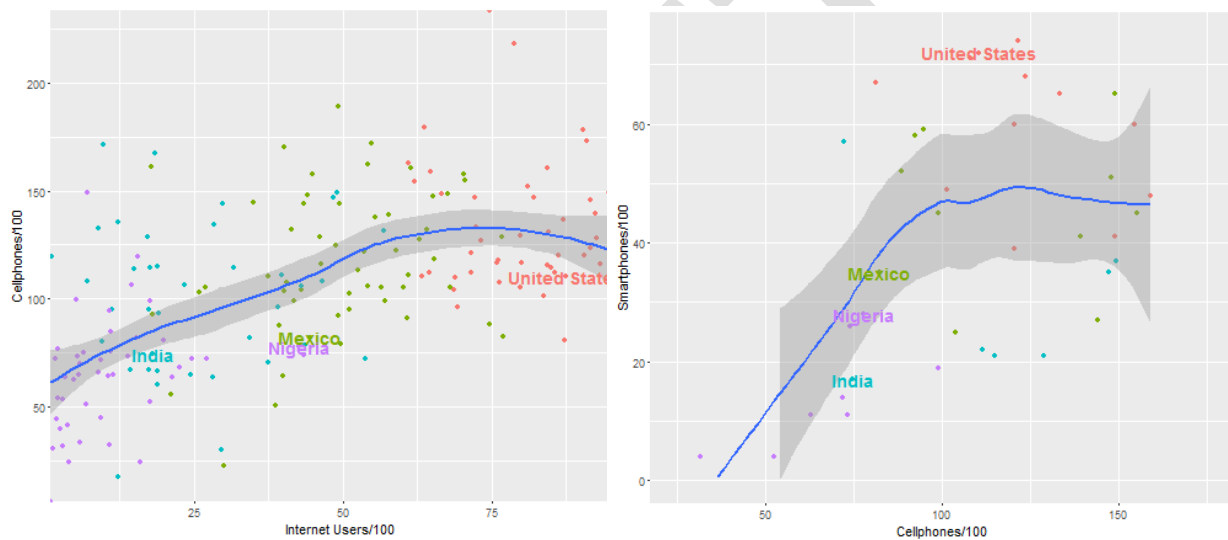


Means by HDI

| HDI Level | Cell Mean | Internet Mean |
|-----------------------------|-----------|---------------|
| Very High Human Development | 131.15 | 80.84 |
| High Human Development | 116.92 | 50.09 |
| Medium Human Development | 100.9 | 25.52 |
| Low Human Development | 65.48 | 11.1 |

Internet vs. Cellphones

Correlation = 0.55 (p<0.01)



Cellphone use may be able to be used as a proxy for smartphone penetration

Pew collected data from 40 countries on smartphone use

Correlation = 0.44 (p<0.01)

High Internet Countries

| HDI | Country | Internet |
|------------------------------|---------------------|--------------|
| Very High Human Development | Andorra | 95.9 |
| Very High Human Development | Denmark | 95.99 |
| Very High Human Development | Finland | 92.38 |
| Very High Human Development | Iceland | 98.16 |
| Very High Human Development | Liechtenstein | 95.21 |
| Very High Human Development | Luxembourg | 94.67 |
| Very High Human Development | Netherlands | 93.17 |
| Very High Human Development | Norway | 96.3 |
| Very High Human Development | Sweden | 92.52 |
| High Human Development | Bahamas, The | 76.92 |
| High Human Development | Barbados | 76.67 |
| High Human Development | Lebanon | 74.7 |
| High Human Development | Malaysia | 67.5 |
| High Human Development | Oman | 70.22 |
| High Human Development | Russian Federation | 70.52 |
| High Human Development | St. Kitts and Nevis | 65.4 |
| High Human Development | Macedonia, FYR | 68.06 |
| High Human Development | Trinidad and Tobago | 65.1 |
| Medium Human Development | Moldova | 46.6 |
| Medium Human Development | Morocco | 56.8 |
| Medium Human Development | Paraguay | 43 |
| Medium Human Development | South Africa | 49 |
| Medium Human Development | Uzbekistan | 43.55 |
| Medium Human Development | Vietnam | 48.31 |
| Medium Human Development | West Bank and Gaza | 53.67 |
| Low Human Development | Angola | 21.26 |
| Low Human Development | Kenya | 43.4 |
| Low Human Development | Nigeria | 42.68 |
| Low Human Development | Sudan | 24.64 |
| Low Human Development | Swaziland | 27.1 |
| Low Human Development | Yemen, Rep. | 22.55 |

Low Internet Countries

| HDI | Country | Cellphones |
|-----------------------------|----------------------|------------|
| Very High Human Development | Bahrain | 173.27 |
| Very High Human Development | Hong Kong SAR, China | 233.62 |
| Very High Human Development | Kuwait | 218.43 |
| Very High Human Development | Montenegro | 163.03 |
| Very High Human Development | Saudi Arabia | 179.56 |
| Very High Human Development | United Arab Emirates | 178.06 |
| High Human Development | Kazakhstan | 172.19 |
| High Human Development | Libya | 161.12 |
| High Human Development | Maldives | 189.38 |
| High Human Development | Oman | 157.75 |
| High Human Development | Panama | 158.05 |
| High Human Development | Russian Federation | 155.14 |
| High Human Development | Seychelles | 162.19 |
| High Human Development | Suriname | 170.57 |
| High Human Development | Uruguay | 160.8 |
| Medium Human Development | Botswana | 167.3 |
| Medium Human Development | El Salvador | 144.01 |
| Medium Human Development | Gabon | 171.38 |
| Medium Human Development | South Africa | 149.19 |
| Medium Human Development | Vietnam | 147.11 |
| Low Human Development | Benin | 99.65 |
| Low Human Development | Cote d'Ivoire | 106.25 |
| Low Human Development | Gambia, The | 119.63 |
| Low Human Development | Mali | 149.07 |
| Low Human Development | Mauritania | 94.2 |
| Low Human Development | Senegal | 98.84 |

High Cellphone Countries

| HDI | Country | Internet |
|-----------------------------|-------------------|----------|
| Very High Human Development | Argentina | 64.7 |
| Very High Human Development | Brunei Darussalam | 68.77 |
| Very High Human Development | Croatia | 68.57 |
| Very High Human Development | Cyprus | 69.33 |
| Very High Human Development | Greece | 63.21 |
| Very High Human Development | Italy | 61.96 |
| Very High Human Development | Montenegro | 61 |
| Very High Human Development | Poland | 66.6 |
| Very High Human Development | Portugal | 64.59 |
| Very High Human Development | Saudi Arabia | 63.7 |
| High Human Development | Algeria | 18.09 |
| High Human Development | Samoa | 21.2 |
| High Human Development | Cuba | 30 |
| High Human Development | Libya | 17.76 |
| High Human Development | Mongolia | 27 |
| High Human Development | Sri Lanka | 25.8 |
| High Human Development | Thailand | 34.89 |
| Medium Human Development | Bangladesh | 9.6 |
| Medium Human Development | Cambodia | 9 |
| Medium Human Development | Congo, Rep. | 7.11 |
| Medium Human Development | Gabon | 9.81 |
| Medium Human Development | Timor-Leste | 1.14 |
| Low Human Development | Eritrea | 0.99 |

Low Cellphone Countries

| HDI | Country | Cellphones |
|-----------------------------|--------------------------|------------|
| Very High Human Development | Andorra | 82.64 |
| Very High Human Development | Canada | 81.04 |
| Very High Human Development | Cyprus | 96.34 |
| High Human Development | Samoa | 55.53 |
| High Human Development | Bahamas, The | 82.3 |
| High Human Development | Belize | 50.71 |
| High Human Development | Cuba | 22.48 |
| High Human Development | Dominican Republic | 78.86 |
| High Human Development | Mexico | 82.22 |
| High Human Development | Tonga | 64.28 |
| Medium Human Development | Kiribati | 17.41 |
| Medium Human Development | Micronesia, Fed. Sts. | 30.32 |
| Medium Human Development | Sao Tome and Principe | 64.94 |
| Medium Human Development | Syrian Arab Republic | 63.86 |
| Medium Human Development | Vanuatu | 60.41 |
| Low Human Development | Burundi | 30.46 |
| Low Human Development | Central African Republic | 24.54 |
| Low Human Development | Djibouti | 32.39 |
| Low Human Development | Eritrea | 6.39 |
| Low Human Development | Ethiopia | 31.59 |
| Low Human Development | Malawi | 33.47 |
| Low Human Development | South Sudan | 24.5 |

Conclusions

- Mexico is behind on cellphone coverage which has been noted in studies which found its prices to be much higher than global averages
- Nigeria is ahead on internet
- Cellphone penetration is very high in low income countries but internet generally is not
- Medium and High HDI have a big spread in internet penetration

Target 4.1

Primary & Secondary

1. Select Target

Target 4.1

By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.

2a. Review SDG Indicator and Metadata

Indicator 4.1.1: Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex

- Divide percentage of children and young people at the end of primary and lower secondary levels of education achieving at least minimum proficiency level in (a) reading and (b) mathematics
- The minimum proficiency level will be measured relative to new common reading and numeracy scales currently in development

2b. Missing from the Indicator

- The indicator shows how well those who make it all the way to the end of primary and secondary are doing but does not say if all are making it to that stage
- Does not assess whether education is free (especially private costs like uniforms, transport etc.) or equitable (eg 80% may be proficient but what if only 20% of indigenous students are)

3a. What is available now for assessing the current state of the indicator?

- UNESCO collects most education data but currently the most international assessment test is organized through the OECD
- Various international assessments (e.g., PIRLS, PISA, TIMSS), regional learning assessments (e.g., LLECE, SACMEQ, PASEC), national and citizen-led learning assessments exist and will need to be harmonized

Proposed existing data sources:

- Gross graduation ratio from primary education, both sexes (%)
- Gross graduation ratio from lower secondary education, both sexes (%)

Number of graduates regardless of age in a given level or programme, expressed as a percentage of the population at the theoretical graduation age for that level or programme.

3b. How close does this match to what the indicator metadata describes?

- Judgment: Presumably every education system requires students to meet some proficiency standard in order to graduate. This data will give us a fair sense about how far we are from the whole population making it to nationally accepted levels of proficiency.
- Missing elements:
 - The level of proficiency required to graduate in each country is not the same

- Does not assess progress of grades 2/3 as called for by the indicator
- Does not specifically assess reading and math progress separately
- Timeline: 3-5 years

3c. Is there data for aspects of the target not captured by the indicator?

- % of population which is currently reaching the end of primary and the end of secondary is available (and what we will be using)
- Unknown if there is a way to measure the costs of primary/secondary education or how equitable it is

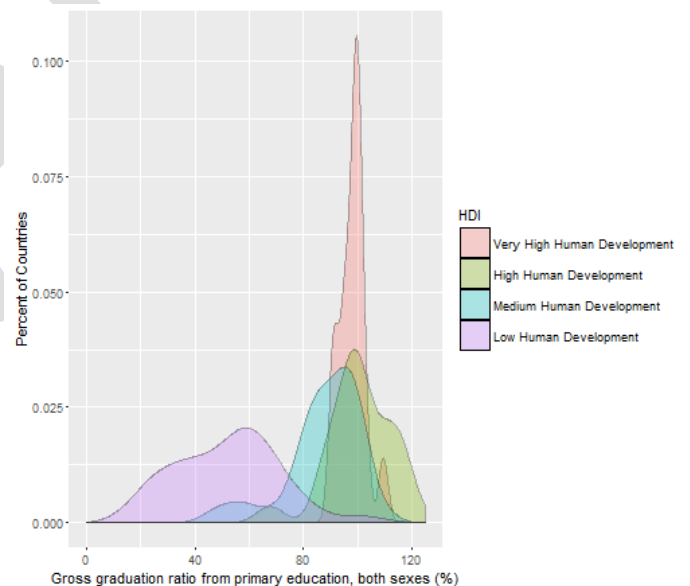
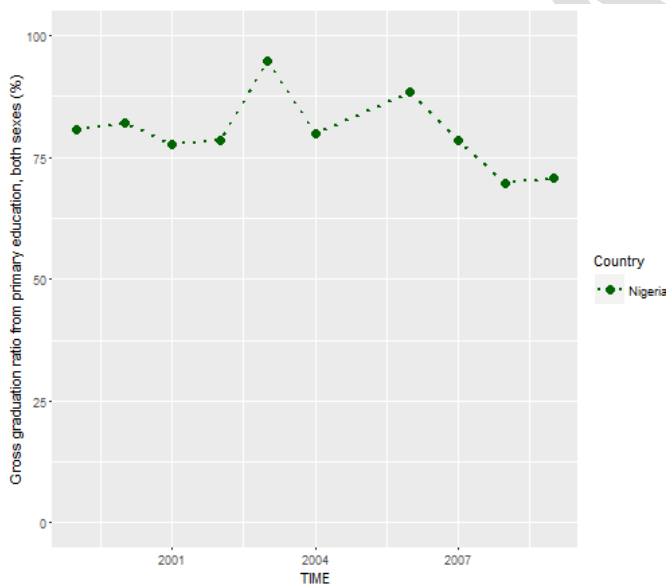
3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

- The goal is that EVERYONE achieve proficiency—ie 100%

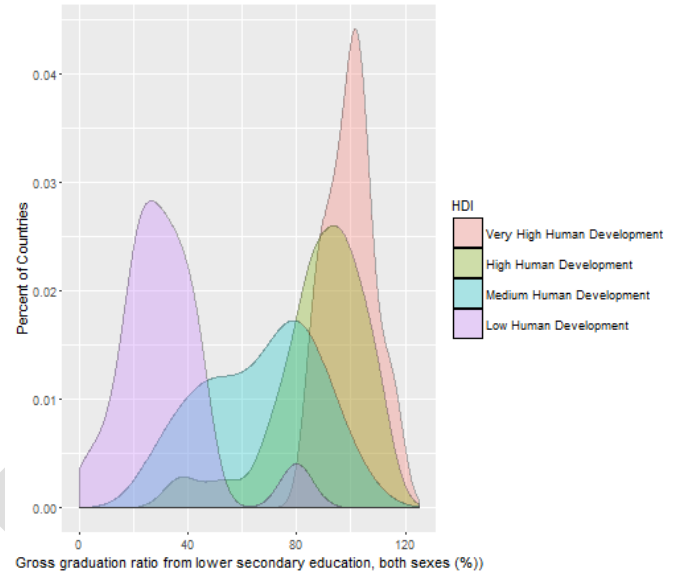
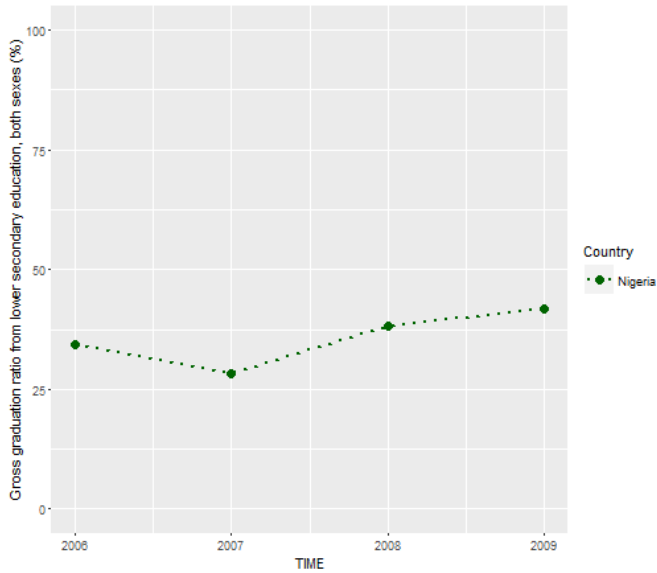
3e. What can we learn from the available data?

- Gross graduation ratio from primary education, both sexes (%)
- Gross graduation ratio from lower secondary education, both sexes (%)
- Countries: USA, Mexico, India, Nigeria
- ICT data: Internet users and Cellphone subscriptions

Gross graduation ratio from primary education, both sexes (%)



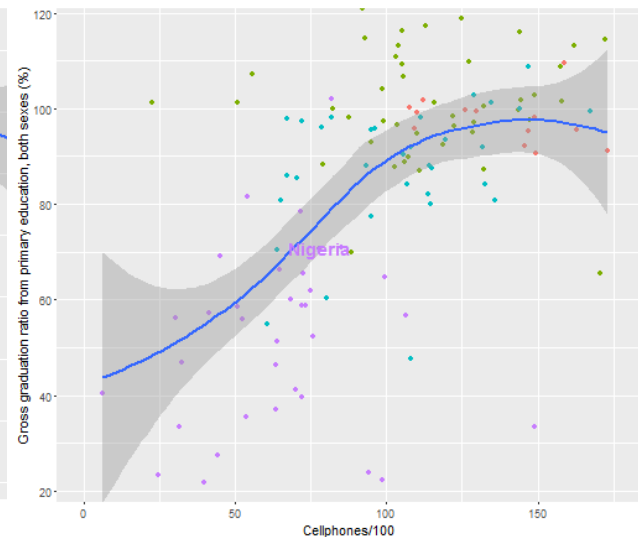
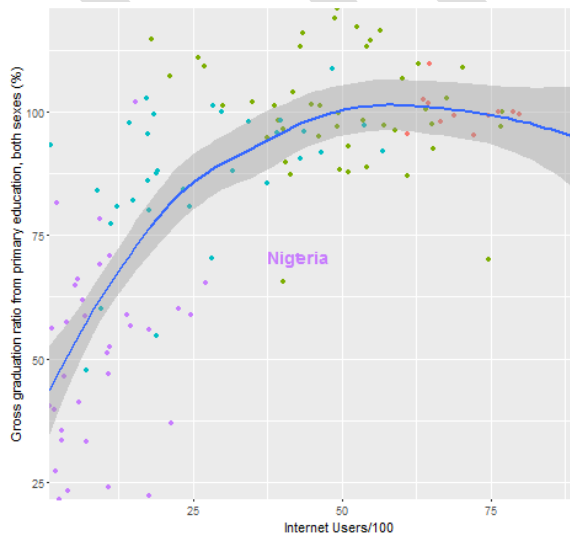
Gross graduation ratio from lower secondary education, both sexes (%)



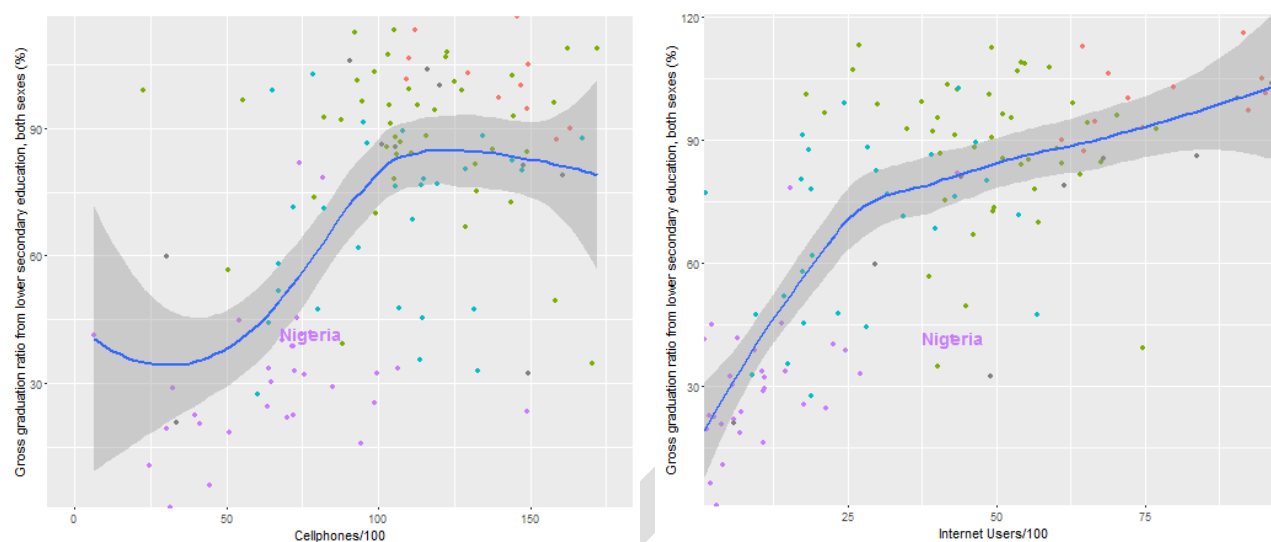
Means by HDI

| HDI Level | Primary Graduation Mean | Secondary Graduation Mean |
|-----------------------------|-------------------------|---------------------------|
| Very High Human Development | 98.14 | 99.71 |
| High Human Development | 100.65 | 88.24 |
| Medium Human Development | 87.72 | 66.52 |
| Low Human Development | 52.03 | 31.28 |

Primary Graduation vs. ICT



Secondary Graduation vs. ICT



Regression Results

| | Primary Graduation (1) | Secondary Graduation (2) |
|-------------------------|---------------------------|-----------------------------|
| High HDI | 7.450 (4.963) | -5.271 (6.911) |
| Medium HDI | -2.533 (6.663) | -20.365** (8.958) |
| Low HDI | -34.112*** (8.157) | -52.754*** (10.771) |
| Internet | 0.114 (0.098) | 0.231* (0.131) |
| Cellphones | 0.051 (0.041) | 0.013 (0.056) |
| Constant | 81.652*** (9.703) | 80.792*** (12.868) |
| Observations | 127 | 115 |
| R ² | 0.689 | 0.680 |
| Adjusted R ² | 0.676 | 0.665 |
| Residual Std. Error | 13.864 (df = 121) | 17.717 (df = 109) |
| F Statistic | 53.534*** (df = 5; 121) | 46.298*** (df = 5; 109) |

Note: * p<0.1; ** p<0.05; *** p<0.01

Primary Outliers

| High | | | Low | | |
|-----------------------------|--------------------------------|------------|-----------------------------|--------------------------|------------|
| HDI | Country | Graduation | HDI | Country | Graduation |
| Very High Human Development | Argentina | 109.61 | Very High Human Development | Bahrain | 91.17 |
| High Human Development | Algeria | 114.63 | Very High Human Development | Luxembourg | 90.63 |
| High Human Development | China | 120.91 | Very High Human Development | Qatar | 92.25 |
| High Human Development | Colombia | 117.18 | High Human Development | Azerbaijan | 87.1 |
| High Human Development | Ecuador | 113.11 | High Human Development | Dominican Republic | 88.4 |
| High Human Development | Georgia | 118.94 | High Human Development | Lebanon | 70.02 |
| High Human Development | Kazakhstan | 114.31 | High Human Development | Mauritius | 87.36 |
| High Human Development | Seychelles | 113.16 | High Human Development | Romania | 88.73 |
| High Human Development | St. Vincent and the Grenadines | 116.35 | High Human Development | St. Lucia | 87.78 |
| High Human Development | Ukraine | 115.91 | High Human Development | Suriname | 65.54 |
| Medium Human Development | Indonesia | 102.73 | Medium Human Development | Bangladesh | 60.23 |
| Medium Human Development | Vietnam | 108.68 | Medium Human Development | Congo, Rep. | 47.61 |
| Low Human Development | Burkina Faso | 78.43 | Medium Human Development | Syrian Arab Republic | 70.34 |
| Low Human Development | Lesotho | 70.93 | Medium Human Development | Vanuatu | 54.77 |
| Low Human Development | Myanmar | 81.44 | Low Human Development | Central African Republic | 23.27 |
| Low Human Development | Nepal | 101.93 | Low Human Development | Chad | 21.65 |
| | | | Low Human Development | Mauritania | 23.92 |
| | | | Low Human Development | Niger | 27.38 |
| | | | Low Human Development | Senegal | 22.33 |

Secondary Outliers

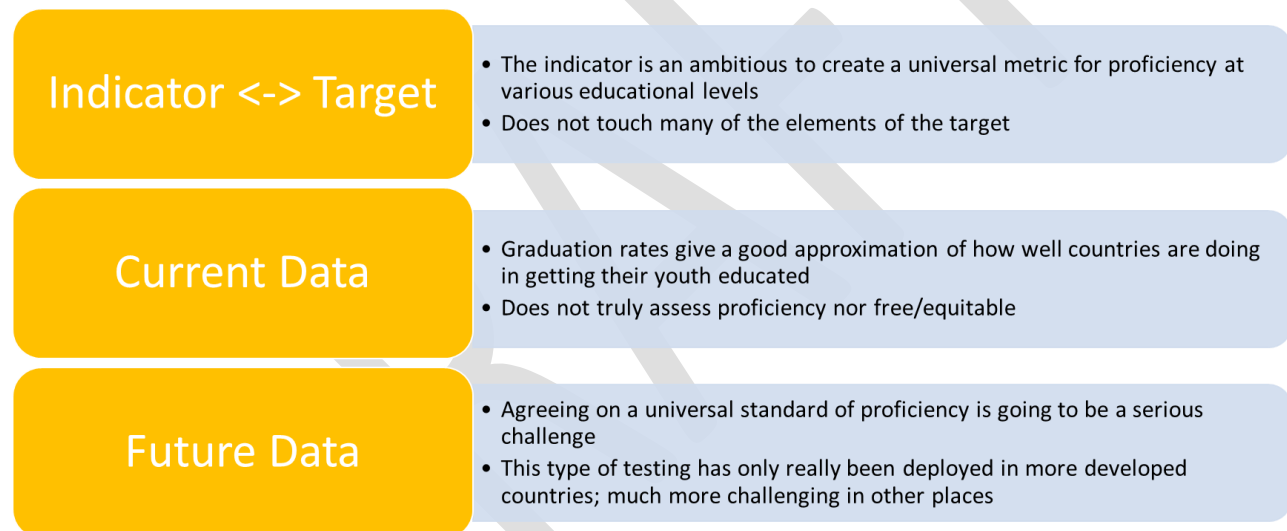
| High | | | Low | | |
|------------------------------|------------------------|--------------|------------------------------|--------------------------|------------|
| HDI | Country | Graduation | HDI | Country | Graduation |
| Very High Human Development | Portugal | 112.86 | Very High Human Development | Argentina | 87.25 |
| Very High Human Development | Qatar | 116.15 | Very High Human Development | France | 86.06 |
| High Human Development | Belarus | 107.66 | Very High Human Development | Montenegro | 89.85 |
| High Human Development | China | 112.43 | High Human Development | Belize | 56.57 |
| High Human Development | Kazakhstan | 108.54 | High Human Development | Lebanon | 39.33 |
| High Human Development | Mongolia | 113 | High Human Development | Panama | 49.36 |
| High Human Development | Serbia | 106.68 | High Human Development | Suriname | 34.73 |
| High Human Development | Seychelles | 108.71 | High Human Development | Tunisia | 66.92 |
| High Human Development | Sri Lanka | 107.1 | High Human Development | Venezuela, RB | 69.83 |
| Medium Human Development | Botswana | 87.45 | Medium Human Development | Cambodia | 32.86 |
| Medium Human Development | Kyrgyz Republic | 88.02 | Medium Human Development | Namibia | 35.53 |
| Medium Human Development | Moldova | 89.35 | Medium Human Development | Nicaragua | 45.36 |
| Medium Human Development | Sao Tome and Principe | 98.95 | Medium Human Development | South Africa | 32.53 |
| Medium Human Development | Tajikistan | 91.19 | Medium Human Development | Syrian Arab Republic | 44.37 |
| Medium Human Development | Uzbekistan | 102.59 | Medium Human Development | Vanuatu | 27.51 |
| Low Human Development | Kenya | 81.72 | Low Human Development | Central African Republic | 10.85 |
| Low Human Development | Nepal | 78.36 | Low Human Development | Ethiopia | 1.1 |
| | | | Low Human Development | Niger | 6.29 |

Conclusions

- Indicator marks a shift from attendance to a focus on what the students are gaining. It will be difficult measuring that. Much easier to count bodies in a seat than to assess proficiency on a universal scale.
- There is still significant progress that needs to be made on graduation rates, particularly in low HDI countries, regardless of proficiency
- Internet access and graduation rates do appear to be linked
 - Going from 0 to 25% internet also means big increases in graduation rates after which it flattens out

- Internet access is a significant predictor of secondary graduation rates in a country (larger returns on education?)
- Our four focus countries
 - Only have data from Nigeria
 - Nigeria has not raised the graduation rate in the last 15 years, presumably at least partly because of an increasing youth population—this is a major concern
- Outliers of interest
 - Kyrgyz Republic stands out in secondary
 - Massive difference between neighbors, Ethiopia and Kenya, on secondary education
 - Conflict is probably a driver of Lebanon and Syria's low outcomes

Traffic Light Analysis of Indicator 4.1



Target 4.2

Access to Early Childhood Development, Care & Pre-primary Education

1. Select Target

Target 4.2

By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education.

Indicator 4.2.1

2. Review SDG Indicator and Metadata

Indicator 4.2.1: Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex

- Divide population of children to isolate those under 5 years of age
- Data is available by age, sex, place of residence, wealth quintiles and other background characteristics. When used in conjunction with a module on child disability, data can also be disaggregated by disability statistics.
- Disaggregate by sex

3a. What is available now for assessing the current state of the indicator?

- UNICEF has estimates for the percentage of children under the age of five who are developmentally on track in health, learning and psychosocial well-being by country and some regional groupings
- Proposed existing data sources:
 - UNICEF – Early Childhood Development Index

The ECDI score is calculated as the percentage of children aged 36 to 59 months who are developmentally on track in at least three of four domains of development— Literacy-numeracy, Physical, Social-emotional and Learning. The index is best interpreted within the context of other variables related to support for early childhood development in the home and community. (official indicator description)

- Domain Definitions:
 - Literacy-numeracy: Children are identified as being developmentally on track if they can do at least two of the following: identify/name at least 10 letters of the alphabet; read at least 4 simple, popular words; and/or know the name and recognize the symbols of all numbers from 1 to 10.
 - Physical: If the child can pick up a small object with two fingers, like a stick or rock from the ground, and/or the mother/primary caregiver does not indicate that the child is sometimes too sick to play, then the child is regarded as being developmentally on track in the physical domain.
 - Social-emotional: The child is considered developmentally on track if two of the following are true: The child gets along well with other children; the child does not kick, bite or hit other children; and the child does not get distracted easily.
 - Learning: If the child follows simple directions on how to do something correctly and/or when given something
 - Availability: Although the individual elements are mostly accessible, the index does not appear to be available in a raw data type of format. This will surely be remedied as it is integrated into the SDG reporting.

3b. How close does this match to what the indicator metadata describes?

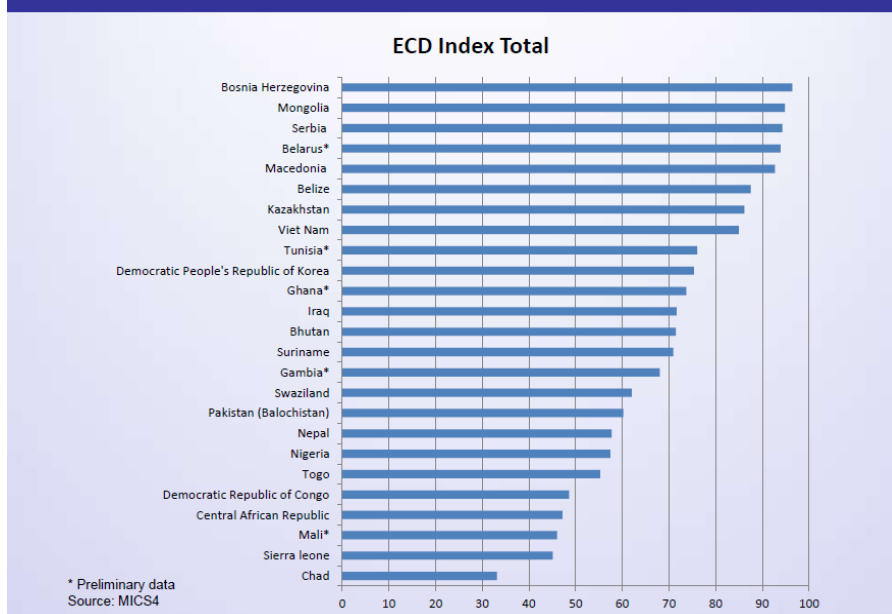
- Judgment: Although measuring early childhood development is an imprecise science, the ECDI seems to be a close match.
- Missing elements:
 - Need to ensure proposed measures are relevant to all children, in all parts of the world. What is “normal” varies across cultures and parenting strategies and may differ among countries, and also among cultural, ethnic or religious groups within the same country.
 - Need to ensure the index measures the skills and competencies most important for early school participation and learning.
 - Not clear how measuring the elements in ECDI translate to being ready for primary education as described in the target.
 - Currently, this data comes from a certain survey (MICs), which is not taken in all countries.
 - Timeline: 1-3 years (i.e., by 2018)

3c. Is there data for aspects of the target not captured by the indicator?

- Indicator measures percentage of children who are developmentally “on track” in health, learning and psychosocial well-being by sex
- Aspects of target not captured:
 - Access to ECD, care and pre-primary education
 - Quality of care and education
 - Availability of pre-primary education
 - Readiness for primary education as a result
- Other data options
 - Access
 - Home environment – Inadequate care (UNICEF)
 - Home environment – Support for learning (UNICEF)
 - Quality
 - Trained teachers in pre-primary education
 - Pupil-teacher ratio, pre-primary
 - Availability
 - Attendance in early childhood education (UNICEF)
 - School enrollment, pre-primary (% gross)
 - Home environment – Learning materials at home (UNICEF)
- How is readiness for primary education determined?
- Data available for primary, secondary and tertiary education not reported for pre-primary
 - Children out of school
 - Current education expenditure as a percentage of total expenditures in public institutions
 - Net school enrollment

ECD Index Total

Percentage of children age 36-59 months who are developmentally on track in literacy-numeracy, physical, social-emotional, and learning domains



http://www.unicef.org/earlychildhood/files/Website_data_presentation_Global_-_11_July_2013.pdf

3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

- No quantitatively define goals for Target nor Indicator

3e. What can we learn from the available data?

Indicator 4.2.2

2. Review SDG Indicator and Metadata

Indicator 4.2.2: Participation rate in organized learning (one year before the official primary entry age), by sex

- No metadata received on the current indicator formulation

3a. What is available now for assessing the current state of the indicator?

- UNESCO collects education related data including on preprimary enrollment.
- School enrollment, preprimary (% gross)

Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Preprimary education refers to programs at the initial stage of organized instruction, designed primarily to introduce very young children to a school-type environment and to provide a bridge between home and school. (official indicator description)

3b. How close does this match to what the indicator metadata describes?

- Judgment: We cannot make a judgment without the metadata, but the current data would appear to be close to what the indicator calls for.
- Missing elements:
 - Indicator specifies only the year before primary as opposed to the whole age group.

- Timeline:

3c. Is there data for aspects of the target not captured by the indicator?

Unknown

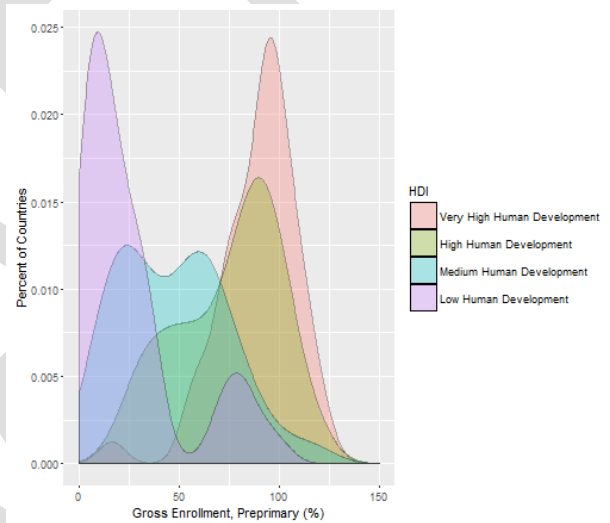
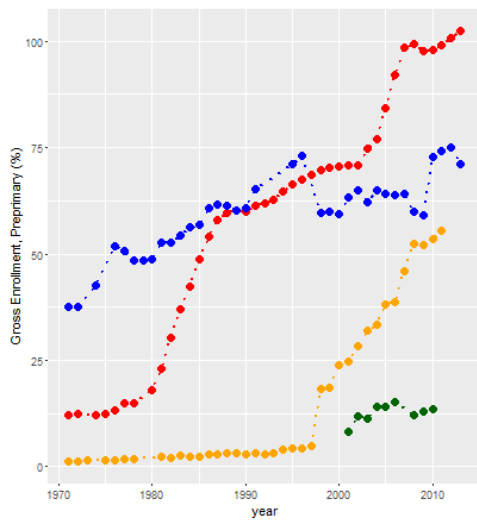
3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

- No quantitatively define goals for Target nor Indicator

3e. What can we learn from the available data?

- Gross Enrollment, Preprimary (%)
- Countries: USA, Mexico, India, Nigeria
- ICT data:
 - Internet users
 - Cellphone subscriptions

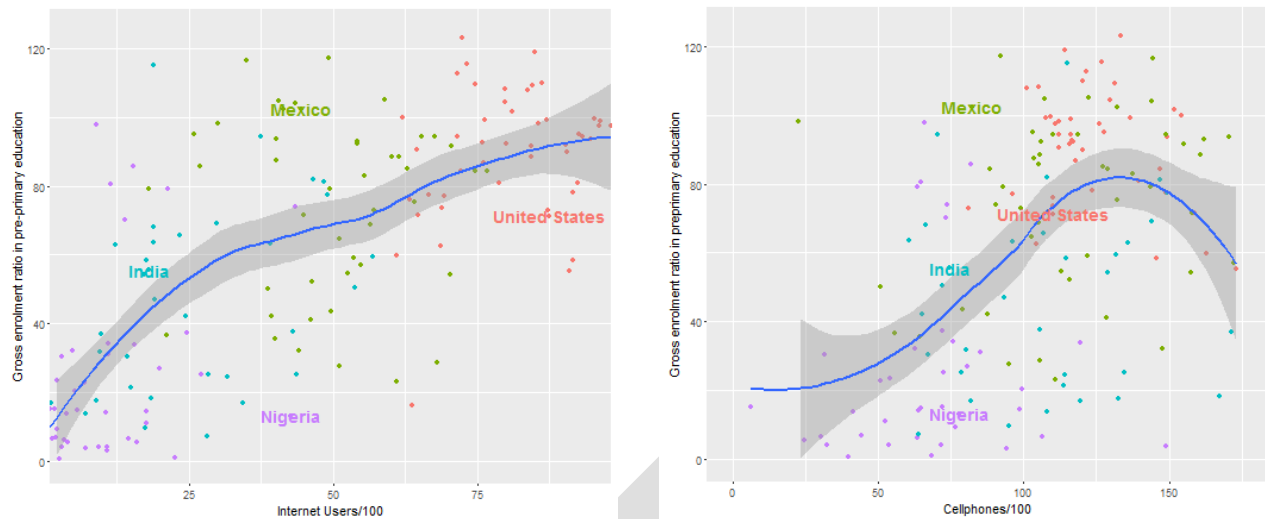
School enrollment, preprimary (% gross)



Means by HDI

| HDI Level | Preprimary Enrollment Mean |
|-----------------------------|----------------------------|
| Very High Human Development | 89.53 |
| High Human Development | 77.04 |
| Medium Human Development | 46.84 |
| Low Human Development | 25.36 |

Preprimary Enrollment vs. ICT



Regression Results

| | Preprimary |
|-------------------------|--------------------------------|
| High HDI | -1.770 (7.314) |
| Medium HDI | -23.897** (10.632) |
| Low HDI | -39.845*** (12.826) |
| Internet | 0.337** (0.165) |
| Cellphones | 0.017 (0.067) |
| Constant | 60.114*** (15.318) |
| Observations | 166 |
| R ² | 0.507 |
| Adjusted R ² | 0.492 |
| Residual Std. Error | 25.752 (df = 160) |
| F Statistic | 32.944*** (df = 5; 160) |
| Note: | * p<0.1; ** p<0.05; *** p<0.01 |

Preprimary Outliers

| High | | | Low | | |
|-----------------------------|----------------------|------------|-----------------------------|----------------------|------------|
| HDI | Country | Preprimary | HDI | Country | Preprimary |
| Very High Human Development | Australia | 109.23 | Very High Human Development | Bahrain | 55.23 |
| Very High Human Development | Belgium | 118.81 | Very High Human Development | Croatia | 62.67 |
| Very High Human Development | Chile | 122.9 | Very High Human Development | Montenegro | 59.66 |
| Very High Human Development | Germany | 109.71 | Very High Human Development | Qatar | 58.49 |
| Very High Human Development | Hong Kong SAR, China | 109.41 | Very High Human Development | Saudi Arabia | 16.33 |
| Very High Human Development | Israel | 112.68 | High Human Development | Samoa | 36.87 |
| Very High Human Development | Malta | 115.41 | High Human Development | Azerbaijan | 23.11 |
| High Human Development | China | 117.15 | High Human Development | Dominican Republic | 43.6 |
| High Human Development | Ecuador | 187.19 | High Human Development | Iran, Islamic Rep. | 42.4 |
| High Human Development | Thailand | 116.5 | High Human Development | Jordan | 32.23 |
| Medium Human Development | Ghana | 115.1 | High Human Development | Macedonia, FYR | 28.66 |
| Medium Human Development | Guyana | 94.34 | High Human Development | Tonga | 35.53 |
| Medium Human Development | Moldova | 82.06 | High Human Development | Tunisia | 41.25 |
| Medium Human Development | South Africa | 77.37 | High Human Development | Turkey | 27.58 |
| Medium Human Development | Vietnam | 81.35 | Medium Human Development | Bhutan | 17.05 |
| Low Human Development | Angola | 79.25 | Medium Human Development | Botswana | 18.33 |
| Low Human Development | Haiti | 80.64 | Medium Human Development | Cambodia | 17.6 |
| Low Human Development | Kenya | 73.8 | Medium Human Development | Congo, Rep. | 13.91 |
| Low Human Development | Nepal | 85.76 | Medium Human Development | Syrian Arab Republic | 7.22 |
| Low Human Development | Pakistan | 70.24 | Medium Human Development | Tajikistan | 9.92 |
| Low Human Development | Solomon Islands | 97.9 | Medium Human Development | Timor-Leste | 17.02 |

Conclusions

- Indicator 4.2.1 represents the end product of a long process in assessing early childhood development
 - The data appears to be mostly there, but not available in a functionally accessible form for independent analysis
 - Currently only a limited subset of countries are participating, expected to expand with enactment of SDGs
- Indicator 4.2.2 is fairly straightforward in looking at enrollment—the only challenge is looking at only one year rather than an age range
- Low and medium HDI countries have quite low rates of pre-primary education enrollment
- 100% is unlikely, given that many parents choose to keep kids at home in developed countries until primary.
- Internet access is a significant predictor of pre-primary enrollment (have no hypothesis as to why)
- Consider that the very high enrollment of some countries (e.g. Mexico) is because Kindergarten and earlier may be offered free in those countries (or could represent measurement oddities). Germany for example heavily subsidizes daycare beginning at 1 years old

Traffic Light Analysis of Indicator 4.2.1

Indicator <-> Target

- With two indicators this target's aspects are better captured than with others.
- The ECD index is a well developed and useful tool

Current Data

- This indicator appears to be on the verge of being fully measurable for a subset of countries
- Currently one either has to look at reports or the actual country level surveys (no accessible database for ECD index)

Future Data

- The approach to measuring this indicator is well established and the main challenge remaining is to roll it out in more countries and share the results in a public database.

Traffic Light Analysis of Indicator 4.2.2

Indicator <-> Target

- This along with the other indicator well captures the target

Current Data

- Data on enrollment is widely available and very close to the specifics of the indicator

Future Data

- Although the metadata is not yet available it would seem that aligning data collection with the specifics of the indicator will be straightforward.

Target 4.3

Post-Secondary Education

1. Select Target

Target 4.3

By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.

2a. Review SDG Indicator and Metadata

Indicator 4.3.1: Participation rate of youth and adults in formal and non-formal education and training in the last 12 months, by sex

- Divide population into age ranges (e.g. 15-24 years, 25-64 years etc.)
- Disaggregate by type of program
- Disaggregate by sex

2b. Missing from the Indicator

The indicator does not measure:

- *Affordable* (not just public costs but private costs as well)
- *Quality*
- *Equal Access*

3a. What is available now for assessing the current state of the indicator?

- UNESCO currently collects and publishes education data
- Proposed existing data sources:
 - School enrollment, tertiary (% gross)

Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.

3b. How close does this match to what the indicator metadata describes?

- Judgment: Is close enough to give a fair judgment of the current state and broad trends
- Missing elements
 - All types of post-secondary education (particularly non-formal) are not tracked sufficiently
 - Lack of consistent definitions of adult education across countries
 - Enrollment by age group is not tracked
 - Timeline: 1-3 years

3c. Is there data for aspects of the target not captured by the indicator?

- There is a possibility to capture as well:
 - Equal Access
 - Affordability
- No currently accepted measures:
 - Quality
- Murakami and Blom (2008) describe an affordability and an accessibility index
- Affordability Index: Out-of-pocket costs/GDP per capita
 - Education (tuition etc.)-mixed availability of data
 - Living costs-very crude estimates
 - Grants/Tax breaks-okay data
 - Loans-okay data
- Accessibility:
 - Participation rate-% of college age population in university
 - Attainment rate-population by age 34 that has attained a degree
 - Educational Equity Index-% of tertiary students whose fathers have a degree/% of males between 45-64 who have a degree
 - Gender Parity Index-female to male enrollment ratio

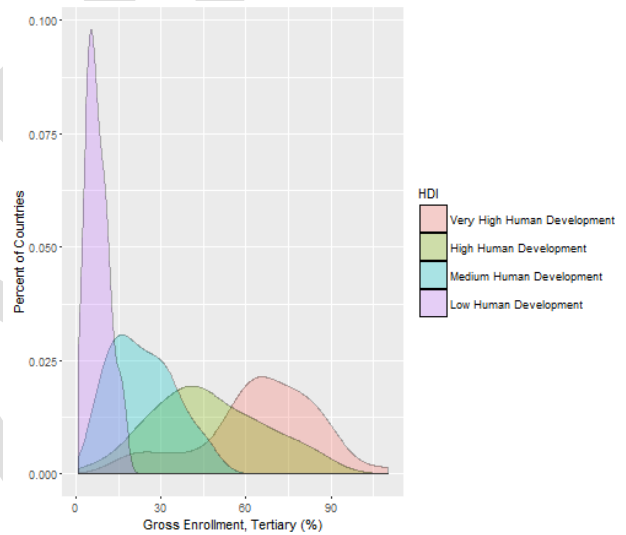
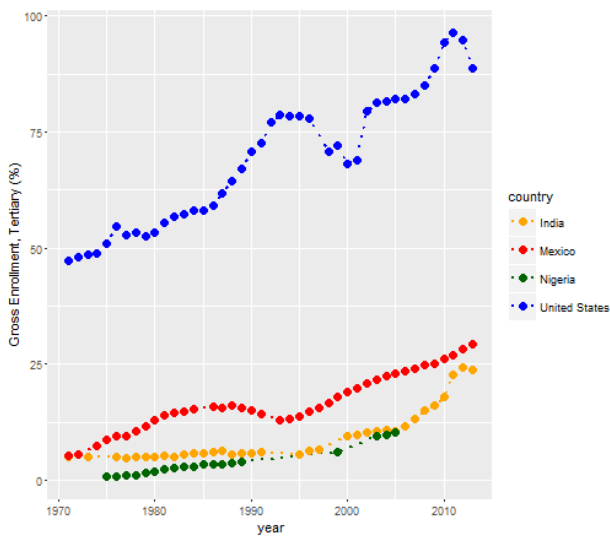
3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

- There are no quantitatively defined goals for the target nor the indicator.

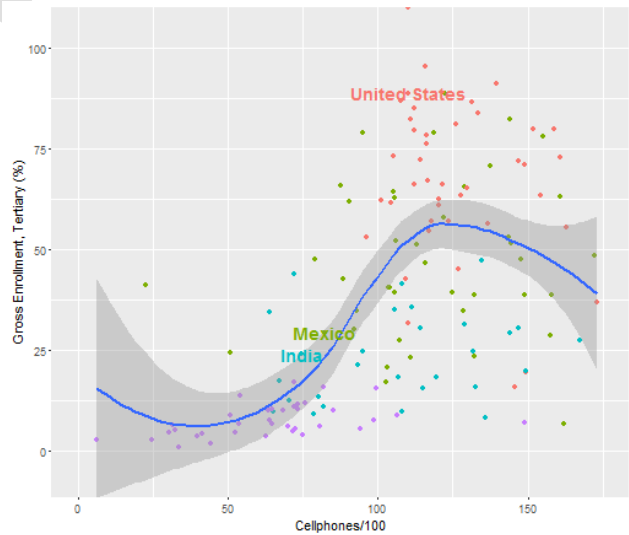
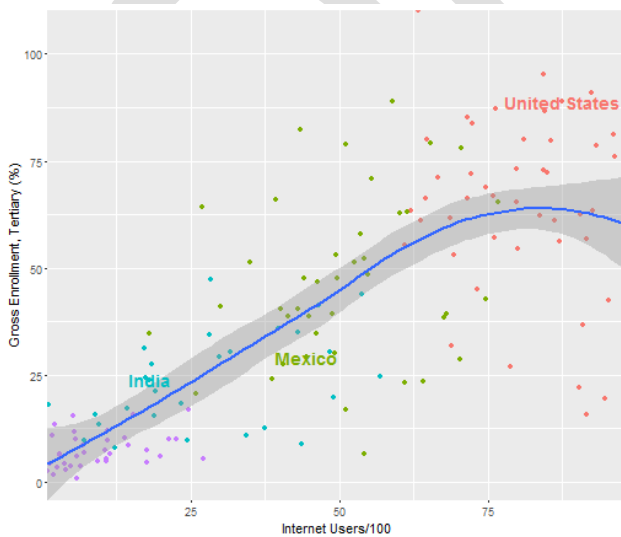
3e. What can we learn from the available data?

- Gross Enrollment, Tertiary (%)
- Countries: USA, Mexico, India, Nigeria
- ICT data:
 - Internet users
 - Cellphone subscriptions

Gross Enrollment, Tertiary (%)



Gross Enrollment, Tertiary (%) vs. ICT



Means by HDI

| HDI Level | Enrollment Mean |
|-----------------------------|-----------------|
| Very High Human Development | 64.99 |
| High Human Development | 47.05 |
| Medium Human Development | 23.53 |
| Low Human Development | 7.48 |

Regression Analysis

| | Enrollment |
|-------------------------|-------------------------------------|
| High HDI | -13.861 ^{***} (4.815) |
| Medium HDI | -33.616 ^{***} (7.039) |
| Low HDI | -47.751 ^{***} (8.910) |
| Internet | 0.161 (0.113) |
| Cellphones | -0.024 (0.046) |
| Constant | 55.233 ^{***} (10.464) |
| Observations | 151 |
| R ² | 0.670 |
| Adjusted R ² | 0.659 |
| Residual Std. Error | 16.107 (df = 145) |
| F Statistic | 58.984 ^{***} (df = 5; 145) |

Note: * p<0.1; ** p<0.05; *** p<0.01

High Enrollment Countries

| HDI | Country | Enrollment |
|-----------------------------|---------------------|------------|
| Very High Human Development | Australia | 86.55 |
| Very High Human Development | Finland | 91.07 |
| Very High Human Development | Greece | 110.16 |
| Very High Human Development | Korea, Rep. | 95.35 |
| Very High Human Development | Spain | 87.07 |
| Very High Human Development | United States | 88.81 |
| High Human Development | Belarus | 88.86 |
| High Human Development | Bulgaria | 70.79 |
| High Human Development | Russian Federation | 78 |
| High Human Development | St. Kitts and Nevis | 79.1 |
| High Human Development | Turkey | 78.98 |
| High Human Development | Ukraine | 82.31 |
| Medium Human Development | Kyrgyz Republic | 47.33 |
| Medium Human Development | Moldova | 41.28 |
| Medium Human Development | Paraguay | 35.08 |
| Medium Human Development | Philippines | 35.75 |
| Medium Human Development | West Bank and Gaza | 44.01 |
| Low Human Development | Benin | 15.36 |
| Low Human Development | Cameroon | 11.93 |
| Low Human Development | Liberia | 11.64 |
| Low Human Development | Myanmar | 13.53 |
| Low Human Development | Nepal | 15.83 |
| Low Human Development | Sudan | 16.92 |

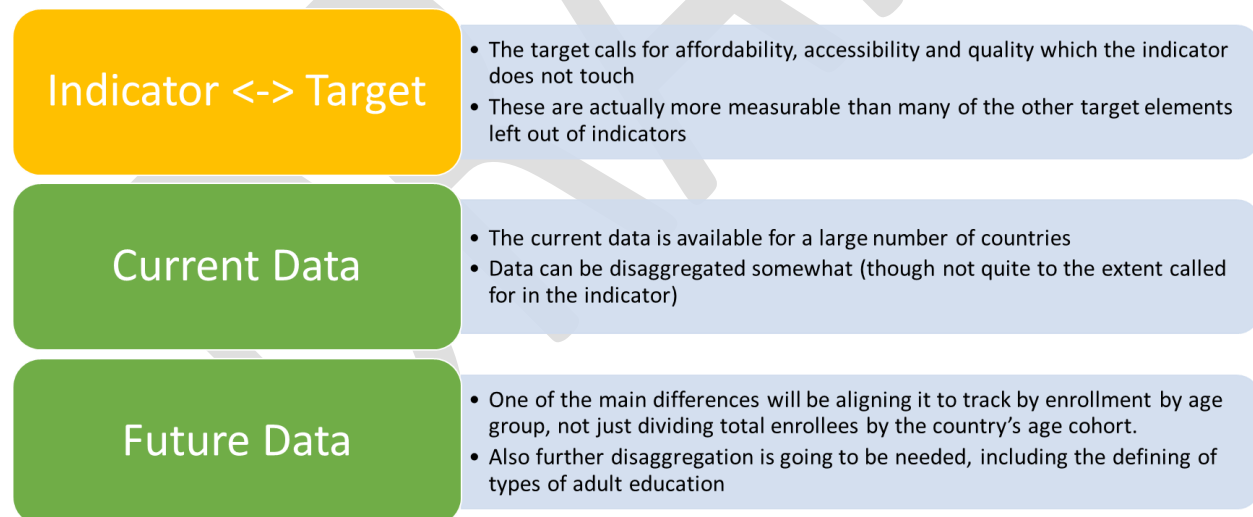
Low Enrollment Countries

| HDI | Country | Enrollment |
|-----------------------------|--------------------------|------------|
| Very High Human Development | Bahrain | 36.84 |
| Very High Human Development | Brunei Darussalam | 31.73 |
| Very High Human Development | Kuwait | 27.03 |
| Very High Human Development | Liechtenstein | 42.5 |
| Very High Human Development | Luxembourg | 19.41 |
| Very High Human Development | Qatar | 15.83 |
| Very High Human Development | United Arab Emirates | 22.04 |
| High Human Development | Antigua and Barbuda | 23.49 |
| High Human Development | Azerbaijan | 23.16 |
| High Human Development | Belize | 24.18 |
| High Human Development | Jamaica | 27.44 |
| High Human Development | Seychelles | 6.47 |
| High Human Development | Sri Lanka | 20.71 |
| High Human Development | St. Lucia | 16.86 |
| Medium Human Development | Bhutan | 10.93 |
| Medium Human Development | Congo, Rep. | 9.72 |
| Medium Human Development | Sao Tome and Principe | 9.75 |
| Medium Human Development | Turkmenistan | 7.98 |
| Medium Human Development | Uzbekistan | 8.9 |
| Low Human Development | Central African Republic | 2.77 |
| Low Human Development | Eritrea | 2.57 |
| Low Human Development | Malawi | 0.8 |
| Low Human Development | Niger | 1.71 |

Conclusions

- Data about post-secondary enrollment is also available in more disaggregated forms than is presented here
- HDI and Tertiary Enrollment are closely linked
 - Low HDI countries are uniformly behind
 - More overlap between other groups
- Focus Countries
 - Nigeria does not have much tertiary data
 - US leads in enrollment
 - Trajectories on enrollment in India and Mexico are good but too slow
- Leaders and Laggards
 - Geographic (e.g. islands), culture (e.g. Islam) and conflict are clearly factors
 - Interesting questions
 - What has Paraguay and Turkey done right?
 - Why is Kyrgyz Republic doing well but its neighbors of Uzbekistan and Tajikistan not?

Traffic Light Analysis of Indicator 4.3



Target 4.4

ICT Skills

1. Select Target

Target 4.4

By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

2a. Review SDG Indicator and Metadata

Indicator 4.4.1: Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill

- The percentage of youth (aged 15-24 years) and adults (aged 15 years and above) that have undertaken certain computer-related activities in a given time period (e.g. last three months)
- List of activities which would be considered is included in the metadata

2b. Missing from the Indicator

- In terms of ICT skills, this list is already quite dated and would struggle to stay relevant regardless. Also it does not get at the level of competence in any of these skills.
- More significant, Target 4.4 calls for increasing all relevant skills, of which ICT can only be considered one of many. The target specifically mentions vocational skills, which is quite distinct from the more white collar ICT skills.

3a. What is available now for assessing the current state of the indicator?

- Proposes to use household surveys which collect data on the use of selected ICT skills.
- Proposed existing data sources:

Eurostat: Has collected the data called for in this indicator, but this provides only a limited snapshot of the global state. This is not useful for measuring trends globally, but gives an idea of what the indicator will look like.

3b. How close does this match to what the indicator metadata describes?

- Judgment: This matches many of the specific skills that the indicator calls for
- Missing elements:
 - Participation from most of the globe
 - Timeline: Unclear what timeline other countries and multinational statistical organizations have for globalizing this measurement

3c. Is there data for aspects of the target not captured by the indicator?

Unknown

3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

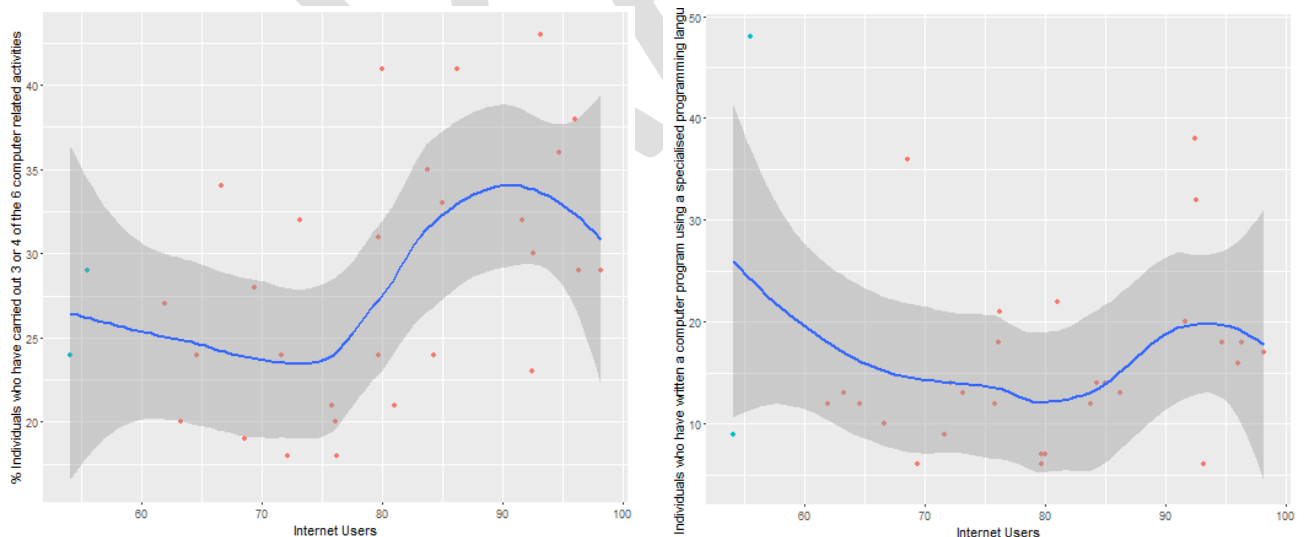
NO

3e. What can we learn from the available data?

- European Union Wide Averages for 16-29 year olds (2011)

| Indicator | Percentage |
|---|------------|
| Individuals who have copied or moved a file or folder | 87 |
| Individuals who have used copy or cut and paste tools to duplicate or move information on screen | 86 |
| Individuals who have used basic arithmetic formulae to add, subtract, multiply or divide figures in a spreadsheet | 65 |
| Individuals who have compressed files | 58 |
| Individuals who have written a computer program using a specialised programming language | 19 |
| Individuals who have connected and installed new devices, e.g. a printer or a modem | 65 |
| Individuals who have carried out 3 or 4 of the 6 computer related activities | 34 |
| Individuals who judge their current computer or Internet skills to be sufficient if they were to look for a job or change job within a year | 66 |
| Individuals who judge their current computer or Internet skills to be sufficient to communicate with relatives, friends, colleagues over the Internet | 90 |
| Individuals who judge their current computer or Internet skills to be sufficient to protect their personal data | 69 |
| Individuals who judge their current computer or Internet skills to be sufficient to protect their private computer from virus or other computer infection | 68 |

Internet Users vs. ICT Skills



Conclusions

- The target calls for a wide range of skills but the indicator narrows it down to only ICT.
- The ICT skills called for are very narrow and mostly outdated

- Only the EU has collected data on this indicator and that is somewhat old

Traffic Light Analysis of Indicator 4.4

Indicator <-> Target

- While ICT skills are obviously highly relevant for this particular project they do not represent all the skills adults should have
- The indicator does a poor job of even measuring ICT skills

Current Data

- Only available for the EU, does not include all parts of the indicator and does not appear to be collected regularly

Future Data

- Given that the proposed metrics are already dated before their collection has begun it seems a serious challenge to create an approach which assesses relevant ICT skills for today

Target 4.5

Parity in Education and Equal Access to All Levels of Education and Vocational Training

1. Select Target

Target 4.5

By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.

2a. Review SDG Indicator and Metadata

Indicator 4.5.1: Parity indices (female/male, rural/urban, bottom/top wealth quintile and others such as disability status, indigenous peoples and conflict-affected, as data becomes available) for all education indicators on this list that can be disaggregated.

2b. Missing from the Indicator

The indicator does not measure:

- Children in vulnerable situations which is mentioned in the target
- Does not define equal access

3a. What is available now for assessing the current state of the indicator?

- The GPI is available for most of the data sources that were selected to represent the indicators and little of the other disparities of interest, so we'll focus on that
- Proposed existing data sources:
 - 4.1: GPI-Graduation from Primary and Lower Secondary (UNESCO)
 - 4.2: GPI-Enrollment Preprimary
 - 4.3: GPI-Enrollment Tertiary
 - 4.4: GPI(estimate)-ICT Skills Eurostat (check online)

- 4.6: GPI(calculate)-Literacy youth and adult
- 4.c: GPI(calculate)-Trained teachers at various levels

3b. How close does this match to what the indicator metadata describes?

- Judgment: While the gender parity data is widely available, the other elements called for in the indicator are less so. Ultimately this indicator depends on the quality of measurement done for the other education targets
- Missing elements:
 - Limited urban/rural and wealth group data
 - No disability data
 - Timeline: none given

3c. Is there data for aspects of the target not captured by the indicator?

No

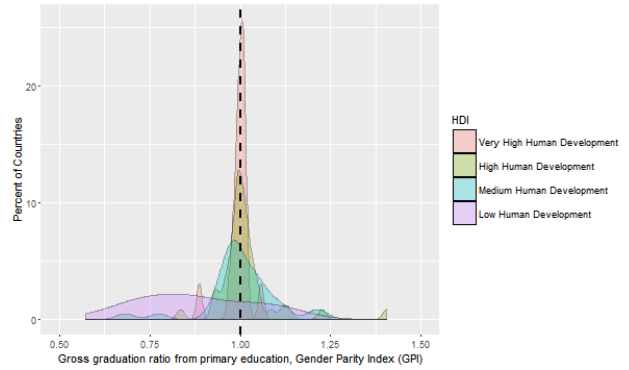
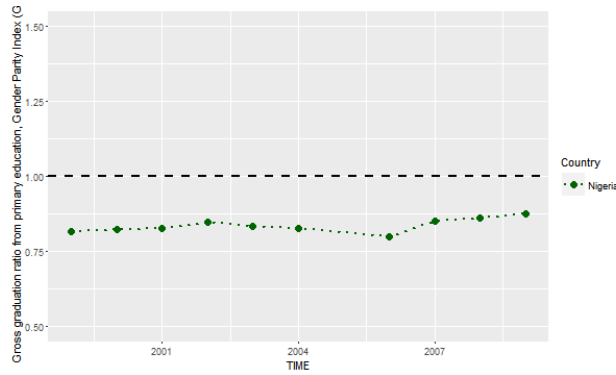
3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

- Elimination of gender disparity is interpreted as raising the GPI to at least 1 on all education levels. Equal access is not yet clearly defined.

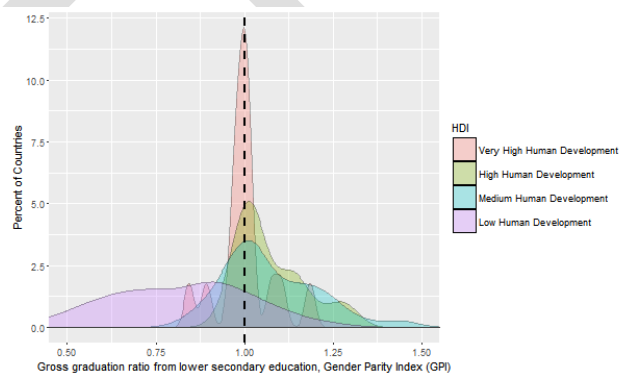
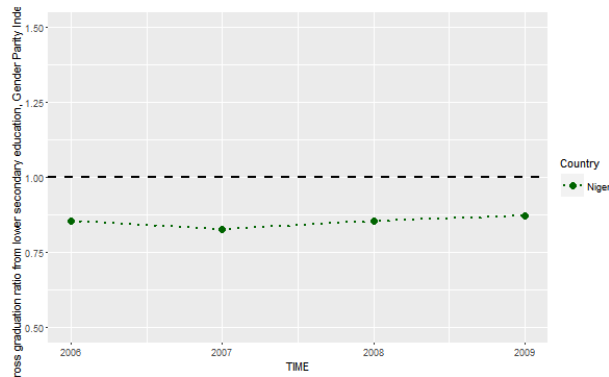
3e. What can we learn from the available data?

- 4.1: GPI-Graduation from Primary and Lower Secondary (UNESCO)
- 4.2: GPI-Enrollment Preprimary
- 4.3: GPI-Enrollment Tertiary
- 4.4: GPI(calculate)-ICT Skills Eurostat
- 4.6: GPI(calculate)-Literacy youth and adult
- 4.c: GPI(calculate)-Trained teachers at various levels
- Countries: USA, Mexico, India, Nigeria
- ICT data:
 - Internet users
 - Cellphone subscriptions

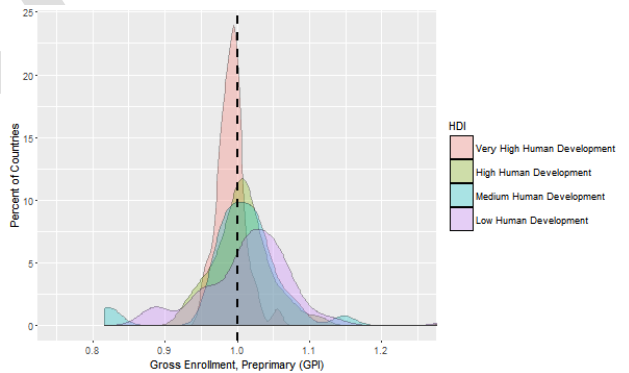
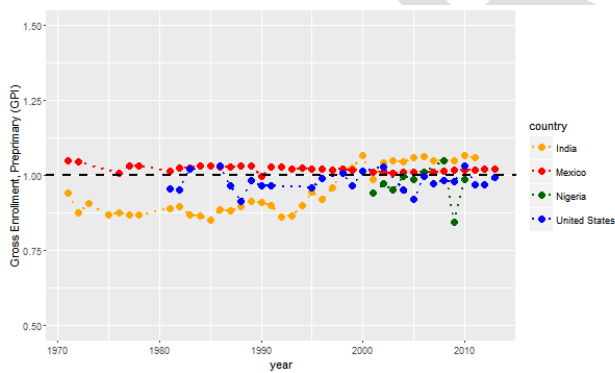
Gross graduation ratio from primary education, gender parity index (GPI)



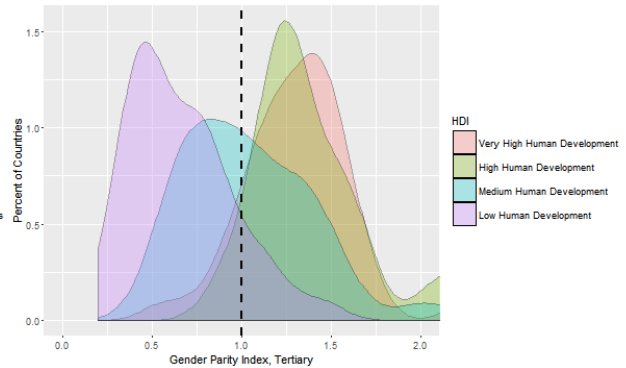
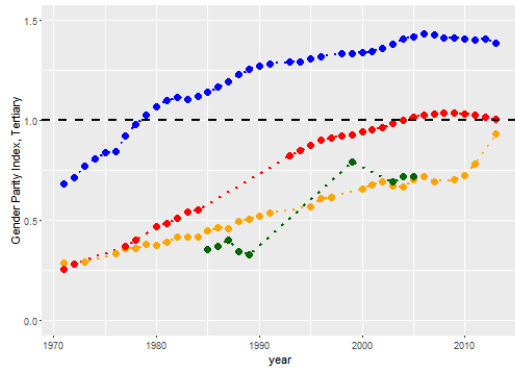
Gross graduation ratio from lower secondary education, gender parity index (GPI)



School enrollment, preprimary (GPI calculated)



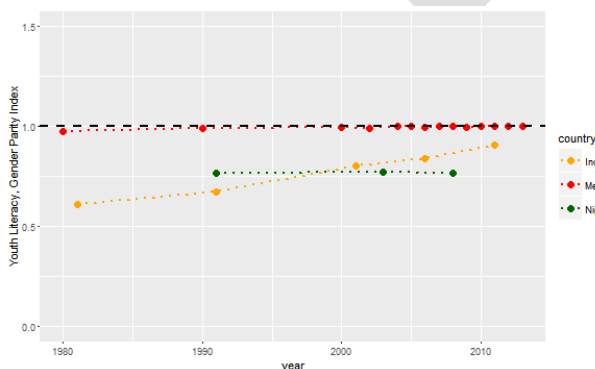
Gross Tertiary Enrollment, Gender Parity Index (GPI)



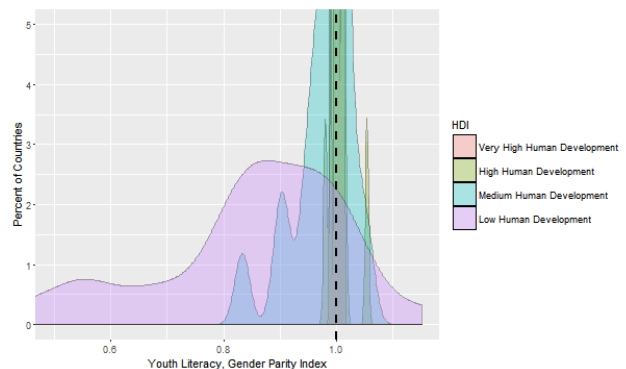
Eurostat ICT Skills Indicators (GPI)

| Indicator | Percentage | GPI |
|---|------------|------|
| Individuals who have copied or moved a file or folder | 90 | 1.01 |
| Individuals who have used copy or cut and paste tools to duplicate or move information on screen | 89 | 1.02 |
| Individuals who have used basic arithmetic formulae to add, subtract, multiply or divide figures in a spreadsheet | 65 | 1 |
| Individuals who have compressed files | 50 | 0.78 |
| Individuals who have written a computer program using a specialised programming language | 9 | 0.45 |
| Individuals who have connected and installed new devices, eg a printer or a modem | 57 | 0.79 |
| Individuals who have carried out 3 or 4 of the 6 computer related activities | 38 | 1.58 |
| Individuals who judge their current computer or Internet skills to be sufficient if they were to look for a job or change job within a year | 67 | 1.02 |
| Individuals who judge their current computer or Internet skills to be sufficient to communicate with relatives, friends, colleagues over the Internet | 94 | 1.01 |
| Individuals who judge their current computer or Internet skills to be sufficient to protect their personal data | 65 | 0.89 |
| Individuals who judge their current computer or Internet skills to be sufficient to protect their private computer from virus or other computer infection | 61 | 0.81 |

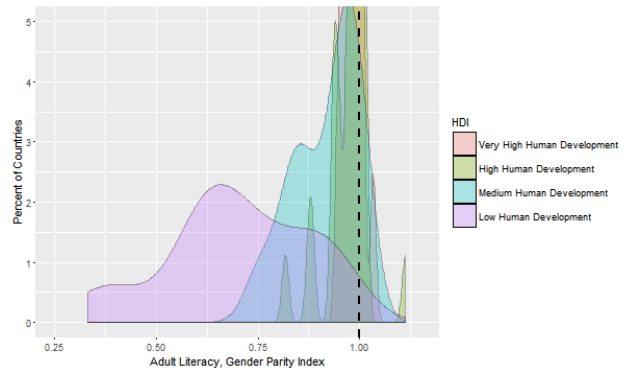
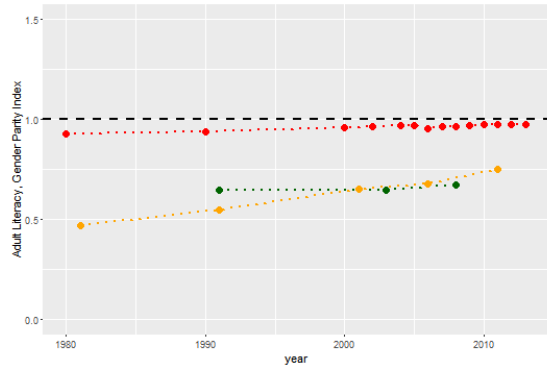
Youth Literacy, Gender Parity Index



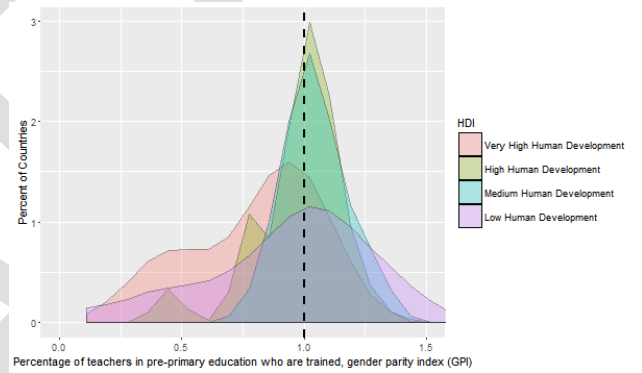
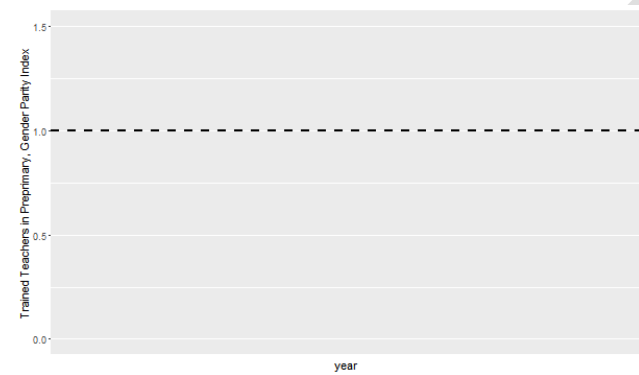
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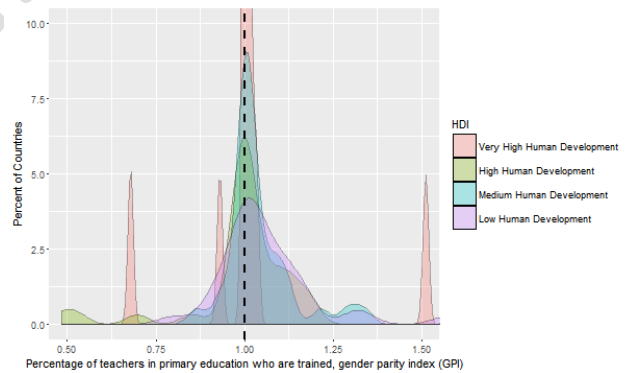
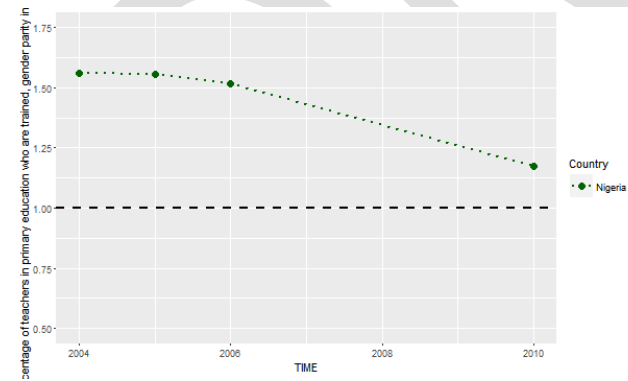
Adult Literacy, Gender Parity Index (GPI)



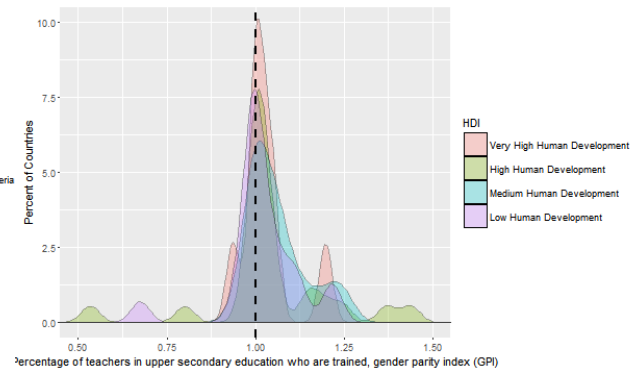
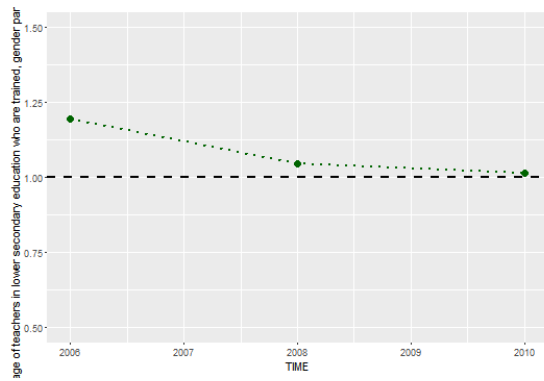
Teachers Preprimary GPI



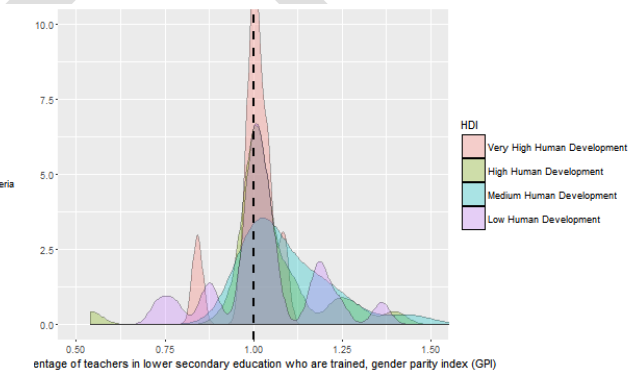
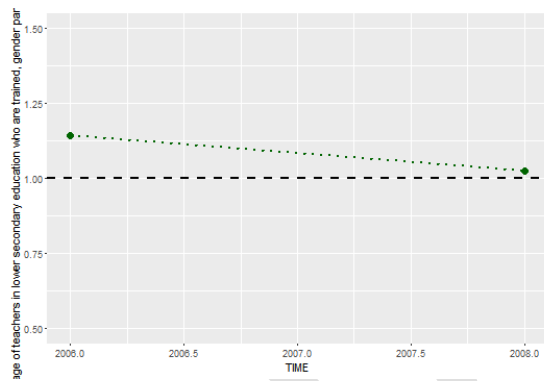
No data from selected countries Teachers Training Primary GPI



Teacher Training Lower Secondary GPI



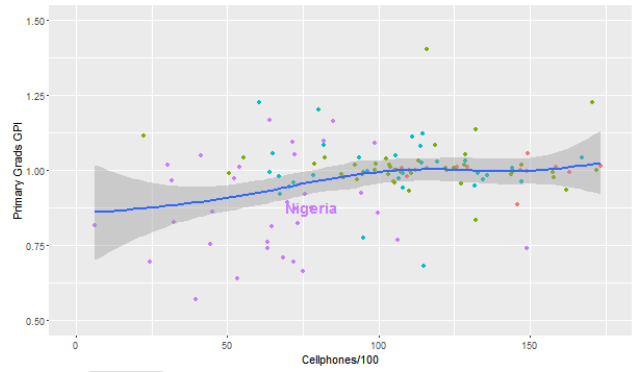
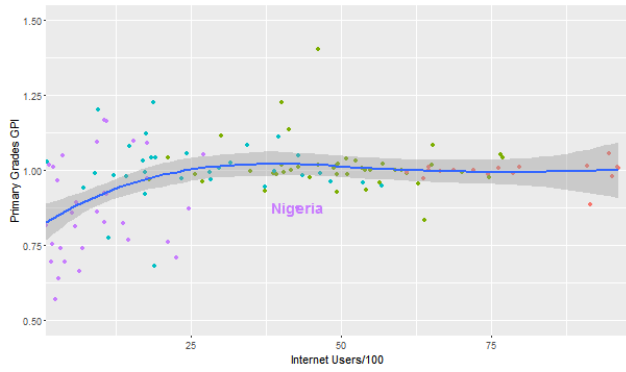
Teacher Training Upper Secondary GPI



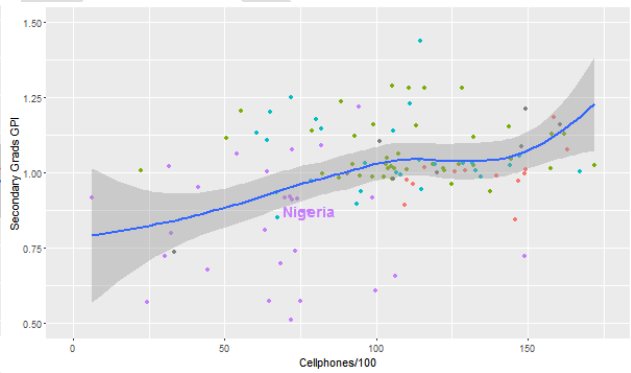
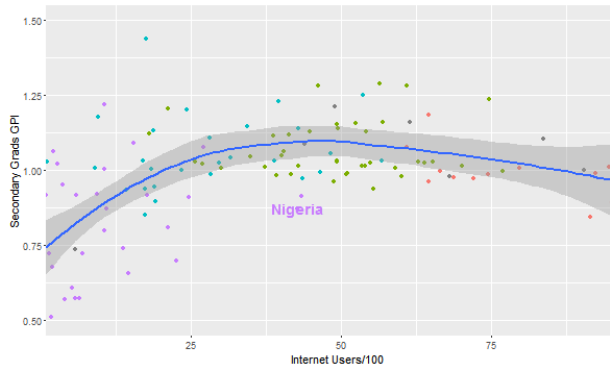
Means by HDI

| HDI Level | Primary Grads | Secondary Grades | Preprimary Enrollment | Tertiary Enrollment | Youth Literacy | Adult Literacy | Preprimary Teachers | Primary Teachers | Lower Secondary Teachers | Upper Secondary Teachers |
|-----------------------------|---------------|------------------|-----------------------|---------------------|----------------|----------------|---------------------|------------------|--------------------------|--------------------------|
| Very High Human Development | 1 | 1 | 1 | 1.44 | 1 | 0.99 | 0.8 | 1.02 | 1 | 1.03 |
| High Human Development | 1.02 | 1.09 | 1.01 | 1.41 | 1 | 0.98 | 2.92 | 1.09 | 1.07 | 1.1 |
| Medium Human Development | 1 | 1.07 | 1 | 1.04 | 0.98 | 0.92 | 1.56 | 1.04 | 1.15 | 1.06 |
| Low Human Development | 0.88 | 0.82 | 1.03 | 0.66 | 0.85 | 0.7 | 1.16 | 1.09 | 1.03 | 1.02 |

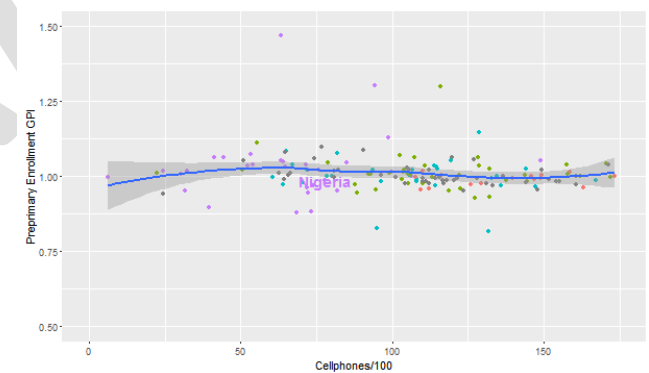
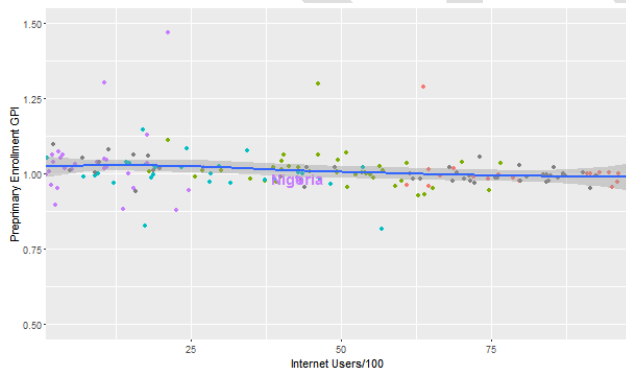
Primary Grads GPI vs. ICT



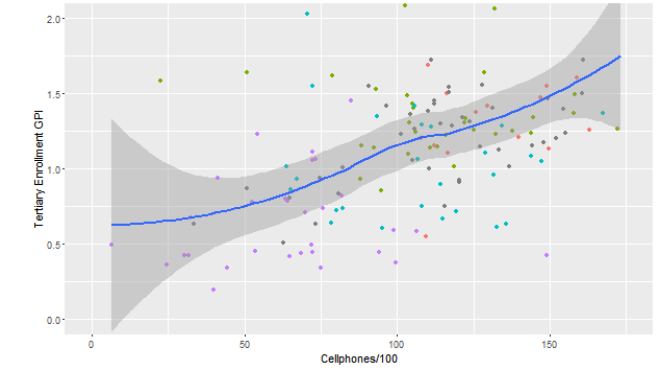
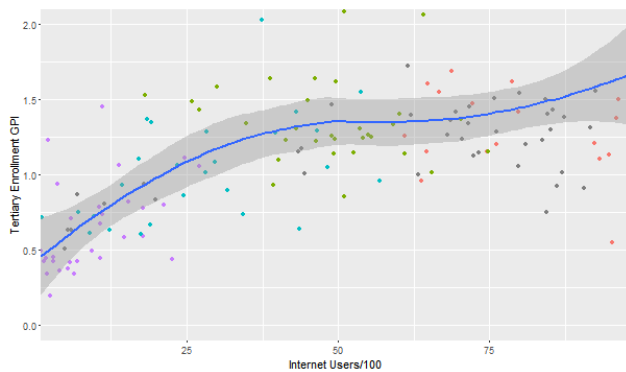
Secondary Grads GPI vs. ICT



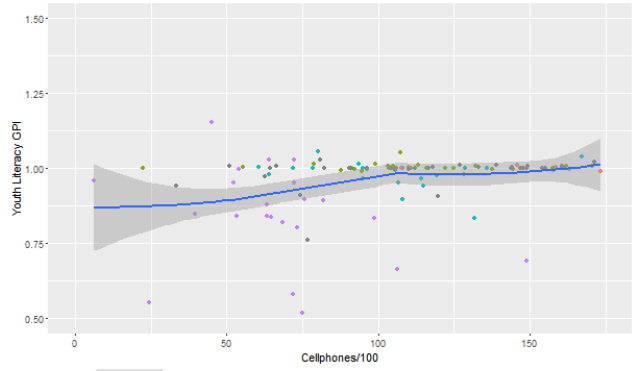
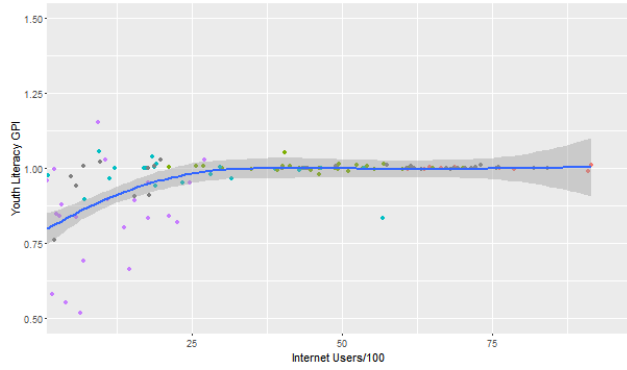
Preprimary Enrollment vs. ICT



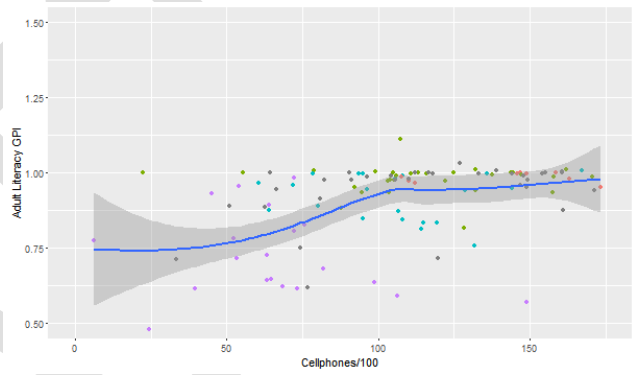
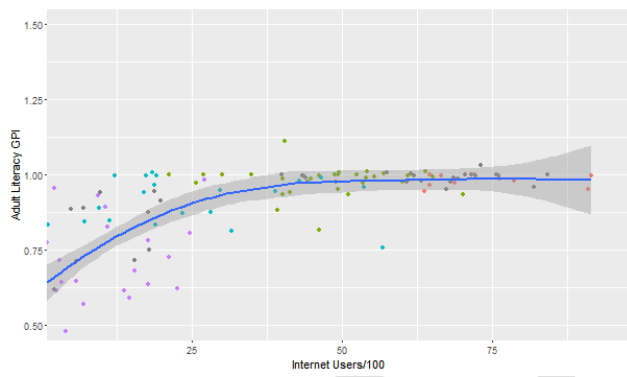
Tertiary Enrollment GPI vs. ICT



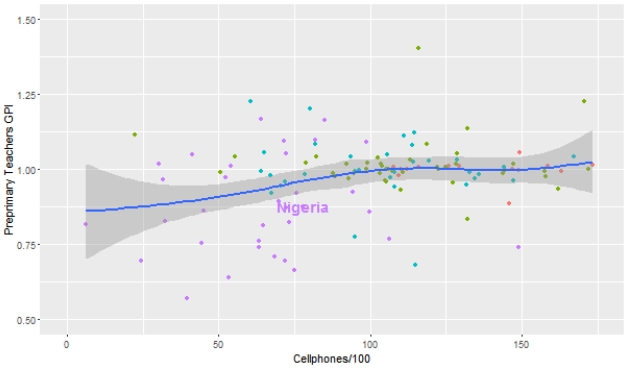
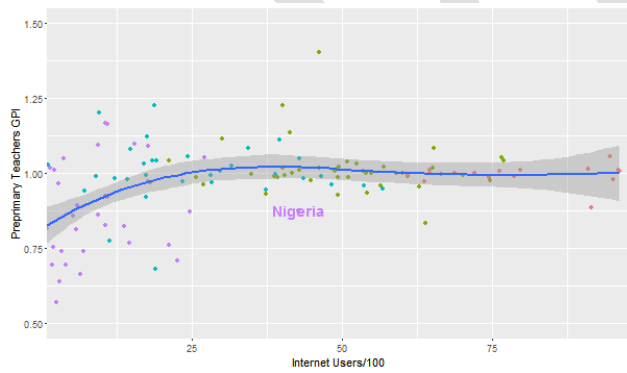
Youth Literacy GPI vs. ICT



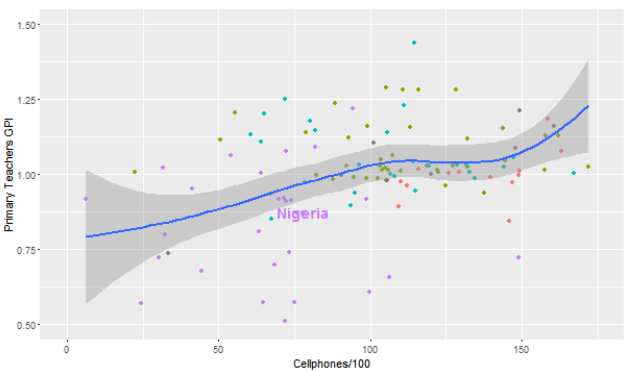
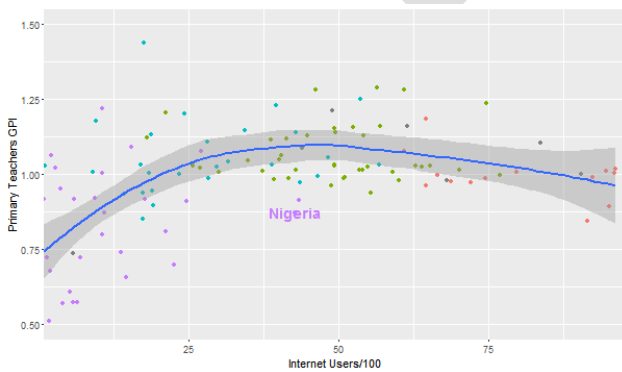
Adult Literacy GPI vs. ICT



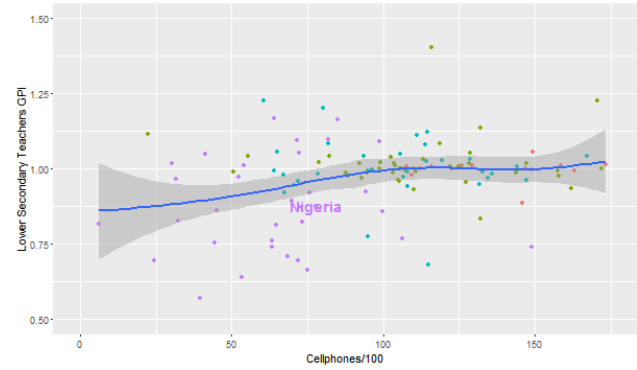
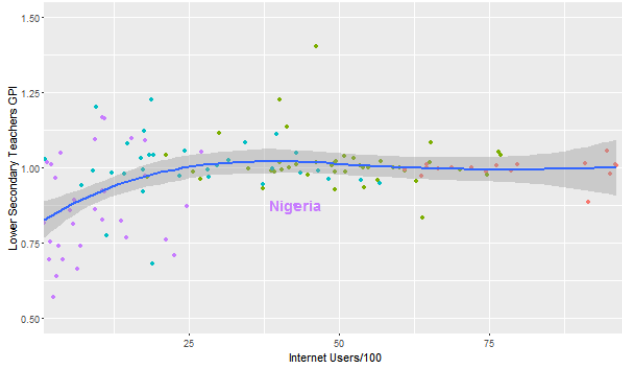
Preprimary Teachers GPI vs. ICT



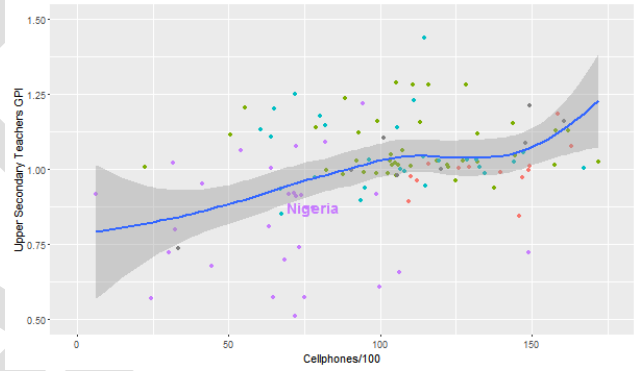
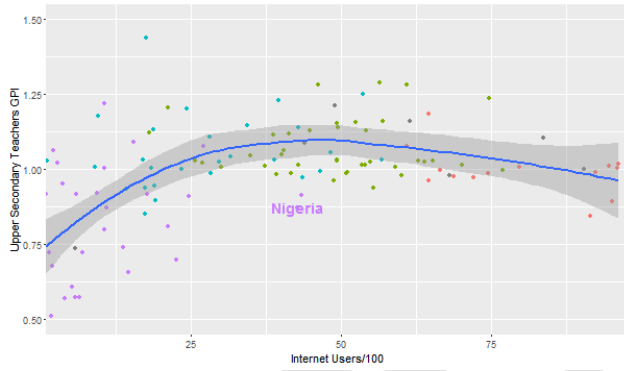
Primary Teacher GPI vs. ICT



Lower Secondary Teachers vs. ICT



Upper Secondary Teachers GPI vs. ICT



Regression Results

| | Primary Grads (1) | Secondary Grades (2) | Primary Enrollment (3) | Tertiary Enrollment (4) | Youth Literacy (5) | Adult Literacy (6) | Preprimary Teachers (7) | Primary Teachers (8) | Lower Secondary Teachers (9) | Upper Secondary Teachers (10) |
|-------------------------|------------------------|-------------------------|---------------------------|----------------------------|------------------------|------------------------|----------------------------|-------------------------|---------------------------------|----------------------------------|
| High HDI | 0.021 (0.040) | 0.127** (0.060) | -0.019 (0.029) | 0.126 (0.223) | 0.010 (0.043) | 0.022 (0.045) | 0.021 (0.040) | 0.127** (0.060) | 0.021 (0.040) | 0.127** (0.060) |
| Medium HDI | 0.011 (0.053) | 0.108 (0.079) | -0.055 (0.038) | -0.085 (0.301) | 0.002 (0.057) | -0.013 (0.060) | 0.011 (0.053) | 0.108 (0.079) | 0.011 (0.053) | 0.108 (0.079) |
| Low HDI | -0.118* (0.065) | -0.111 (0.095) | -0.033 (0.047) | -0.278 (0.382) | -0.156** (0.070) | -0.247*** (0.074) | -0.118* (0.065) | -0.111 (0.095) | -0.118* (0.065) | -0.111 (0.095) |
| Internet | 0.0002 (0.001) | 0.001 (0.001) | -0.001* (0.001) | 0.009** (0.005) | 0.001 (0.001) | 0.001 (0.001) | 0.0002 (0.001) | 0.001 (0.001) | 0.0002 (0.001) | 0.001 (0.001) |
| Cellphones | -0.0001 (0.0003) | 0.0004 (0.0005) | 0.0002 (0.0002) | 0.001 (0.002) | -0.0004 (0.0004) | -0.0004 (0.0004) | -0.0001 (0.0003) | 0.0004 (0.0005) | -0.0001 (0.0003) | 0.0004 (0.0005) |
| Constant | 0.999*** (0.078) | 0.899*** (0.114) | 1.066*** (0.057) | 0.797* (0.455) | 1.000*** (0.084) | 0.937*** (0.089) | 0.999*** (0.078) | 0.899*** (0.114) | 0.999*** (0.078) | 0.899*** (0.114) |
| Observations | 125 | 112 | 118 | 109 | 84 | 85 | 125 | 112 | 125 | 112 |
| R ² | 0.228 | 0.363 | 0.054 | 0.317 | 0.402 | 0.618 | 0.228 | 0.363 | 0.228 | 0.363 |
| Adjusted R ² | 0.195 | 0.332 | 0.011 | 0.284 | 0.364 | 0.594 | 0.195 | 0.332 | 0.195 | 0.332 |
| Residual Std. Error | 0.110 (df = 119) | 0.155 (df = 106) | 0.079 (df = 112) | 0.583 (df = 103) | 0.098 (df = 78) | 0.105 (df = 79) | 0.110 (df = 119) | 0.155 (df = 106) | 0.110 (df = 119) | 0.155 (df = 106) |
| F Statistic | 7.018*** (df = 5; 119) | 12.056*** (df = 5; 106) | 1.267 (df = 5; 112) | 9.574*** (df = 5; 103) | 10.487*** (df = 5; 78) | 25.562*** (df = 5; 79) | 7.018*** (df = 5; 119) | 12.056*** (df = 5; 106) | 7.018*** (df = 5; 119) | 12.056*** (df = 5; 106) |

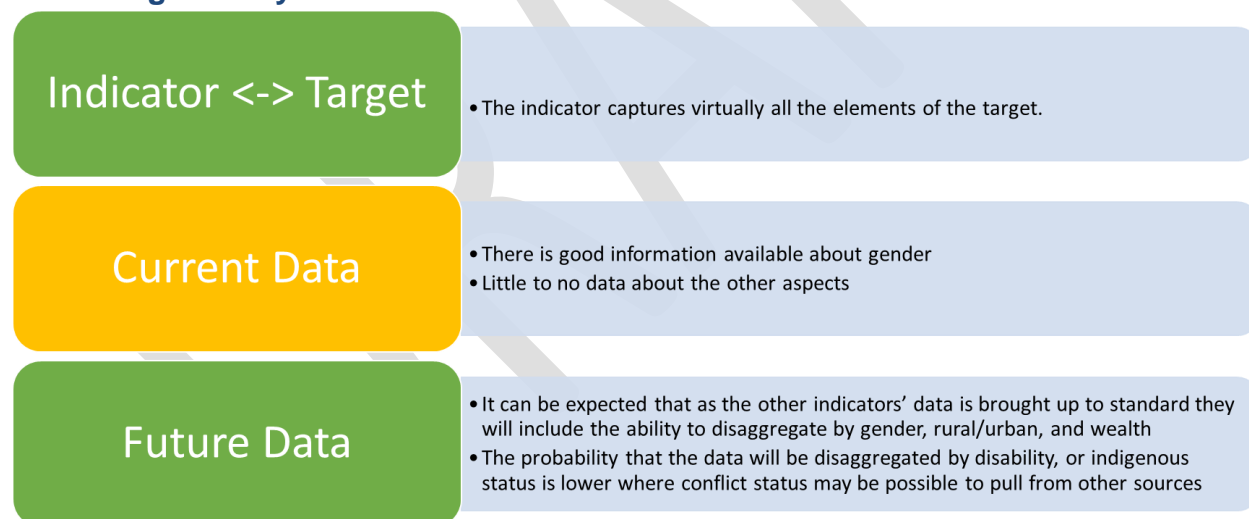
Note:

*p<0.1; **p<0.05; ***p<0.01

Conclusions

- The gender, rural/urban and wealth distributional aspects should be fairly straightforward to capture down the road if data for the other education indicators is properly captured.
- Gender parity is good for all levels in pre-primary but grows worse for low HDI at each level up and is concerning for medium HDI countries only at the tertiary level.
- For literacy parity is low in Low HDI countries and still below 1 on average in medium HDI countries
- Gender parity is quite universal in Europe except for programming, a great opportunity for impact
- Again the relationship between the internet and the indicators from 0-25% internet penetration
- Tertiary GPI is significantly related to internet access. Could represent a third variable, like cultural openness.
- There was little data for the focus countries and we did not calculate the outlier countries

Traffic Light Analysis of Indicator 4.5



Target 4.6

Literacy

1. Select Target

Target 4.6

By 2030, ensure that all youth and a substantial proportion of adults, both men and women, and achieve literacy and numeracy.

2a. Review SDG Indicator and Metadata

Indicator 4.6.1: Percentage of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex

- The percentage of youth (age 15-24 years) and of adults (age 15 years and above) who achieve or exceed a given level of proficiency in (a) literacy and (b) numeracy
- The indicator will be disaggregated by sex and other relevant characteristics enabling a more thorough analysis of the disparities between the sexes

2b. Missing from the Indicator

- The indicator is exactly what the target calls for

3a. What is available now for assessing the current state of the indicator?

- Skills' assessment surveys of the adult population (source UNESCO)
- Proposed existing data sources:
 - Literacy rate, youth total (% of people ages 15-24)

Youth literacy rate is the percentage of people ages 15-24 who can both read and write with understanding a short simple statement about their everyday life.

- Literacy rate, adult total (% of people ages 15 and above)

Adult literacy rate is the percentage of people ages 15 and above who can both read and write with understanding a short simple statement about their everyday life.

- OECD Skills Outlook 2013: has the literacy and numeracy scores of the style called for in the indicator for 20 countries

3b. How close does this match to what the indicator metadata describes?

- Judgment: Good only for worst case countries. Most countries have achieved effectively universal literacy at the low bar set by the existing data collection approach.
- Missing elements:
 - Based on the OECD's PIAAC, they want to use a one hour cognitive assessment
 - Includes literacy, numeracy and problem solving in technical environments
- Timeline: 3-5 years

3c. Is there data for aspects of the target not captured by the indicator?

- N/A

3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

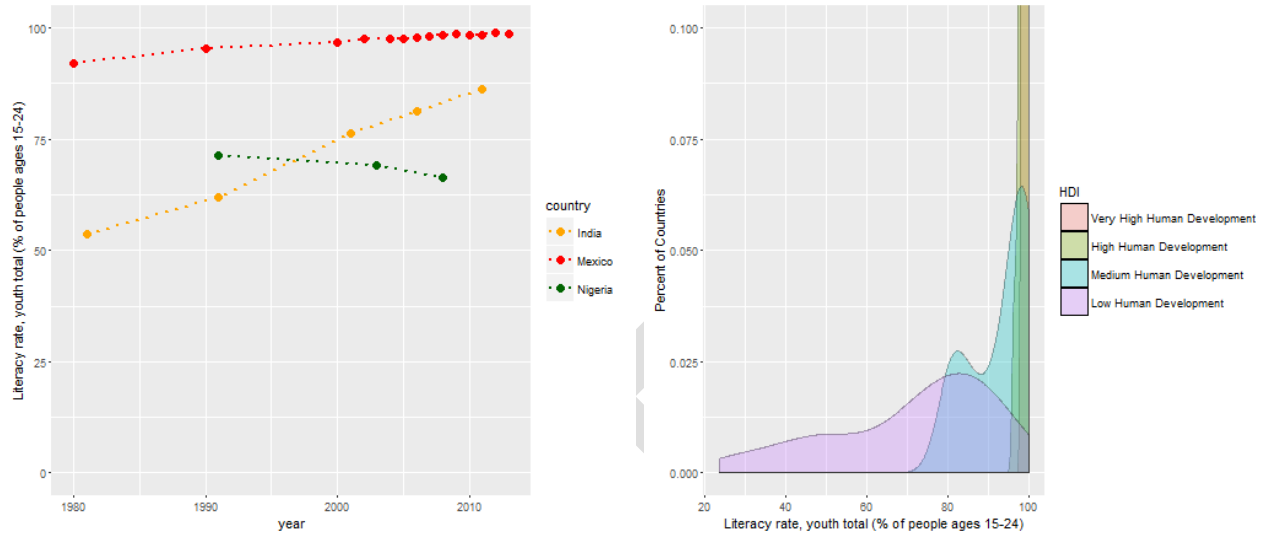
- Yes: 100% youth literacy and numeracy.
- No goal stated for adults

3e. What can we learn from the available data?

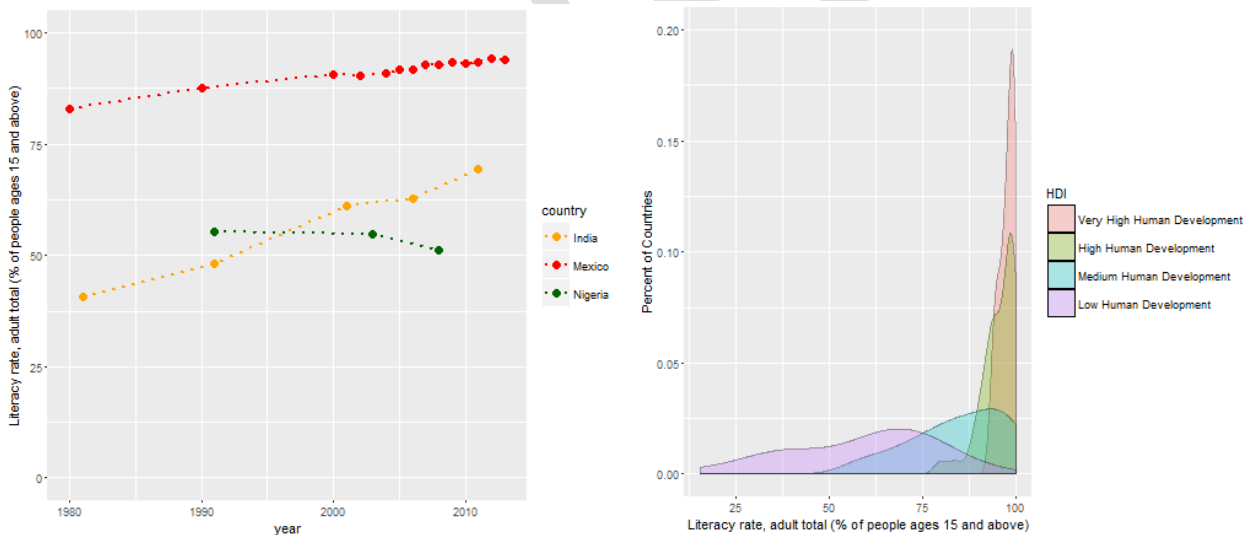
- Literacy rate, youth total (% of people ages 15-24)
- Literacy rate, adult total (% of people ages 15 and above)
- Countries: USA, Mexico, India, Nigeria
- ICT data:

- Internet users
- Cellphone subscriptions
- Qualitative look at OECD data on adult skills

Literacy rate, youth total (% of people ages 15-24)



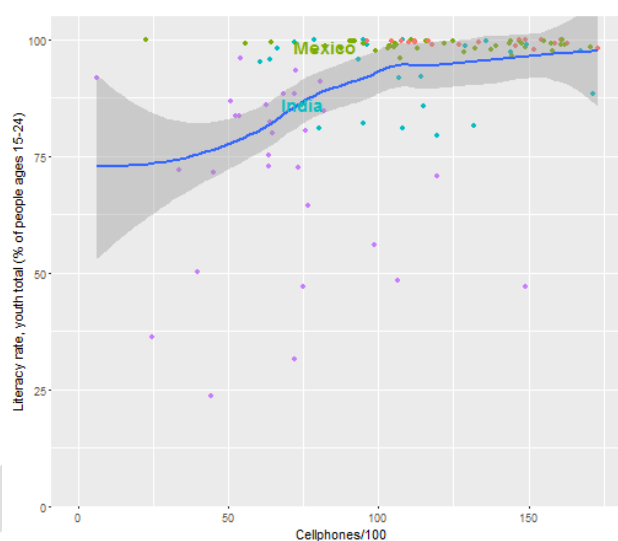
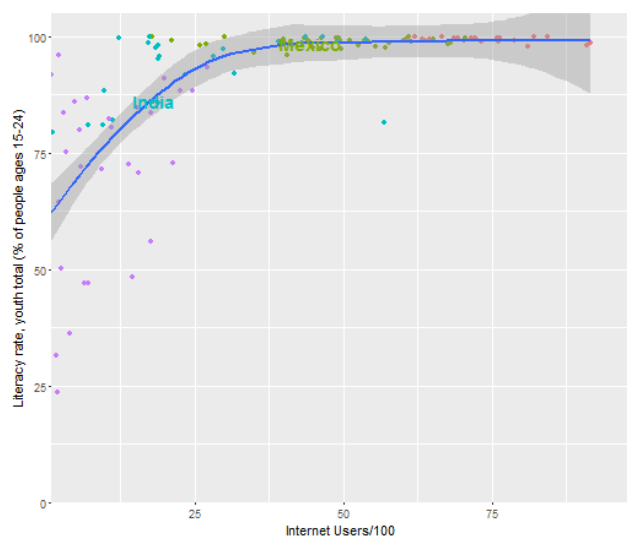
Literacy rate, adult total (% of people ages 15 and above)



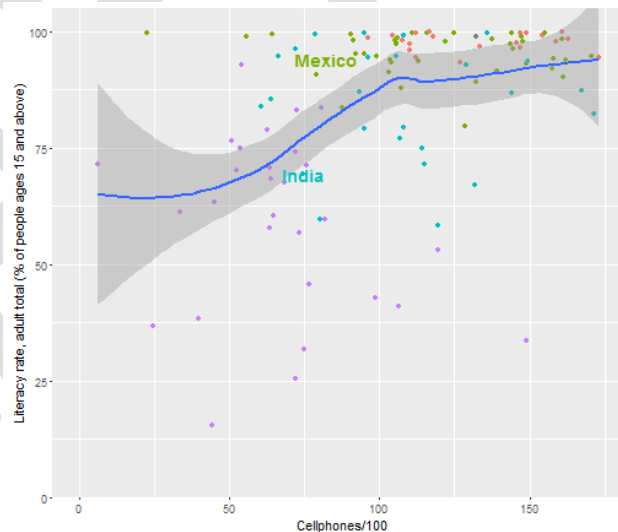
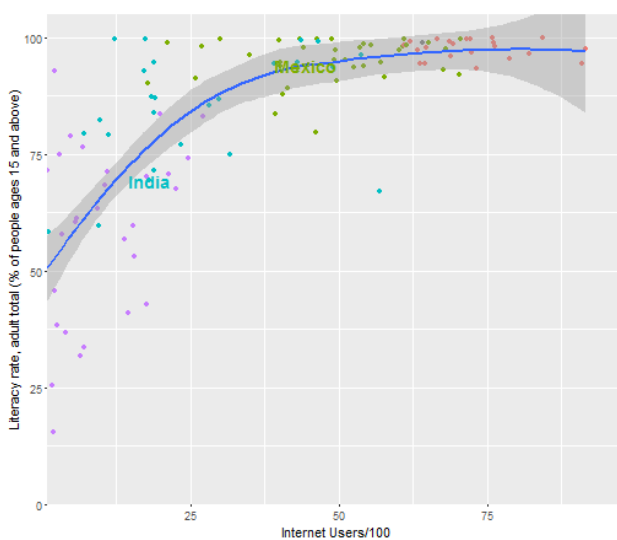
Means by HDI

| HDI Level | Youth Literacy Mean | Adult Literacy Mean |
|-----------------------------|---------------------|---------------------|
| Very High Human Development | 99.37 | 97.56 |
| High Human Development | 98.78 | 95.3 |
| Medium Human Development | 92.93 | 84.58 |
| Low Human Development | 70.9 | 58.86 |

Youth Literacy vs. ICT



Adult Literacy vs. ICT



Regression Results

| | Youth Literacy | Adult Literacy |
|--------------|--------------------|--------------------|
| High HDI | 3.577 (3.400) | 2.851 (3.697) |
| Medium HDI | 1.878 (4.910) | -2.331 (5.319) |
| Low HDI | -18.650*** (6.038) | -26.336*** (6.537) |
| Internet | 0.203** (0.084) | 0.266** (0.091) |
| Cellphones | -0.040 (0.032) | -0.059 (0.035) |
| Constant | 90.163*** (7.158) | 86.419*** (7.749) |
| Observations | 117 | 116 |

| | | |
|-------------------------|-------------------------------------|-------------------------------------|
| R ² | 0.581 | 0.673 |
| Adjusted R ² | 0.562 | 0.659 |
| Residual Std. Error | 10.362 (df = 111) | 11.217 (df = 110) |
| F Statistic | 30.748 ^{***} (df = 5; 111) | 45.360 ^{***} (df = 5; 110) |

Note: *p<0.1; **p<0.05; ***p<0.01

Outlier Countries for Youth Literacy

| High | | | Low | | |
|-----------------------------|--------------------|----------|-----------------------------|--------------------------|----------|
| HDI | Country | YouthLit | HDI | Country | YouthLit |
| Very High Human Development | Estonia | 99.95 | Very High Human Development | Austria | 98.01 |
| Very High Human Development | Poland | 100 | Very High Human Development | Bahrain | 98.16 |
| High Human Development | Armenia | 99.85 | Very High Human Development | Qatar | 98.71 |
| High Human Development | Azerbaijan | 99.96 | High Human Development | Dominican Republic | 97.47 |
| High Human Development | Cuba | 99.87 | High Human Development | Jamaica | 96.1 |
| High Human Development | Georgia | 99.8 | High Human Development | Panama | 97.64 |
| High Human Development | Libya | 99.93 | High Human Development | Thailand | 96.6 |
| High Human Development | Palau | 99.81 | High Human Development | Tunisia | 97.3 |
| High Human Development | Russian Federation | 99.71 | High Human Development | Venezuela, RB | 97.56 |
| High Human Development | Ukraine | 99.77 | Medium Human Development | Bangladesh | 81.08 |
| Low Human Development | Eritrea | 91.78 | Medium Human Development | Congo, Rep. | 80.91 |
| Low Human Development | Myanmar | 96.13 | Medium Human Development | Iraq | 81.95 |
| Low Human Development | Swaziland | 93.5 | Medium Human Development | Morocco | 81.51 |
| | | | Medium Human Development | Timor-Leste | 79.53 |
| | | | Low Human Development | Afghanistan | 46.99 |
| | | | Low Human Development | Central African Republic | 36.36 |
| | | | Low Human Development | Chad | 50.17 |
| | | | Low Human Development | Cote d'Ivoire | 48.31 |
| | | | Low Human Development | Guinea | 31.41 |
| | | | Low Human Development | Mali | 47.14 |
| | | | Low Human Development | Niger | 23.52 |

Outlier Countries for Adult Literacy

| High | | | Low | | |
|-----------------------------|--------------|----------|-----------------------------|--------------------------|-----------|
| HDI | Country | AdultLit | HDI | Country | Adult Lit |
| Very High Human Development | Estonia | 99.86 | Very High Human Development | Bahrain | 94.56 |
| Very High Human Development | Latvia | 99.9 | Very High Human Development | Malta | 93.31 |
| Very High Human Development | Lithuania | 99.82 | Very High Human Development | Portugal | 94.48 |
| Very High Human Development | Poland | 99.76 | Very High Human Development | Saudi Arabia | 94.43 |
| Very High Human Development | Slovenia | 99.71 | High Human Development | Iran, Islamic Rep. | 83.63 |
| Medium Human Development | Moldova | 99.17 | High Human Development | Jamaica | 87.9 |
| Medium Human Development | Tajikistan | 99.75 | High Human Development | Libya | 90.26 |
| Medium Human Development | Turkmenistan | 99.65 | High Human Development | Mauritius | 89.25 |
| Medium Human Development | Uzbekistan | 99.52 | High Human Development | Tunisia | 79.65 |
| Low Human Development | Myanmar | 92.79 | Medium Human Development | Bangladesh | 59.72 |
| Low Human Development | Swaziland | 83.1 | Medium Human Development | Ghana | 71.5 |
| Low Human Development | Tanzania | 78.98 | Medium Human Development | India | 69.3 |
| Low Human Development | Zimbabwe | 83.58 | Medium Human Development | Morocco | 67.08 |
| | | | Medium Human Development | Timor-Leste | 58.31 |
| | | | Low Human Development | Afghanistan | 31.74 |
| | | | Low Human Development | Central African Republic | 36.75 |
| | | | Low Human Development | Chad | 38.23 |
| | | | Low Human Development | Guinea | 25.31 |
| | | | Low Human Development | Mali | 33.56 |
| | | | Low Human Development | Niger | 15.46 |

Conclusions

- This indicator exactly matches the target.
- It is unclear what the difference is between the current assessment of Literacy and the new one this indicator calls for. Numeracy on the other hand does not yet appear to be measured.
- India and Mexico have been making steady improvements, while it appears that Nigeria has been getting worse.
- Almost 1/3 of youth in Low HDI countries are still illiterate
- Internet and literacy have a significant relationship, though perhaps it is increase literacy that drives internet access not vice versa

Traffic Light Analysis of Indicator 4.6

| | |
|----------------------|--|
| Indicator <-> Target | <ul style="list-style-type: none">• The indicator measures exactly what is called for in the target |
| Current Data | <ul style="list-style-type: none">• Literacy data is widely available though the standard is going to be raised• Numeracy data is currently not available |
| Future Data | <ul style="list-style-type: none">• Seems that fairly straightforward enhancements to current data collections will yield what this indicator calls for |

Target 4.7

Knowledge and Skills Needed to Promote Sustainable Development

1. Select Target

Target 4.7

By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

2a. Review SDG Indicator and Metadata

Indicator 4.7.1: Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment

- No metadata

2b. Missing from the Indicator

The indicator does not directly measure how “*all learners acquire the knowledge and skills needed to promote sustainable development*” rather, it does so indirectly, and especially in this area the causal links in education are not well proven.

3a. What is available now for assessing the current state of the indicator?

- There does not appear to be any current sources of data which can be used to assess the indicator nor the target in any kind of rigorous way. Case studies and examples abound but this target will require agreement about what these types of education look like and what is required for it to count as being “mainstreamed” (e.g. one question on student assessments or a whole section?).

3b. How close does this match to what the indicator metadata describes?

N/A

3c. Is there data for aspects of the target not captured by the indicator?

N/A

3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

N/A

3e. What can we learn from the available data?

N/A

Conclusions

- This target is very closely aligned with much work being done here at Arizona State University (ASU)
- Unfortunately, this looks like one of the targets that was included because everyone agreed this element needed to be captured but there was no thought yet as to how it might be measured.
- There are small scale and a case study attempts to measure this, but nothing that we found on a national level, let alone international level, which meets what this indicator is looking for.

Traffic Light Analysis of Indicator 4.7

Indicator <-> Target

- The indicator captures some of the key elements of the target though not all of it
- Indicator focuses more on the inputs/outputs than the impacts/outcomes that the target does

Current Data

- There is none

Future Data

- With no meta data to show the direction there is currently no reason to expect that sufficient data will become available to assess progress on this indicator.

Mapping of Target 4.a

Education Facilities

1. Select Target

Target 4.a

Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all.

2a. Review SDG Indicator and Metadata

Indicator 4.a.1: Proportion of schools with access to: (a) electricity; (b) the Internet for pedagogical purposes; (c) computers for pedagogical purposes; (d) adapted infrastructure and materials for students with disabilities; (e) basic drinking water;(f) single-sex basic sanitation facilities; (g) basic handwashing facilities (as per the WASH indicator definitions)

- Percentage of schools by level of education (primary, lower secondary and upper secondary)
- Internet that is available for enhancing teaching and learning
- Functional drinking water source on or near the premises and water points accessible to all users during school hours
- Schools with access to the given facility and service
- Toilet and handwashing facilities by gender

2b. Missing from the Indicator

- While the indicator addresses important infrastructure concerns it does not directly get at many elements of the target itself including:
 - Gender sensitive (it calls for sex-specific bathrooms which could create problems for transgender individuals)
 - Safe, non-violent and inclusive don't appear to be addressed at all

- The indicator also does not say whether all schools should meet these standards or not.

3a. What is available now for assessing the current state of the indicator?

- World Bank currently collects data on access to electricity, improved water sources, and improved sanitation facilities among households

This is not available for schools, just households

- Data from UNESCO on Proportion of computers connected to the Internet for Primary and Secondary

Limited set of countries with data

- Data from UNESCO on Proportion of all computers available for pedagogical use for Primary and Secondary

Limited set of countries with data

3b. How close does this match to what the indicator metadata describes?

- Judgment: Data is close enough to obtain broad country-wide trends for electricity, water, and sanitation. However, it was not adequate enough to see a trend in the Internet, computers, infrastructure and materials for students with disabilities, and basic handwashing facilities at schools themselves.
- Missing elements:
 - School specific (data is country-wide)
 - Data based on level of education
 - Administrative data from schools and other providers of education or training was not found
 - Data on gender or disabilities
 - Timeline: 2-4 years

3c. Is there data for aspects of the target not captured by the indicator?

None found

3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

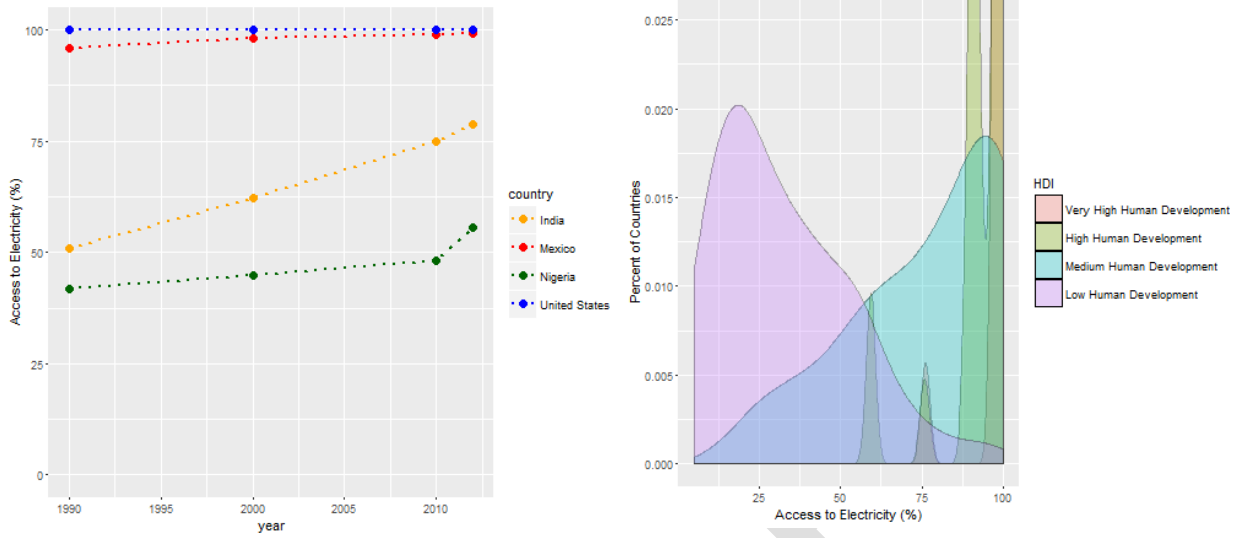
- Goal for indicator 4.a.1 (d) is to develop approach to assess school conditions for people with disabilities by 2020
- Goal for indicator 4.a.1 (g) Apply WASH definitions fully and extend coverage to more countries by 2018
- Although not specified, the goal for this indicator is most likely that all schools should have this infrastructure

3e. What can we learn from the available data?

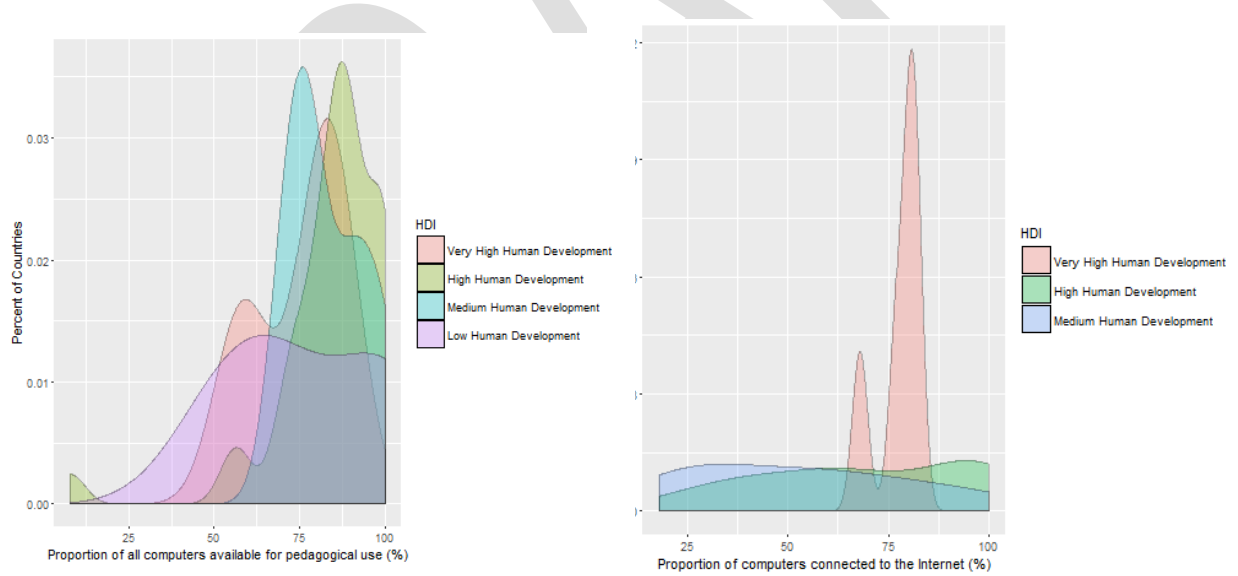
- Households with access to electricity (%)
- Proportion of computers connected to the internet (%)
- Proportion of computers available for pedagogical use (%)
- Improved water source, (% of population with access)
- Improved sanitation facilities, (% of population with access)
- Countries: USA, Mexico, India, Nigeria

- ICT data:
 - Internet users
 - Cellphone subscriptions

4.a.1(a) Access to Electricity (%)

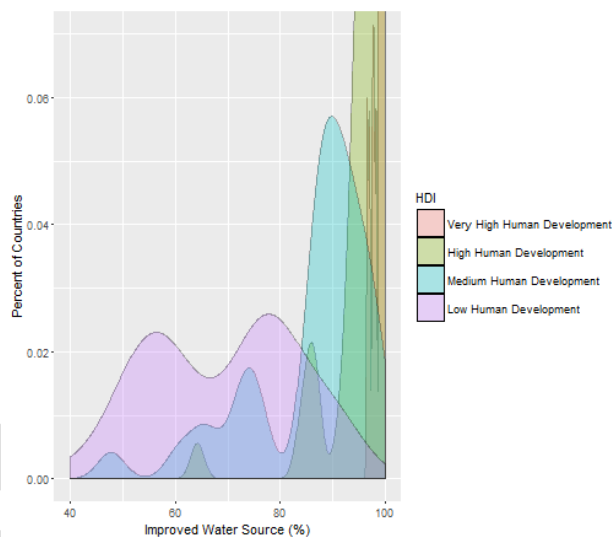
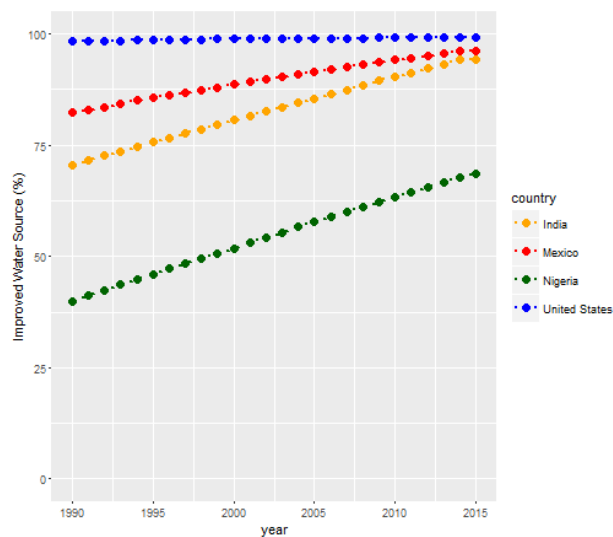


4.a.1 (b) Proportion of computers connected to the Internet (%)

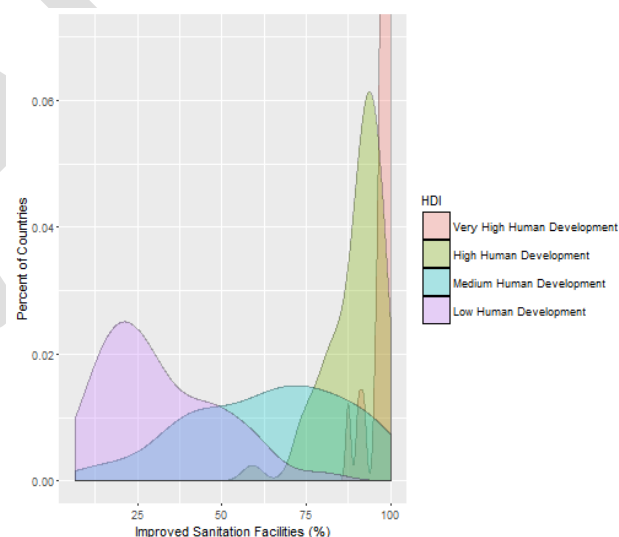
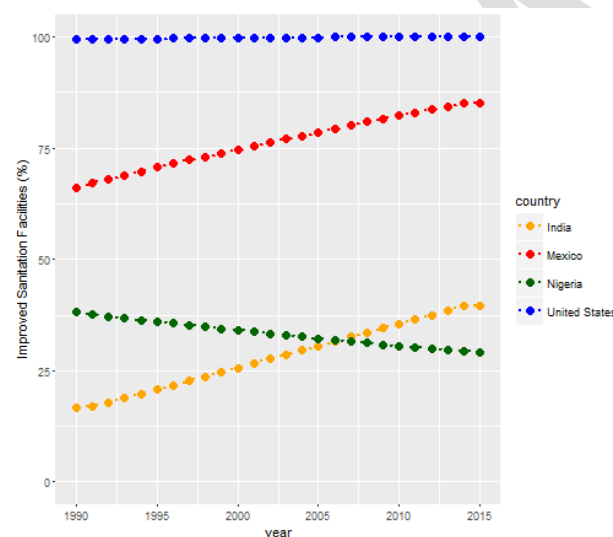


4.a.1 (c) Proportion of all Computers Available for Pedagogical Use (%)

4.a.1 (e) Improved water source, (% of population with access)



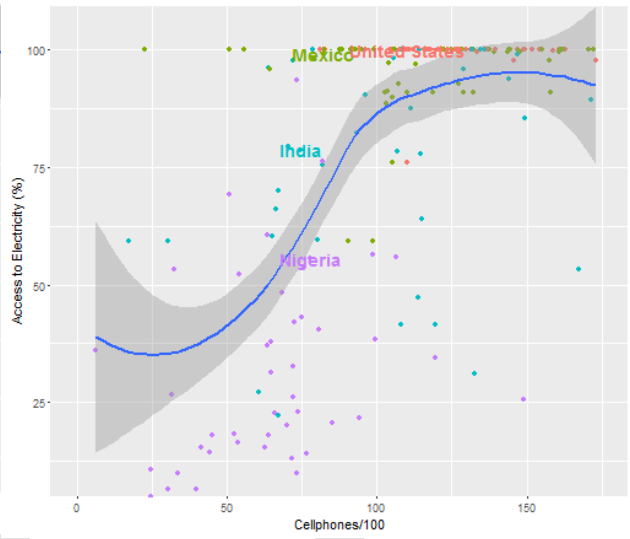
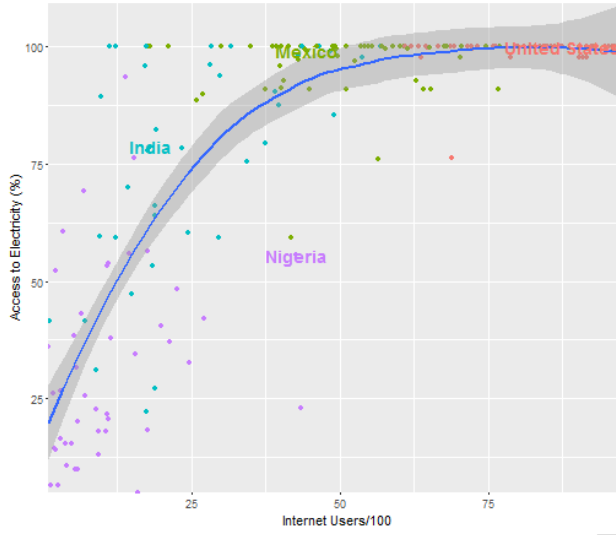
4.a.1 (f) Improved sanitation facilities, (% of population with access)



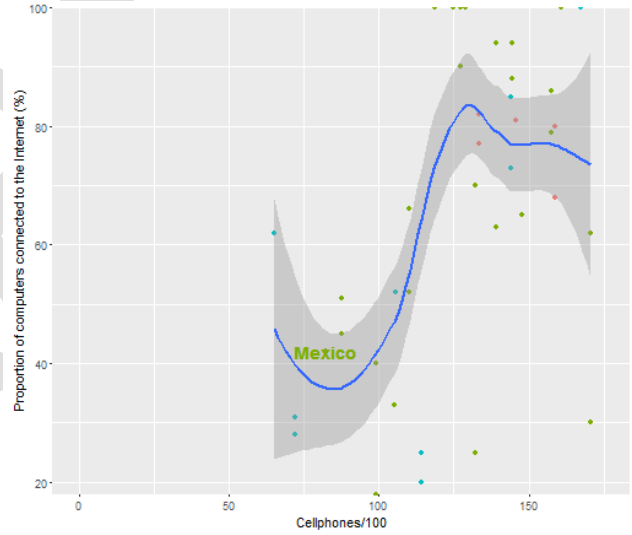
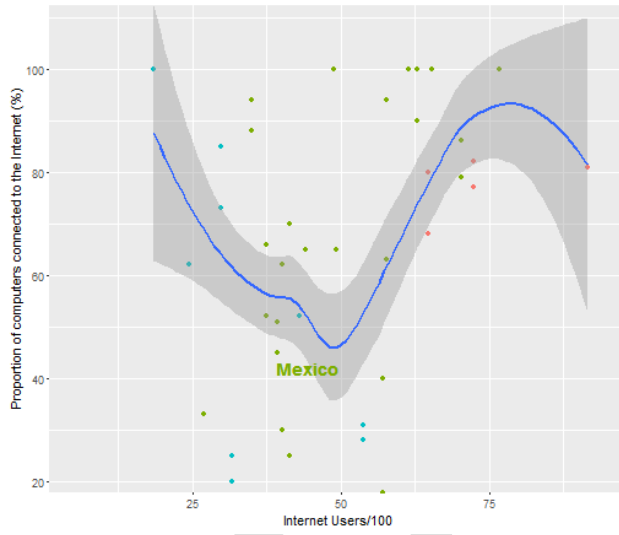
Means by HDI

| HDI Level | Electricity Mean | Internet Mean | Computer Mean | Water Mean | Sanitation Mean |
|-----------------------------|------------------|---------------|---------------|------------|-----------------|
| Very High Human Development | 99.27 | 77.6 | 75 | 99.58 | 98.33 |
| High Human Development | 96.03 | 68.83 | 84.16 | 95.46 | 89.42 |
| Medium Human Development | 76.54 | 52.8 | 82.93 | 85.9 | 64.12 |
| Low Human Development | 32.43 | | 76.8 | 69.23 | 31.47 |

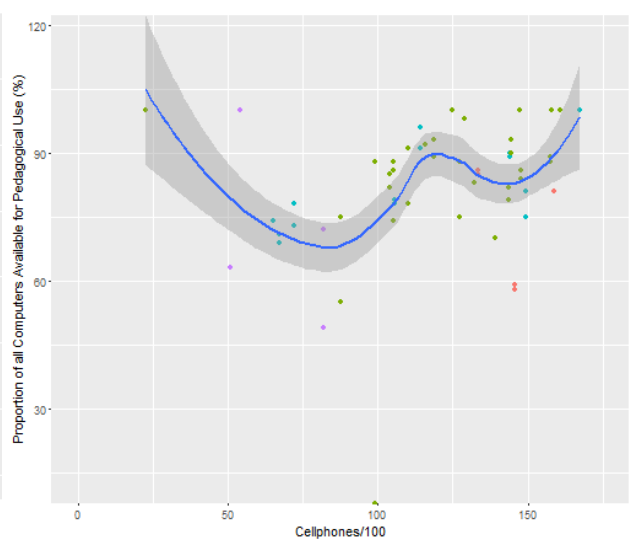
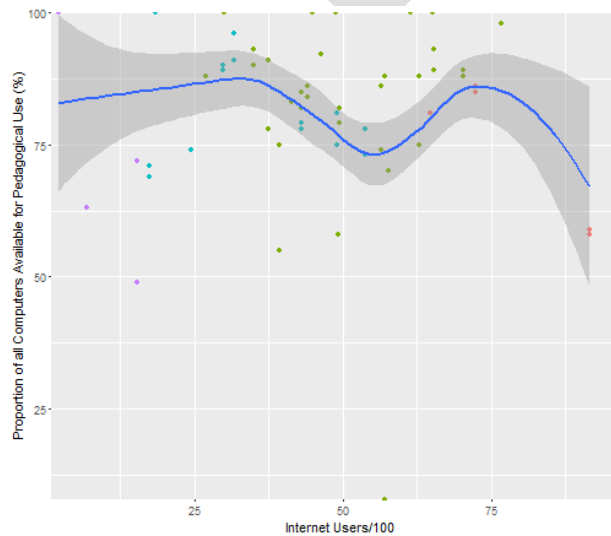
Access to Electricity vs. ICT (%)



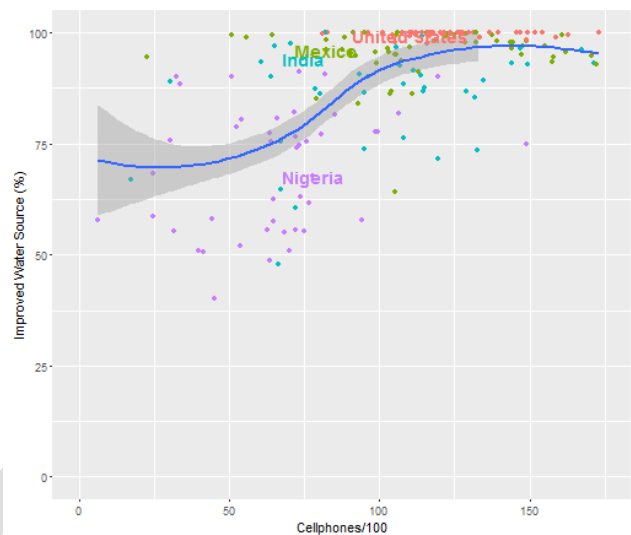
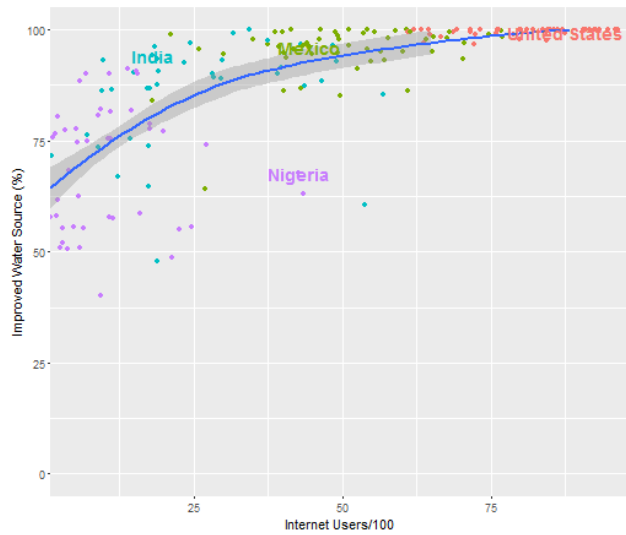
Internet in Schools vs. ICT



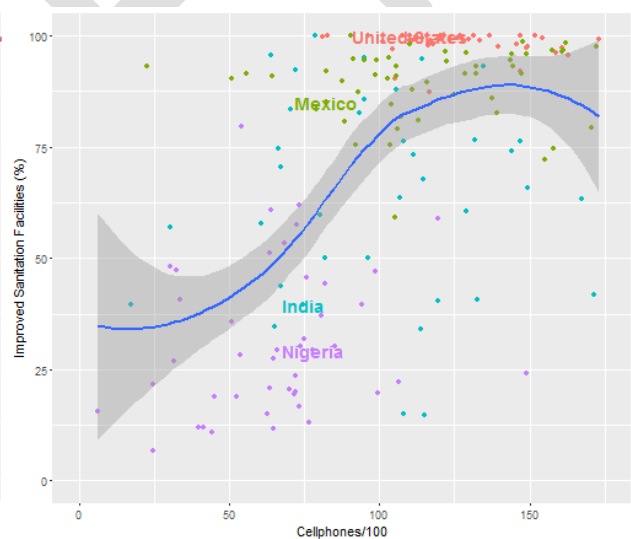
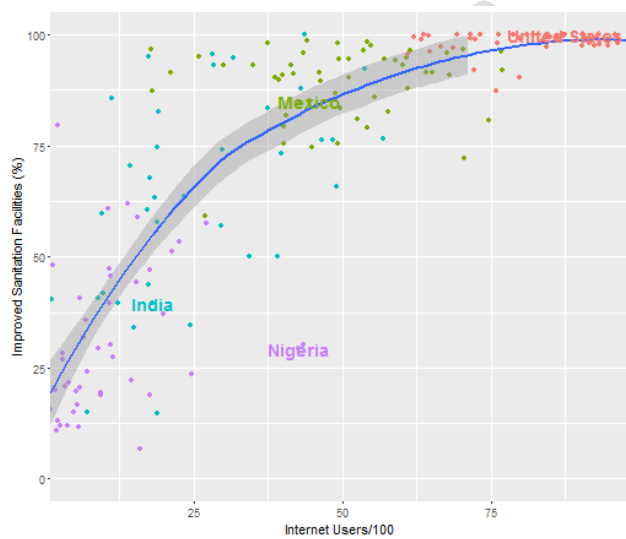
Computers in Schools vs. ICT



Improved Water Source vs. ICT (%)



Improved Sanitation Facilities vs. ICT



Regression Analysis

| | Electricity | Internet | Computers | Water | Sanitation |
|--------------|--------------------------------|-------------------------------|--------------------------------|--------------------------------|--------------------------------|
| High HDI | 6.756 ^{**} (3.118) | 13.641 (8.336) | 3.547 (6.032) | -1.377 (2.019) | 1.994 (3.133) |
| Medium HDI | -2.117 (4.487) | 11.986 (11.069) | 3.078 (7.634) | -8.936 ^{***} (2.875) | -12.557 ^{***} (4.355) |
| Low HDI | -40.327 ^{***} (5.758) | | -2.433 (12.271) | -21.473 ^{***} (3.686) | -42.615 ^{***} (5.589) |
| Internet | 0.301 ^{***} (0.070) | 0.575 ^{***} (0.182) | -0.159 (0.127) | 0.045 (0.046) | 0.324 ^{***} (0.069) |
| Cellphones | 0.066 ^{**} (0.029) | 0.490 ^{***} (0.091) | 0.115 ^{**} (0.056) | 0.075 ^{***} (0.019) | 0.009 (0.029) |
| Constant | 66.480 ^{***} (6.771) | -35.884 [*] (20.815) | 73.152 ^{***} (12.478) | 85.981 ^{***} (4.327) | 71.235 ^{***} (6.572) |
| Observations | 250 | 81 | 98 | 241 | 235 |

| | | | | | |
|-------------------------|--------------------------|------------------------|--------------------|-------------------------|--------------------------|
| R ² | 0.756 | 0.393 | 0.066 | 0.609 | 0.769 |
| Adjusted R ² | 0.751 | 0.361 | 0.015 | 0.601 | 0.764 |
| Residual Std. Error | 14.039 (df = 244) | 20.632 (df = 76) | 15.600 (df = 92) | 8.821 (df = 235) | 13.340 (df = 229) |
| F Statistic | 150.927*** (df = 5; 244) | 12.309*** (df = 4; 76) | 1.304 (df = 5; 92) | 73.313*** (df = 5; 235) | 152.384*** (df = 5; 229) |

Note: * p<0.1; ** p<0.05; *** p<0.01

High Electricity

| HDI | Country | Electricity |
|--------------------------|------------------|-------------|
| Medium Human Development | Egypt, Arab Rep. | 100 |
| Medium Human Development | Iraq | 100 |
| Medium Human Development | Kyrgyz Republic | 100 |
| Medium Human Development | Moldova | 100 |
| Medium Human Development | Morocco | 100 |
| Medium Human Development | Tajikistan | 100 |
| Medium Human Development | Turkmenistan | 100 |
| Medium Human Development | Uzbekistan | 100 |
| Low Human Development | Cameroon | 53.7 |
| Low Human Development | Comoros | 69.3 |
| Low Human Development | Cote d'Ivoire | 55.8 |
| Low Human Development | Djibouti | 53.26 |
| Low Human Development | Guinea-Bissau | 60.61 |
| Low Human Development | Nepal | 76.3 |
| Low Human Development | Nigeria | 55.6 |
| Low Human Development | Pakistan | 93.6 |
| Low Human Development | Senegal | 56.5 |

Low Electricity

| HDI | Country | Electricity |
|-----------------------------|--------------------------------|-------------|
| Very High Human Development | Brunei Darussalam | 76.16 |
| High Human Development | Fiji | 59.33 |
| High Human Development | Palau | 59.33 |
| High Human Development | St. Vincent and the Grenadines | 75.91 |
| Medium Human Development | Cambodia | 31.1 |
| Medium Human Development | Congo, Rep. | 41.6 |
| Medium Human Development | Namibia | 47.26 |
| Medium Human Development | Timor-Leste | 41.56 |
| Medium Human Development | Vanuatu | 27.08 |
| Medium Human Development | Zambia | 22.06 |
| Low Human Development | Burundi | 6.5 |
| Low Human Development | Central African Republic | 10.8 |
| Low Human Development | Chad | 6.4 |
| Low Human Development | Liberia | 9.8 |
| Low Human Development | Malawi | 9.8 |
| Low Human Development | South Sudan | 5.06 |

High Improved Water

| HDI | Country | Water |
|--------------------------|------------------|-------|
| Medium Human Development | Bhutan | 100 |
| Medium Human Development | Egypt, Arab Rep. | 99.2 |
| Low Human Development | Comoros | 90.1 |
| Low Human Development | Djibouti | 90 |
| Low Human Development | Gambia, The | 90.2 |
| Low Human Development | Malawi | 88.4 |
| Low Human Development | Nepal | 90.7 |
| Low Human Development | Pakistan | 91.3 |

Low Improved Water

| HDI | Country | Water |
|-----------------------------|--------------------|-------|
| Very High Human Development | Ireland | 97.9 |
| Very High Human Development | Korea, Rep. | 97.6 |
| Very High Human Development | Lithuania | 96.6 |
| Very High Human Development | Poland | 98.3 |
| Very High Human Development | Saudi Arabia | 97 |
| High Human Development | Algeria | 84 |
| High Human Development | Azerbaijan | 86.2 |
| High Human Development | Dominican Republic | 85 |
| High Human Development | Ecuador | 86.9 |
| High Human Development | Mongolia | 64.2 |
| High Human Development | Peru | 86.3 |
| Medium Human Development | Cambodia | 73.4 |
| Medium Human Development | Equatorial Guinea | 47.8 |
| Medium Human Development | Kiribati | 66.8 |
| Medium Human Development | Tajikistan | 73.7 |
| Medium Human Development | Timor-Leste | 71.7 |
| Medium Human Development | West Bank and Gaza | 60.6 |
| Medium Human Development | Zambia | 64.6 |
| Low Human Development | Afghanistan | 55.2 |
| Low Human Development | Angola | 48.6 |
| Low Human Development | Chad | 50.8 |
| Low Human Development | Congo, Dem. Rep. | 52.1 |
| Low Human Development | Madagascar | 50.6 |
| Low Human Development | Mozambique | 50.9 |
| Low Human Development | Papua New Guinea | 40 |
| Low Human Development | Yemen, Rep. | 54.9 |

High Sanitation

| HDI | Country | Sanitation |
|--------------------------|----------------------|------------|
| High Human Development | Grenada | 98 |
| High Human Development | Jordan | 98.6 |
| High Human Development | Maldives | 98 |
| High Human Development | Palau | 100 |
| High Human Development | Seychelles | 98.4 |
| Medium Human Development | Egypt, Arab Rep. | 94.7 |
| Medium Human Development | Kyrgyz Republic | 93.2 |
| Medium Human Development | Paraguay | 87.8 |
| Medium Human Development | Syrian Arab Republic | 95.7 |
| Medium Human Development | Tajikistan | 95 |
| Medium Human Development | Uzbekistan | 100 |
| Medium Human Development | West Bank and Gaza | 92.3 |
| Low Human Development | Angola | 51.1 |
| Low Human Development | Gambia, The | 58.8 |
| Low Human Development | Myanmar | 79.5 |
| Low Human Development | Pakistan | 61.8 |
| Low Human Development | Rwanda | 60.8 |
| Low Human Development | Swaziland | 57.5 |
| Low Human Development | Yemen, Rep. | 53.3 |

Low Sanitation

| HDI | Country | Sanitation |
|-----------------------------|-----------------------|------------|
| Very High Human Development | Ireland | 90.5 |
| Very High Human Development | Latvia | 87.4 |
| Very High Human Development | Lithuania | 92 |
| Very High Human Development | Montenegro | 95.6 |
| High Human Development | China | 75.4 |
| High Human Development | Colombia | 81.1 |
| High Human Development | Lebanon | 80.7 |
| High Human Development | Mongolia | 59.1 |
| High Human Development | Panama | 74.5 |
| High Human Development | Peru | 75.4 |
| High Human Development | Romania | 79 |
| High Human Development | Russian Federation | 72.2 |
| High Human Development | Suriname | 79.2 |
| Medium Human Development | Cambodia | 40.8 |
| Medium Human Development | Congo, Rep. | 14.9 |
| Medium Human Development | Ghana | 14.8 |
| Medium Human Development | India | 39.5 |
| Medium Human Development | Kiribati | 39.7 |
| Medium Human Development | Namibia | 34 |
| Medium Human Development | Sao Tome and Principe | 34.6 |
| Medium Human Development | Timor-Leste | 40.4 |
| Low Human Development | Chad | 12 |
| Low Human Development | Madagascar | 11.9 |
| Low Human Development | Niger | 10.8 |
| Low Human Development | Sierra Leone | 13.1 |
| Low Human Development | South Sudan | 6.7 |
| Low Human Development | Togo | 11.6 |

Conclusions

- There does not appear to be (virtually) any data on school infrastructure currently available, the best we can do is proxies
- Some very limited information about Internet and computers, but it does not effectively get at the indicator
- It's predictable, but comforting, that country-wide Internet access is significant in predicting % of computers in schools with Internet and electricity use (it would be strange otherwise).

Traffic Light Analysis of Indicator 4.a

Indicator <-> Target

- The indicator gets at some very important elements of infrastructure which are sorely lacking in all too many schools
- But it does not actually address many of the elements of the indicator

Current Data

- There is essentially no data for this indicator and the proxies we use here are extremely crude

Future Data

- Given that there are only a limited number of schools in each country it should be feasible to survey them and capture this data about infrastructure without too much trouble as I think the average school principal could answer these questions in a few minutes.
- But given that they are starting from scratch on this indicator, the task is more significant

Target 4.b

Expand Scholarship Availability

1. Select Target

Target 4.b

By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrollment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries.

2a. Review SDG Indicator and Metadata

Indicator 4.b.1: Volume of official development assistance flows for scholarships by sector and type of study

- Total net official development assistance (ODA) for scholarships and student costs in donor countries
- Financial aid awards for students and contributions to trainees (E01)
- Indirect costs of tuition in donor countries (E02)
- Scholarships by sector and type of study
- US dollars at average annual exchange rate
- Disaggregated by provider and recipient country
- Data for high-income countries is readily available and improving for middle-income

2b. Missing from the Indicator

The indicator does not address:

- *Depth of scholarship beneficiaries.*
- *Target focus for specific locations and programmes*

- Any scholarships which come from outside of the ODA (universities, companies, NGOs or even individuals)

3a. What is available now for assessing the current state of the indicator?

- Proposed Indicator:
 - OECD reports on flows from most donor countries: “I.A.5 Scholarships and student costs in donor countries”

3b. How close does this match to what the indicator metadata describes?

- Judgment: The ODA flows for scholarships extremely limits the original Target 4.b. By not tracking scholarships provided by universities, colleges, foundations, NGOs, and other sources, the understanding of what is the actual number of scholarships available to developing countries is skewed.
- Missing elements:
 - Detailed, internationally comparable data on scholarships for developing country nationals provided by universities, colleges, foundations, NGOs, and other sources
 - Breakdown by sex of beneficiaries is not available
 - Low-income countries lack data
 - Definition of “substantially” in Target 4.b
 - Timeline: 2020 goal

3c. Is there data for aspects of the target not captured by the indicator?

Not found

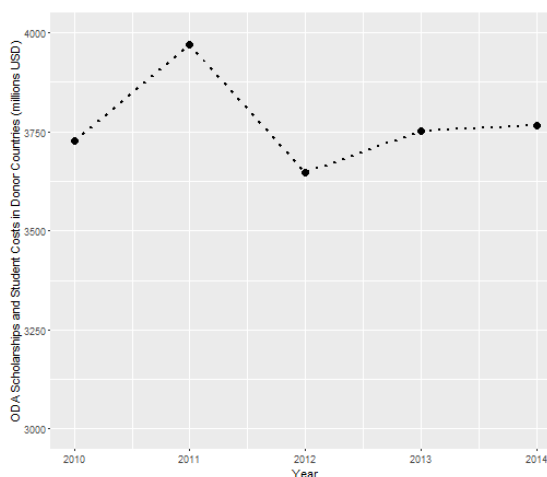
3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

- No, does not define what “substantially expand” means

3e. What can we learn from the available data?

- OECD Data “I.A.5 Scholarships and student costs in donor countries”
 - All Donors
 - Amount by country

I.A.5 Scholarships and student costs in donor countries (All Donors)



“I.A.5 Scholarships and student costs in donor countries” (by country)

| Donor | Year | Millions of USD | | | |
|----------------|------|-----------------|----------------------|------|-------|
| | | | Portugal | 2014 | 26.68 |
| | | | Greece | 2014 | 13.17 |
| | | | Spain | 2014 | 10.21 |
| | | | Denmark | 2014 | 8.01 |
| | | | Hungary | 2014 | 7.37 |
| | | | Switzerland | 2014 | 7.01 |
| | | | Slovenia | 2014 | 5.3 |
| | | | Czech Republic | 2014 | 5.15 |
| | | | Italy | 2014 | 5.05 |
| | | | Norway | 2014 | 4.73 |
| | | | Ireland | 2014 | 3.54 |
| | | | Slovak Republic | 2014 | 2.21 |
| | | | United Arab Emirates | 2012 | 1 |
| | | | Luxembourg | 2014 | 0.67 |
| | | | Estonia | 2014 | 0.6 |
| | | | Lithuania | 2014 | 0.3 |
| | | | Malta | 2014 | 0.26 |
| | | | Finland | 2013 | 0.11 |
| Germany | 2014 | 1057.58 | | | |
| France | 2014 | 1051.24 | | | |
| Australia | 2014 | 308.95 | | | |
| Turkey | 2014 | 226.33 | | | |
| Japan | 2014 | 201.37 | | | |
| Canada | 2014 | 182.1 | | | |
| Austria | 2014 | 115.65 | | | |
| Belgium | 2014 | 96.38 | | | |
| Romania | 2014 | 78.54 | | | |
| Korea | 2014 | 66.69 | | | |
| Sweden | 2014 | 53.71 | | | |
| Netherlands | 2014 | 46.31 | | | |
| New Zealand | 2014 | 42.37 | | | |
| United Kingdom | 2014 | 30.25 | | | |
| Poland | 2014 | 29.16 | | | |

Conclusions

- The indicator substantially narrows the scope of this target, but limiting the measurement of it to official development flows. This unfortunately makes it impossible for a private entity to improve the indicator, even if directly addressing the target.
- OECD countries report data about this indicator, though not quite all of what the indicator metadata calls for

Traffic Light Analysis of Indicator 4.b

Indicator <-> Target

- The indicator measures one potential source of funds to support the target but misses measuring more creative (and bigger potential) options

Current Data

- There is data on aid going to scholarships by source country
- Not yet disaggregated in the ways called for by the indicator

Future Data

- Since aid is reported and tracked by government agencies it should be fairly straightforward for the mostly wealth countries to meet this new reporting standard in the near future.

Mapping of Target 4.c

Increase Supply of Qualified Teachers

1. Select Target

Target 4.c

By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States.

2. Review SDG Indicator and Metadata

Indicator 4.c.1: Percentage of teachers in: (a) pre-primary; (b) primary; (c) lower secondary; and (d) upper secondary education who have received at least the minimum organized teacher training (i.e. pedagogical training) pre-service or in-service required for teaching at the relevant level in a given country

- Calculated separately for public and private institutions
- Measures the share of the teaching workforce which is pedagogically well-trained
- Disaggregated by sex

2b. Missing from the Indicator

Indicator does not define:

- *Substantially increase*

Or address:

- *Target focus for specific locations*

Which are both called for in the target.

3a. What is available now for assessing the current state of the indicator?

- Proposed Indicator:
 - World Bank currently collects data on trained teachers in preprimary, primary, lower and upper secondary (% of total teachers)

Trained teachers in primary education are the percentage of primary school teachers who have received the minimum organized teacher training (pre-service or in-service) required for teaching in a given country.

3b. How close does this match to what the indicator metadata describes?

- Judgment: Is close enough to give a fair judgment of the current state and broad trends
- Missing elements:
 - This indicator does not take into account differences in teachers' experiences and status, teaching methods, teaching materials, and classroom conditions - all factors that affect the quality of teaching and learning. Some teachers without formal training may have acquired equivalent pedagogical skills through professional experience. In addition, national standards regarding teacher qualifications and pedagogical skills may vary.
 - Timeline: 2030 goal

3c. Is there data for aspects of the target not captured by the indicator?

- None found

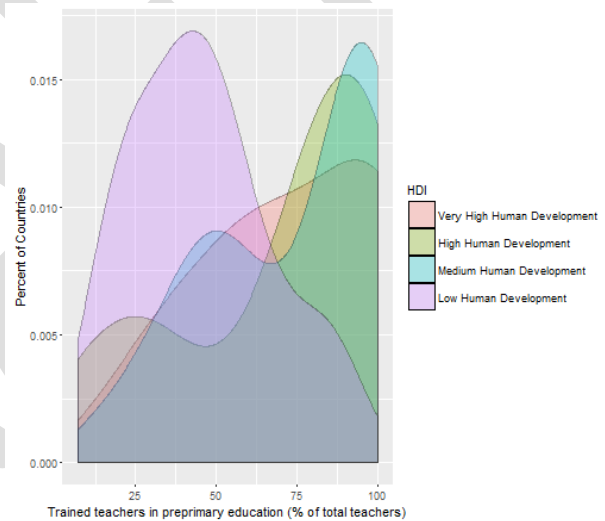
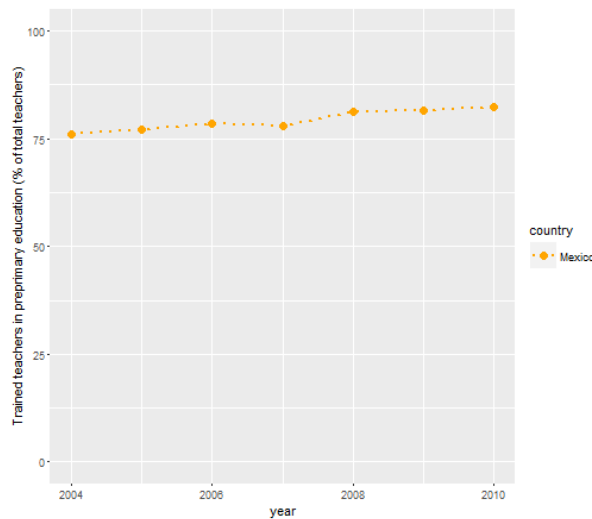
3d. Is there a goal(s) for 2030 for target and/or indicator(s)?

- Substantially is not defined, so no.

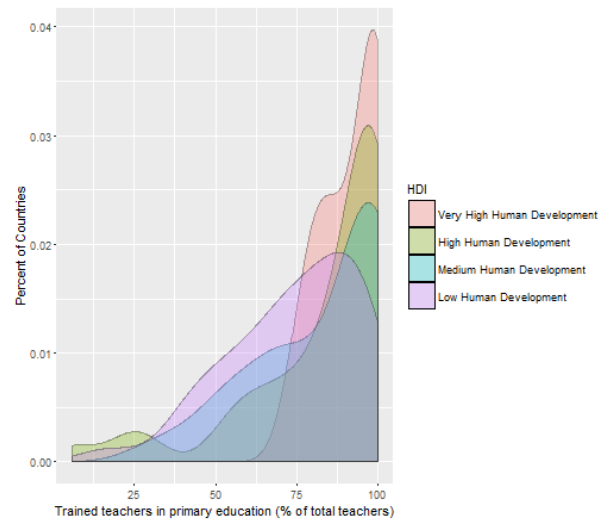
3e. What can we learn from the available data?

- Trained Teachers in:
 - Preprimary
 - Primary
 - Lower Secondary
 - Upper Secondary
 - Countries: USA, Mexico, India, Nigeria
- ICT data:
 - Internet users
 - Cellphone subscriptions

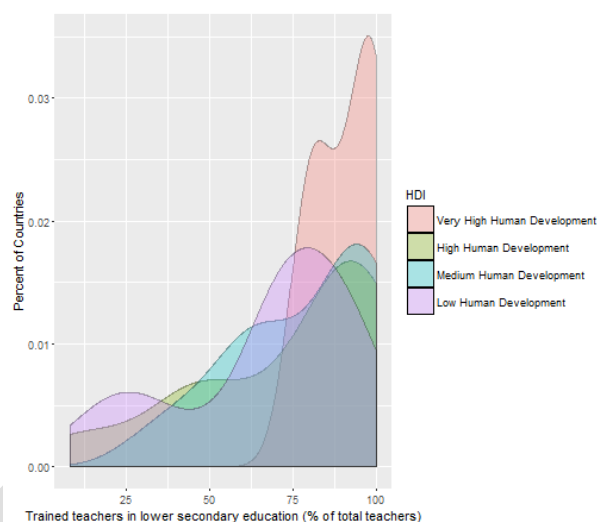
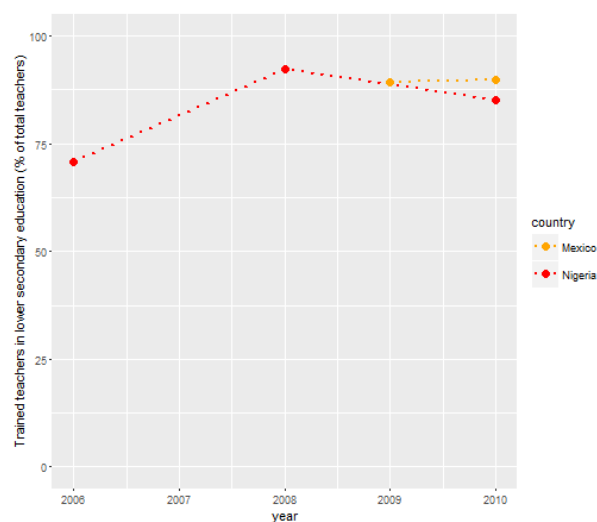
Trained teachers in preprimary education (% of total teachers)



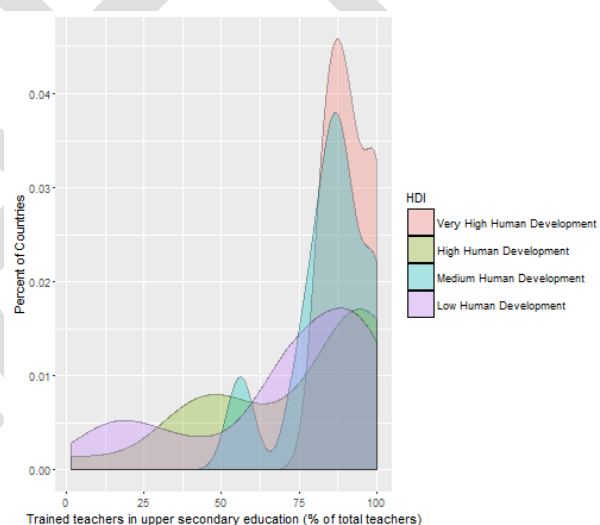
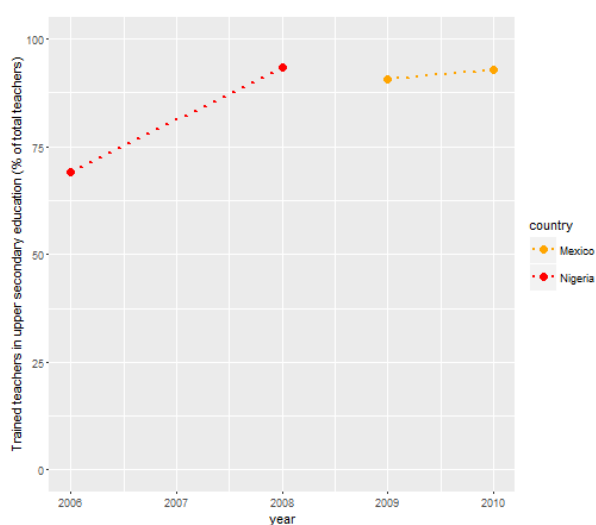
Trained teachers in primary education (% of total teachers)



Trained teachers in lower secondary education (% of total teachers)



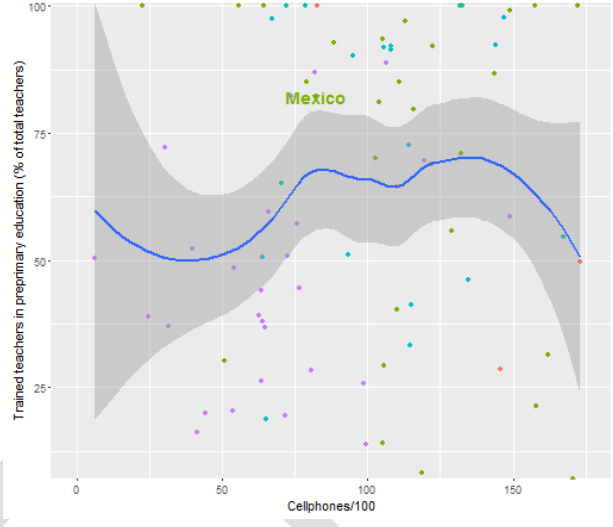
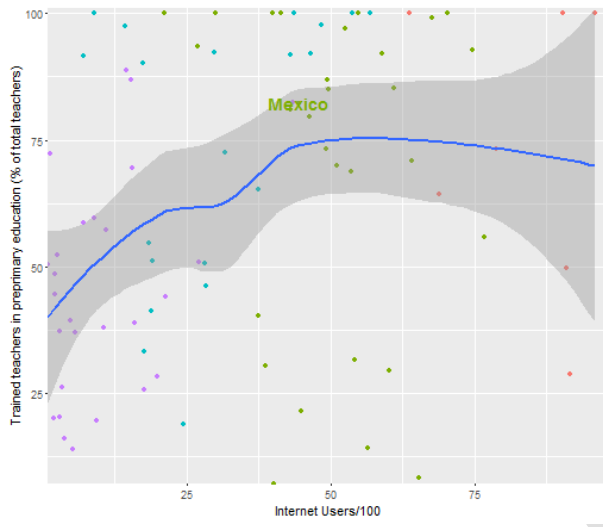
Trained teachers in upper secondary education (% of total teachers)



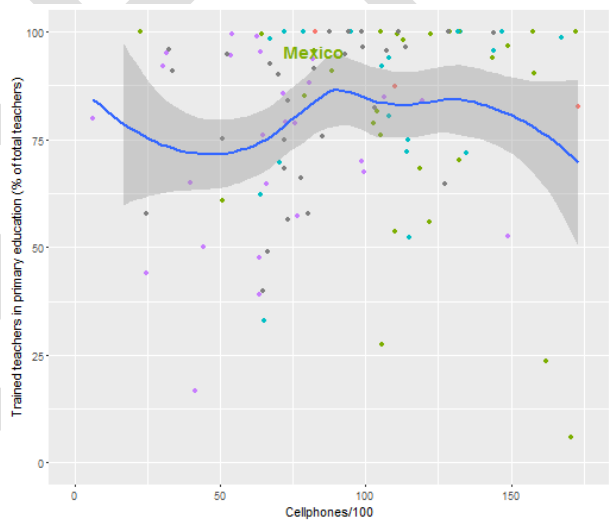
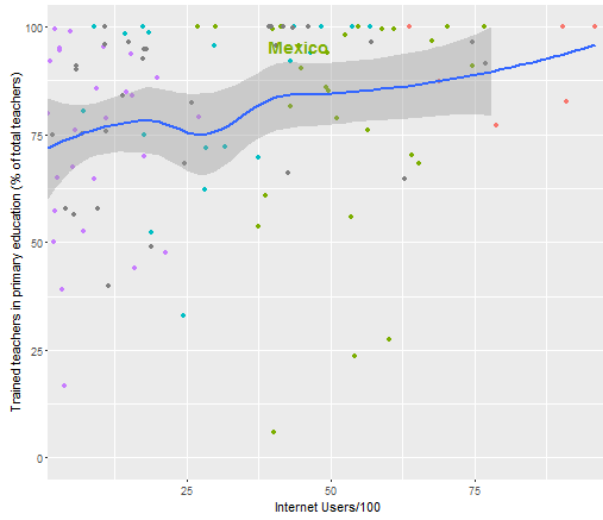
Means by HDI

| HDI Level | Preprimary Mean | Primary Mean | Lower Secondary Mean | Upper Secondary |
|-----------------------------|-----------------|--------------|----------------------|-----------------|
| Very High Human Development | 73.71 | 91.97 | 91.17 | 91.37 |
| High Human Development | 69.86 | 83.24 | 73.48 | 75.03 |
| Medium Human Development | 74.34 | 82.94 | 78.49 | 84.97 |
| Low Human Development | 45.39 | 74.24 | 67.08 | 70.46 |

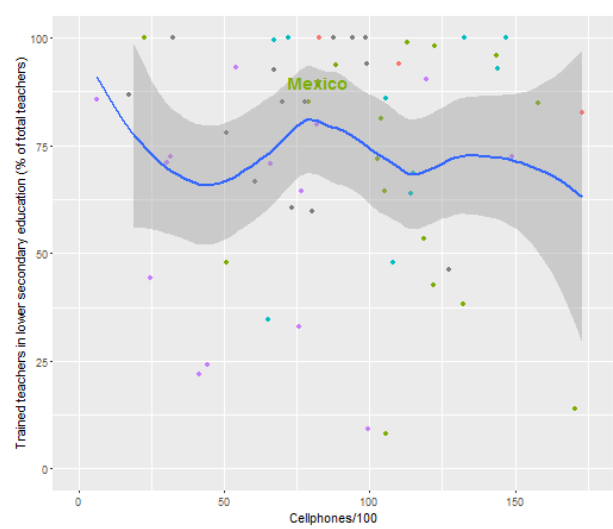
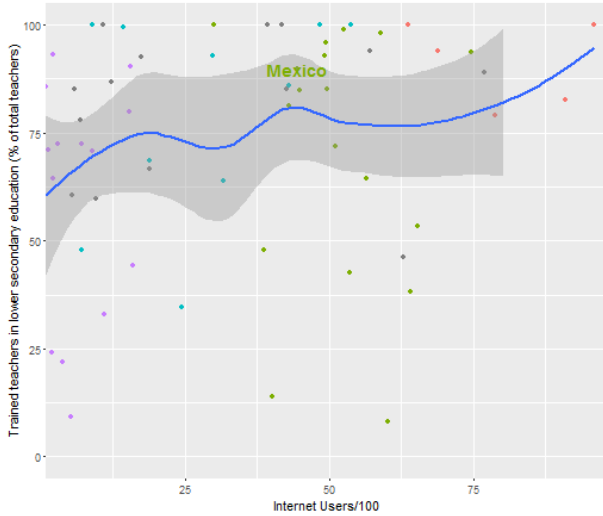
Pre-primary vs. ICT



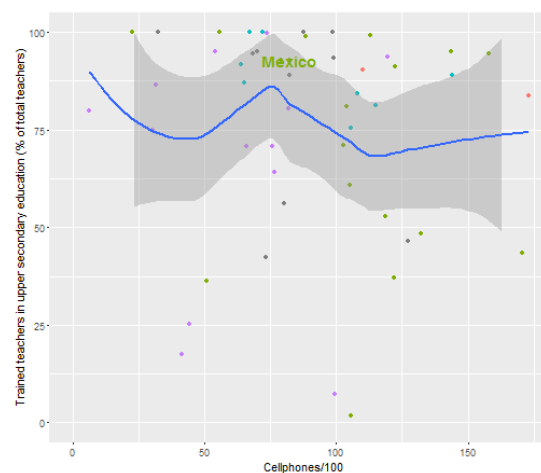
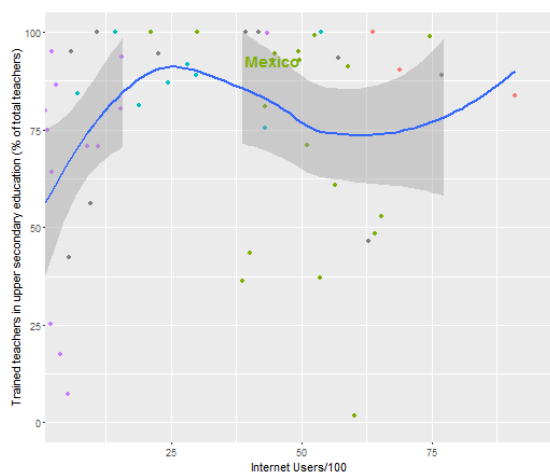
Primary vs. ICT



Lower Secondary vs. ICT



Upper Secondary vs. ICT



Regression Analysis

| | Preprimary Mean | Primary Mean | Lower Secondary Mean | Upper Secondary |
|-------------------------|-----------------------|--------------------|----------------------|---------------------|
| High HDI | 3.778 (13.900) | -5.448 (12.061) | -18.962 (17.442) | -23.099 (19.065) |
| Medium HDI | 13.928 (17.548) | 3.444 (15.380) | -6.870 (24.139) | -5.930 (24.210) |
| Low HDI | -10.995 (21.271) | -3.555 (19.118) | -25.453 (30.784) | -29.922 (28.323) |
| Internet | 0.285 (0.245) | 0.238 (0.220) | 0.128 (0.366) | 0.091 (0.349) |
| Cellphones | -0.038 (0.089) | -0.029 (0.074) | -0.035 (0.104) | -0.120 (0.133) |
| Constant | 56.034** (24.323) | 76.435*** (21.681) | 86.369** (34.032) | 103.139*** (31.875) |
| Observations | 84 | 79 | 47 | 42 |
| R ² | 0.197 | 0.073 | 0.136 | 0.132 |
| Adjusted R ² | 0.145 | 0.010 | 0.030 | 0.011 |
| Residual Std. Error | 27.243 (df = 78) | 22.399 (df = 73) | 27.150 (df = 41) | 26.823 (df = 36) |
| F Statistic | 3.823*** (df = 5; 78) | 1.154 (df = 5; 73) | 1.288 (df = 5; 41) | 1.094 (df = 5; 36) |

Note: * p<0.1; ** p<0.05; *** p<0.01

Preprimary High and Low

| High | | | LOW | | |
|-----------------------|---------------|------------|-----------------------------|--------------------------------|------------|
| HDI | Country | Preprimary | HDI | Country | Preprimary |
| Low Human Development | Burundi | 72.2 | Very High Human Development | Qatar | 28.7 |
| Low Human Development | Cote d'Ivoire | 88.8 | High Human Development | Albania | 29.36 |
| Low Human Development | Gambia, The | 69.53 | High Human Development | Belize | 30.31 |
| Low Human Development | Kenya | 82.32 | High Human Development | Panama | 21.46 |
| Low Human Development | Nepal | 86.87 | High Human Development | Seychelles | 31.53 |
| | | | High Human Development | St. Vincent and the Grenadines | 14.07 |
| | | | High Human Development | St. Kitts and Nevis | 8.28 |
| | | | High Human Development | Suriname | 7.17 |
| | | | Medium Human Development | Ghana | 41.16 |
| | | | Medium Human Development | Kyrgyz Republic | 46.16 |
| | | | Medium Human Development | Nicaragua | 33.29 |
| | | | Medium Human Development | Sao Tome and Principe | 18.84 |
| | | | Low Human Development | Benin | 13.82 |
| | | | Low Human Development | Burkina Faso | 19.59 |
| | | | Low Human Development | Congo, Dem. Rep. | 20.33 |
| | | | Low Human Development | Madagascar | 16.1 |
| | | | Low Human Development | Niger | 19.95 |

Primary High and Low

| High | | | Low | | |
|-----------------------|------------------|---------|-----------------------------|-----------------------|---------|
| HDI | Country | Primary | HDI | Country | Primary |
| Low Human Development | Congo, Dem. Rep. | 94.62 | Very High Human Development | Kuwait | 77.16 |
| Low Human Development | Djibouti | 96 | High Human Development | Albania | 27.53 |
| Low Human Development | Ethiopia | 95 | High Human Development | Grenada | 53.71 |
| Low Human Development | Mauritania | 100 | High Human Development | Serbia | 55.73 |
| Low Human Development | Myanmar | 99.55 | High Human Development | Seychelles | 23.65 |
| Low Human Development | Rwanda | 95.2 | High Human Development | Suriname | 5.86 |
| Low Human Development | Tanzania | 98.99 | Medium Human Development | Bangladesh | 57.73 |
| Low Human Development | Uganda | 94.77 | Medium Human Development | Equatorial Guinea | 48.83 |
| | | | Medium Human Development | Ghana | 52.4 |
| | | | Medium Human Development | Sao Tome and Principe | 33.02 |
| | | | Medium Human Development | Syrian Arab Republic | 62.12 |
| | | | Low Human Development | Angola | 47.49 |
| | | | Low Human Development | Guinea-Bissau | 38.93 |
| | | | Low Human Development | Haiti | 39.94 |
| | | | Low Human Development | Madagascar | 16.66 |
| | | | Low Human Development | Mali | 52.42 |
| | | | Low Human Development | Niger | 50.08 |
| | | | Low Human Development | South Sudan | 44.03 |

Lower Secondary High and Low

| High | | | Low | | |
|-----------------------|------------|-----------|-----------------------------|-----------------------|-----------|
| HDI | Country | Lower Sec | HDI | Country | Lower Sec |
| Low Human Development | Djibouti | 100 | Very High Human Development | Kuwait | 79.14 |
| Low Human Development | Mauritania | 100 | High Human Development | Albania | 8.18 |
| | | | High Human Development | Antigua and Barbuda | 38.21 |
| | | | High Human Development | Serbia | 42.51 |
| | | | High Human Development | Suriname | 13.86 |
| | | | Medium Human Development | Congo, Rep. | 47.9 |
| | | | Medium Human Development | Sao Tome and Principe | 34.48 |
| | | | Low Human Development | Benin | 9.34 |
| | | | Low Human Development | Cameroon | 33.01 |
| | | | Low Human Development | Madagascar | 21.93 |
| | | | Low Human Development | Niger | 24.15 |

Upper Secondary High and Low

| HDI | Country | Upper Sec | HDI | Country | Upper Sec |
|-----------------------------|--------------------|-----------|--------------------------|------------|-----------|
| Very High Human Development | Saudi Arabia | 100 | High Human Development | Albania | 1.66 |
| Medium Human Development | Lao PDR | 99.95 | High Human Development | Belize | 36.19 |
| Medium Human Development | West Bank and Gaza | 100 | High Human Development | Dominica | 46.48 |
| | | | High Human Development | Serbia | 37.18 |
| | | | High Human Development | Suriname | 43.49 |
| | | | Medium Human Development | Bangladesh | 56.19 |
| | | | Low Human Development | Benin | 7.42 |
| | | | Low Human Development | Madagascar | 17.39 |
| | | | Low Human Development | Niger | 25.2 |

Conclusions

- Percentage of teachers who are trained is already reported to international agencies, though many countries (including the USA) are not reporting any data.
- The variance between national standards makes comparing countries a fraught exercise and probably not very useful.
- This is the only indicator where none of the data had any correlation with Internet or cellphone access

Traffic Light Analysis of Indicator 4.b

Indicator <-> Target

- The indicator captures the intended result of the target if not all the means mentioned (ie "international cooperation)

Current Data

- There is data for many countries on teacher training
- It is disaggregated in all the desired ways
- Hard to impossible to compare

Future Data

- The number of countries reporting this indicator will likely increase as will the ability to disaggregate the data
- Still will be difficult to compare countries but the indicator does not actually call for us to be able to do that

Appendix E: Leverage Points

Indicator 4.1.1. *Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex*

- **Infrastructure:** Rapidly growing youth populations and a need to enroll far higher proportions of youth calls for significant infrastructure.
 - **More schools:** In countries lagging far behind they simply need more schools. For example building schools was extremely effective in Afghanistan.
 - **Materials:** So far studies have not found meaningful improvements when things like books or backpacks are distributed but there may be other more fruitful approaches in this area.
 - **4.a** outlines the minimum infrastructure which the UN has agreed is necessary for all schools to have by 2030
- **Teachers:** Some recent studies have found that the most important factor in student success is the quality of the teachers
 - **Absenteeism:** Studies have found that teachers miss between 10-30% of school days in much of the developing world.
 - **4.c:** Qualified teachers (based on national standards)
- **Student Assessments:** Incorporating and measuring 21st century skills in reading and mathematics assessments, for example, could shift what is tested, how it is tested, and how student achievement is defined, potentially leading to the development of large-scale performance assessments that can capture a broader range of student primary learning and preparation.
- **Curriculum:** Many school systems need radically upgraded curriculums to meet proficiency standards.
 - **Localization:** There is an extreme lack of materials in local languages which hampers the learning of children working in their non-native tongues
 - **Pedagogy:** Teacher directed, rote learning is still dominant in much of the world, an approach shown to be far less effective than other methods
 - **Streaming:** This can be done by sorting students or through computer assisted learning, but some evidence that learning improves when students are able to learn at their level (and not the average of their peers).
- **Inequitable access:** Beyond being part SDG 4.5, inequitable access will be a barrier to raising participation rates because it means a portion of the population is not involved.
 - **Socio-economic:** Poor families may not be able to afford to keep their kids in school through completion, or they may have to miss too many days for farm labor. In addition certain indigenous and other social groups have been marginalized out of the system in many places.
 - **Geographic:** In rural areas students may face a long walk or difficult transportation situation, particularly for secondary school.
 - **See 4.5**

Indicator 4.2.1 *Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex*

Indicator 4.2.2 *Participation rate in organized learning (one year before the official primary entry age), by sex*

- **Infrastructure:** Adequate preprimary availability to meet the requirements
 - **4.c** Sufficient trained teachers
 - **4.a** Adequate facilities
 - **Government Support:** Whether subsidized by the government or provided as part of public schools, this makes an enormous difference
- **Home Learning Materials:** The existence and use of books and other learning materials and activities at home makes a big difference in early childhood development (could potentially be digital)
- **Health and Nutrition:** There is increasing evidence that poor nutrition sets children back in terms of brain development, from which they can never recover
- **Safety from Violence**
- **Inequitable access:** Beyond being part SDG 4.5, inequitable access already shows up in the limited data as an issue, with a yawning gap in outcomes between the rich and poor.

Indicator 4.3.1 *Participation rate of youth and adults in formal and non-formal education and training in the last 12 months, by sex*

- **Public Costs:** This refers to costs born by the higher education system and government. For low income countries it costs an average of 100% of GDP/capita to educate one student.
 - **Infrastructure:** Many of these countries have large and rapidly growing youth populations and a sudden influx of secondary graduates from improved K-12 systems. This is creating a demand which far outstrips the limited infrastructure which exists.
 - **ICT costs:** While costs are generally lower in less developed countries, ICT costs are the same or higher than in developed countries. This means that as a proportion of university budgets, ICT capital expenditures and maintenance is quite large and is often sacrificed.
 - **Qualified Faculty:** To meet demand and this target countries need to vastly grow their enrollments which does not just mean infrastructure but also qualified faculty to teach the classes. Many of these countries have too few PhD trained citizens and of those it can be difficult to convince them to live where new universities are being built (often in the middle of nowhere or less developed regions of the country).
- **Private Costs:** Even though many countries make higher education free or virtually so, families and students still have to bear significant costs to send their child to school. A reliance on private universities to expand enrollment is a much more serious barrier.
 - **Living Expenses:** In many developing countries young people live with family until marriage (and sometimes after). The cost difference between living at home and on one's own is very large. In addition new universities are often built on cheap land on the periphery of cities leading to significant transportation costs.
 - **Lack of scholarships/loans:** Most low income countries have no system for students to get loans and especially when university is heavily subsidized, few

scholarships available. The advantage of these systems is they could be used to target low income families instead of free tuition being captured mostly by middle and upper income students. Also **4.b**

- **Inequitable access:** Beyond being part SDG 4.5, inequitable access will be a barrier to raising participation rates because it means a portion of the population is not involved.
 - **Socio-economic:** Middle and upper income students are overrepresented in higher education the world over. In addition certain indigenous and other social groups have been marginalized out of the system in many places.
 - **Geographic:** Typically national universities are located in the capitals of countries, leaving other parts of the country with much lower quality (or no) higher education institutions. This is a significant barrier for students from these regions.
 - **See 4.5**

Indicator 4.4.1 *Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill*

- **Infrastructure:** Computers, internet access and mobile networks are all prerequisites for the development of ICT skills
 - **4.a.** call for computers and internet in schools
 - **9.c.** Universal and affordable internet access
- **Schools:** Even with infrastructure, students are not necessarily gaining the necessary ICT skills during their schooling years.
 - **Curriculum:** ICT skills need to be integrated fully into the curriculum
 - **4.c/Qualified Teachers:** This does not only apply in less developed regions where teachers may never have used a computer before but also in developed regions where teachers don't feel comfortable in ICT where their students may actually know more than them.
- **Adult Learning:** To boost ICT skills it will be necessary to reach adults who have finished their education yet whose ICT skills are not adequate. This will be an ongoing challenge as particular skills an individual needs will evolve and change over one's lifetime.
- **Inequitable access:** Beyond being part SDG 4.5, inequitable access to ICT is holding back the skill levels of large portions of the population
 - **Socio-economic:** Poor families cannot afford the ICT equipment at home where so much ICT skill development really happens.
 - **Unconnected Adults:** Billions of adults around the world have never used a computer or connected to the internet.
 - **See 4.5**

Indicator 4.5.1: *Parity indices (female/male, rural/urban, bottom/top wealth quintile and others such as disability status, indigenous peoples and conflict-affected, as data become available) for all education indicators on this list that can be disaggregated*

- **Socio-cultural constraints:** Whether explicit or implicit, internal to households or an aspect of the broader society, socio-cultural constraints are the biggest reason that in

many places around the world women and girls are less educated than their male counterparts.

- **Cultural:** A range of barriers including child marriage, early motherhood, traditional seclusion practices, sexual violence and more severely limit the education of women.
- **Domestic:** In most of the world women are expected to bear a disproportionate share of the household labor and young girls begin contributing early, limiting their ability to continue in school.
- **Educational policies:** Include but are not limited to the following:
 - **Female Teachers:** Beyond serving as role models, female teachers can also make classrooms safer and more inviting places for young girls.
 - **Costs:** Whether formal fees or other costs like books and uniforms, poor families will typically choose to cover the male children's' expenses before those of their sisters.
- **Infrastructure:** Include but are not limited to the following:
 - **Bathrooms:** Shared (or no) bathrooms can be a serious problem for secondary girls, particularly in more traditional societies.
 - **Distance:** Rural girls in particular may live long walks from school which (beyond being dangerous) cut into the time girls have to do school work as well as their expected household chores.
- **Returns on education:** In countries where women are excluded from jobs or expected to stay home once married, the financial return on investing in education is much lower for women compared to men. This creates a disincentive for women (and their families) to invest in education for them.

Indicator 4.6.1 *Percentage of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex*

- **Improved Measurement:** Even developed countries have not done a good job at assessing how much of their adult population struggles with literacy and numeracy even if they pass a minimum bar.
- **Identifying and Inducing Participation:** Given the data it can be a challenge to identify those adults who would most benefit from literacy programs and to induce them to participate in them.
- **Effective Content and Practices:** There is a need to continue to improve the content and implementation of literacy programs as assessed by their effectiveness
- **Inequitable access:** Beyond being part SDG 4.5, inequitable access is already a problem as more women than men suffer from illiteracy.
 - **Socio-economic:** Poor families are far more likely to have illiterate members and be least able to afford for them to study.
 - **Geographic:** In rural areas adults may not have access to any continuing education.
 - **See 4.5**
- **Literate Environment:** Maintaining and improving literacy happens best in local environments with rich literacy and numeracy opportunities. This is a particularly key opportunity for ICT.

- **Mobile phones:** Many low literate people have cellphones and text messaging and other approaches have been shown to be successful in maintaining and improving literacy and numeracy
- **Radio/TV:** With their wide and deep penetration radio and TV offer excellent gateways for promoting sustainable literacy.

Indicator 4.7.1 *Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment*

- **Interdisciplinarity:** One of the principal barriers to integrating Sustainability and citizenship curriculum into schools is that it does not live within any of the traditional silos. Sustainability should properly be part of all the disciplines. Rather than just work with one of the silos, one has to work to integrate it everywhere, a much bigger task.
- **Agreement:** There is a wide-ranging debate about citizenship and Sustainability education.. In a positive sense this has created a diversity of approaches but this diversity has created a barrier to it being mainstreamed in a more permanent fashion. The challenge of reaching an international agreement on this is clear when compared to agreement on what proficiency in math and reading means in 4.1.
- **Research:** Most of the research in this area consist of case study descriptions. Too little work has been done to rigorously analyze curriculum and programs to identify the most successful which could then be scaled up (as this indicator calls for). Additionally we have little follow-up in terms of what kind of impact these programs are having on students' lives down the road.
- **Employability:** While surveys and other work has found that employers say they want knowledge and skills regarding Sustainability, actual hiring practices don't appear to be prioritizing this. Therefore for students and educational systems there is little incentive to go beyond paying lip service to sustainability education. Part of this may be driven by a lack of accepted Sustainability standards by employers.

Indicator 4.a.1 *Proportion of schools with access to: (a) electricity; (b) the Internet for pedagogical purposes; (c) computers for pedagogical purposes; (d) adapted infrastructure and materials for students with disabilities; (e) basic drinking water;(f) single-sex basic sanitation facilities; (g) basic handwashing facilities (as per the WASH indicator definitions)*

Computers/Internet

- **Infrastructure:** Personnel, building, and equipment infrastructure is essential for operating computers and providing Internet access.
 - **Reliable Electricity:** Battery back-up is critical when electricity is not reliable.
 - **Secure Facility:** Ability to lock equipment into a secure room is essential to reducing theft and misuse.
 - **Capacity Building for ICT Integration:** Computers were left for individual schools to figure out what to do with the computers
- **ICT costs:**

- **Necessity cost:** While costs are generally lower in less developed countries, ICT costs are the same or higher than in developed countries. This means that as a proportion of a family or school's budget, ICT capital expenditures and maintenance is quite large and is often sacrificed. Empirical studies show that people consider ICT expenditure of US\$120 per year as a basic necessity. ICT costs must be weighed to other needs, like food or medicine.
- **Supplemental expenses:** ICT costs will also add additional expenses in the budget with the need of fans, added security, and ongoing-training.
- **Computer lab vs individual classroom computers:** Little has been reported, but some research shows computer labs are more cost effective.
- **Trade Environment:** Many less developed countries have to import 100% of their ICT equipment, tariffs, costs of shipping and customs can dramatically increase cost and difficult of setting up infrastructure.
- **Geographic:** Rural schools, already disadvantaged, are going to have particular difficulty with installing computers and connecting to the internet

Adapted Infrastructure and Materials for Students with Disabilities

- **Modified computers and software:** Providing the disabled community with more equitable opportunities in school and the workplace.

Electricity/ Improved Sanitation and Water Source

- **Local Infrastructure:** Many schools are in places with no electrical grid or the existing grid may be very unreliable or too expensive for the school to use for much beyond lights. Same applies for water and sanitation infrastructure
- **Solar Energy:** Or other localized electricity solutions may enable schools to jump ahead of local grid development.

Indicator 4.b.1 *Volume of official development assistance flows for scholarships by sector and type of study*

- **Proportion of ODA:** Scholarships currently form only a tiny portion of ODA and even small increases relative to the overall budget would mean a huge increase in the number of scholarships.
- **Accountability:** Donor nations have not been held to the quality or quantity of support.

Note: While the indicator only measures ODA, there would seem to be a lot of other sources for scholarships

- **Private Scholarships:**
 - **Donors:** Currently existing scholarship programs could be re-oriented to support students from developing countries.
 - **Universities:** Universities often target international students as a source of revenue but could also develop special scholarships for the less wealthy (means based scholarships)
 - **Online:** Online universities in the developed world could be a key way to increase opportunities of study for students in developing countries without incurring the cost and difficult of them leaving their home country.
- **Inequitable access:** Crudely measuring the number of students who leave developing countries for university would not be sufficient as wealthy youth in these countries are

already going abroad for university. This goal needs to be focused on reaching the less well-off.

Indicator 4.c.1 *Percentage of teachers in: (a) pre-primary; (b) primary; (c) lower secondary; and (d) upper secondary education who have received at least the minimum organized teacher training (i.e. pedagogical training) pre-service or in-service required for teaching at the relevant level in a given country*

- **Standards for Teacher Training:** This indicator focuses on meeting national standards which points to the need for the development of rigorous national standards that actually ensure effective teaching.
- **Pre-service:** Obtaining a teaching degree, generally via a post-secondary education.
- **In-service:** Many education systems require that teacher participate in professional development during their careers. There is vast room to improve this even in countries like the USA where much investment in time and money seems to be wasted.
- **Evidence Based Teaching Standards:** While much evidence is beginning to emerge on what makes great teachers, their training both pre- and in-service does not reflect these best practices for the vast majority of teachers.

Appendix F: Case Studies

ASU Online <http://asuonline.asu.edu/>

ASU online is a rapidly growing part of Arizona State University which seeks to enroll 100,000 students by 2030. ASU online was recently ranked by US News as the 11th best online bachelor's degree program in America (<http://asuonline.asu.edu/about-us/newsroom/us-news-ranks-asu-top-15-online-bachelors-programs>). Anyone in the world can enroll for a degree from ASU online but outside of the US they warn that: "Several countries will not formally recognize foreign online degrees." The cost of a degree would vary based on your major, pace of study and transfer credits but we estimate it would be ~\$50,000.

Mappings to SDG 4:

- **Measure 4.3:** ASU online contributes directly to increasing enrollment rates for each student it enrolls from a low-enrollment country.
- **Leverage Points 4.3:**
 - **Infrastructure:** Low enrollment countries would not have to build any additional infrastructure to increase enrollment via online education
 - **Qualified faculty:** High quality faculty will not have to be convinced to move out to isolated new campuses
 - **Living Expenses:** Students will be able to live at home and support their household with local work or domestic labor.
 - **Geographic:** Students who live outside of the main cities will have equal access to ASU online (as long as they have the internet)
- **Leverage Points 4.b:** Although technically not included in the indicator (which only measures ODA flows), ASU or another entity could offer scholarships to students from the countries and degrees called for in Target 4b. Online scholarships would be much cheaper than paying students to travel and live abroad.
- **Relevance to 4.5:** In cultures where the movement of females in public is restricted, ASU online could be a vehicle for reaching them with post-secondary education.
- **Relevance to 4.7:** As a global leader in Sustainability education, ASU online would offer students not just a degree in Sustainability but also the integration of sustainability into many of their other course offerings.

Unete <http://www.unete.org/>

Unete is a Mexican non-profit which seeks to improve the quality of education in Mexico, principally through a focus on equipping schools with computer labs along with the training, support and materials for them to operate effectively. They have received support from this from various entities including Dell who has supported projects through Unete in more than 300 schools around the country. In total they have installed labs in nearly 8,000 schools reaching 12% of Mexico's primary and secondary public

school students. They have also done impact analysis of their program on student achievement.

Mappings to SDG 4:

- **Measure 4.a:** Unete's work directly contributes to two of the measures for target 4.a, schools with computer and internet access. Through their work they have reached 4% of schools in the country (though a higher percentage of students—most likely because there are a lot of very small, rural schools in Mexico). They estimate that of the ~145,000 schools in Mexico, another 50,000 are still lacking functional computers of any kind.
- **Measure 4.1:** One could fairly easily measure both the changes in graduation and the changes on test scores of students with a Unete computer lab, thus measuring directly the difference on target 4.1 which this solution is making.
- **Leverage Points 4.1:** An impact analysis found significant impact on math scores and a bigger impact in primary and more marginalized schools. Other studies have found very mixed results in terms of student improvement after introducing computer learning, enrollment and other metrics. One study found computers to have a positive impact but still found it less cost effective than tutoring and other approaches.
 - **Measure 4.a:** Computer labs are seen as a key input to successful primary and secondary educations
 - **Curriculum:** Unete directly offers new curriculum materials and the combination of computers and internet enables access to an endless amount as well as the streaming of students by need and ability.
 - **Teachers:** A University of Milan study showed that the biggest benefits to student performance from having computers in schools comes through the teachers' use of them to support their teaching.
- **Measure 4.4:** Impact study on 131 schools found a difference in digital skills between students at schools with Unete computer labs and those that didn't have them.
- **Leverage Points 4.4:**
 - **Measure 4.a**
 - **Teacher Skills:** Unete study found increased digital skills among teachers.

Close the Gap <http://close-the-gap.org/>

“Close the Gap is an international non-profit organization that aims to bridge the digital divide by offering high-quality, pre-owned computers donated by large and medium-sized corporations or public organizations to educational, medical, entrepreneurial and social projects in developing and emerging countries.” Dell has been collaborating with Close the Gap to donate over 13,000 decommissioned desktops from Rabobank (<http://en.community.dell.com/dell-blogs/direct2dell/b/direct2dell/archive/2015/11/05/discarded-corporate-technologies-are->

[given-a-new-life-in-africa](#)). This is enough to equip more than 400 computer labs. Other non-profits such as World Computer Exchange (<http://www.worldcomputerexchange.org/>) are similarly trying to give old computers new life.

Mappings to SDG 4:

- **Measure 4.a:** Close the Gap and WCE work with local partners to find homes for computers and so the end use varies widely from project to project. To assess the impact on target 4.a it would be necessary to capture how many of the computers donated from a certain project ended up in how many different schools (and where).
- **Leverage points 4.1 & 4.4:** The installation of computers in schools (4.a) is seen as a key leverage point for achieving targets 4.1 and 4.4.

Dell Professional Learning Services for K-12 <https://www.dell.com/en-us/work/learn/professional-learning>

“Dell Professional Learning Services works with districts to develop customized outcome-based learning programs, incorporating one-on-one instruction, coaching and modeling, and sharing sessions for teachers and district leaders. We align our services to your state’s standards, including Common Core or other next generation standards, as well as the International Society for Technology in Education (ISTE) Standards for students, teachers, administrators and coaches. Using proven industry standards as a foundation, Dell consultants draw from three categories of professional learning activities — experiences, training and professional development — to help you create a program that includes a mix of ongoing activities working together to positively impact teaching practices and student learning.”

Mappings to SDG 4:

- **Leverage Points 4.c:** Target 4c calls for teachers to meet national standards of per-service and in-service training. This service (and most other similarly ICT-based teacher training initiatives) are focused on in-service training.
- **Leverage Points 4.4 Teachers:** One of the key determinates to students acquiring ICT skills is the capabilities and preparedness of their teachers.
- **Leverage Points 4.1 Teachers (4.c)**

mTaleem SMS Based Literacy Program <http://www.unesco.org.pk/education/mlp.html>
UNESCO and the Mobilink Foundation

(<http://www.mobilinkfoundation.org/education.php>) partnered to deploy a mobile phone based literacy program in Pakistan. Thousands of women have participated so far. After taking an in-person literacy class, the women are given a mobile phone and receive regular text messages on fun and interesting topics which require the participant to respond. These have been built as lessons which together form a post-class curriculum.

Mappings to SDG 4:

- **Leverage Points 4.6:** This project conducts literacy training but some (to many) of the participants may not ultimately achieve long term literacy (the measure)
 - **Mobile Phones:** These devices are ubiquitous among youths and adults even those who are illiterate
 - **Identifying & Inducing Participants:** Having a mobile phone increased the feeling of security among female participants, showing how participation in these programs could be incentivized with mobile devices. This project also went out to rural villages to run classes in order to reach those in need.
 - **Effective Content & Practices:** The Mobilink Foundation teamed up with UNESCO to create the highest quality literacy content and assure that it was locally appropriate (including that it was in Urdu).
 - **Inequitable Access:** see 4.5
- **Leverage Points 4.5:** The targeting of rural women was purposeful to bridge the inequitable distribution of illiteracy in the country (Pakistan has one of the worst gender in-balances for literacy in the world).

Made with Code <https://www.madewithcode.com/>

This Google led initiative seeks to get young women excited about learning to code with the explicit goal of closing the gender gap in the tech industry. They seek to inspire girls to see how coding can help them pursue their passions (of any kind). They have launched a website with resources and coding projects as well as connecting youths to communities and mentors online. They are also directly supporting a variety of nonprofit grantees including: *Black Girls Code*, *Code.Org*, *NCWIT Aspirations In Computing*, *Technovation Challenge*, *Donorschoose.org* and *Girls Who Code*.

Mappings to SDG 4:

- **Leverage Points 4.4:** This project is creating and distributing curriculum but mostly it is seeking to increase the overall ICT skill level by closing the gender gap.
- **Leverage Points 4.5:**
 - **Cultural:** Even in egalitarian countries there is a cultural bias towards male programmers as can be easily seen the way they are represented in film.
 - **Female Teachers/Models:** One of the key goals of the project is to connect girls with female programmer role models.
- **Relevance to 4.3:** One of the main objectives of this project is to increase the number of women enrolling in computer science degree programs in university.

Appendix G: Traffic Light Analysis

As discussed in section 3.1 we developed a traffic light diagram to assist with decision-making on which targets to focus on.

| Target | Short Name | The Indicator & the Data | Relevancy of ICT | Magnitude of ICT Impact |
|--------|---|--------------------------|------------------|-------------------------|
| 4.1 | Proficiency of Primary and Secondary students | Yellow | Yellow | Green |
| 4.2 | Early Childhood/ Preprimary Enrollment | Green | Red | Red |
| 4.3 | Post- Secondary Education | Green | Green | Green |
| 4.4 | ICT Skills | Red | Green | Green |
| 4.5 | Equal access for all | Green | Yellow | Yellow |
| 4.6 | Literacy | Green | Yellow | Red |
| 4.7 | Sustainable Development Knowledge | Red | Yellow | Yellow |
| 4.a | School Infrastructure | Yellow | Yellow | Yellow |
| 4.b | Scholarships | Yellow | Yellow | Yellow |
| 4.c | Qualified Teachers | Green | Yellow | Green |

A structured judgement was made for each of the criteria for each of the indicators. For the Indicator and the data three criteria were averaged to get the first column. A diagram of those judgements can be found in section 2.1.2 and justifications for each of the judgements for each of the indicators can be found in Appendix D at the end of the analysis for each indicator. The following two charts provide justifications for the rankings on Relevancy and Magnitude columns.

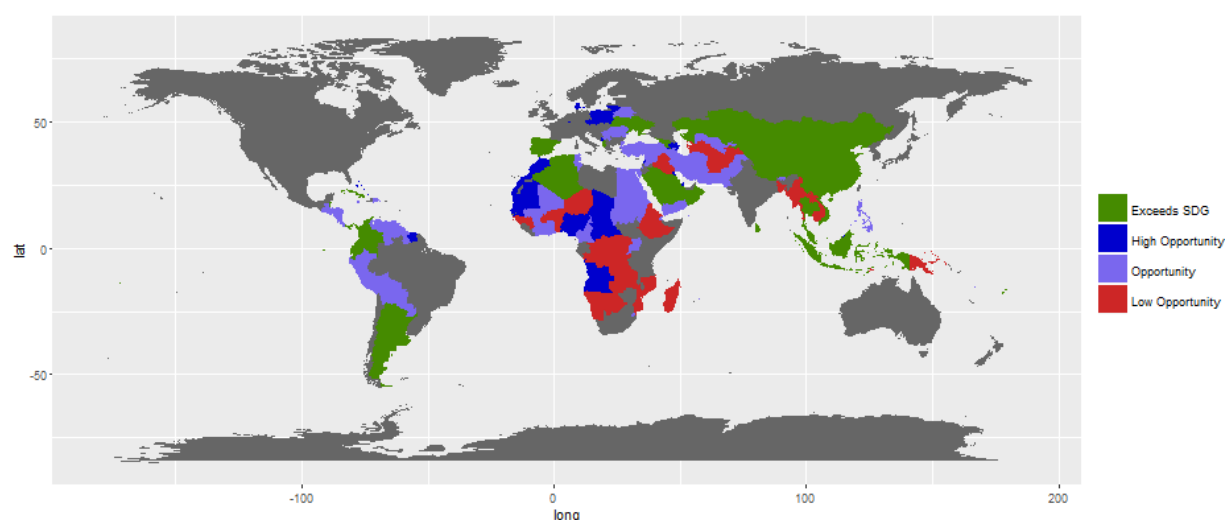
| Target | Short Name | Relevancy of ICT | Justification |
|--------|---|------------------|---|
| 4.1.1 | Proficiency of Primary and Secondary students | | Although student performance has been a key justification for the integration of ICT into schools the world over, the evidence of it improving student performance is mixed at best, especially when compared on a cost effectiveness basis. This is not to say that ICT skills and competence are not valuable but so far improvement in other subject areas is not enough to alone justify these programs. One study did show that ICT is most effective when it supports the teacher through access to resources and in class presentations and activities (but was not when the students use the ICT themselves). |
| 4.2.1 | Early Childhood Development Index | | Early childhood does not appear to be a good target for ICT solutions, in fact it is often not recommended that young children have too much screen time. Unsurprisingly there were not many solutions in this space out there. |
| 4.2.2 | Preprimary Enrollment | | |
| 4.3.1 | Post-Secondary Education | | ICT looks to be the future of post-secondary education. Fully online education is going to make up an increasing portion of students and even immersive students will be using ICT to do homework, take some classes online or for other services. |
| 4.4.1 | ICT Skills | | Clearly no progress can be made on this indicator without ICT. |
| 4.5.1 | Equal access for all | | ICT has the potential to help integrate disadvantages populations from women to the rural poor in education but ICT is generally more accessible to advantaged populations so without explicit efforts ICT will likely only exacerbate inequalities. |
| 4.6.1 | Literacy | | Mobile phones provide a possibility for ICT improving literacy, but only if they are one part of a much bigger non-ICT related project. |
| 4.7.1 | Sustainable Development Knowledge | | In order to mainstream sustainable development education rapidly, it will be necessary to share resources globally, which ICT could enable. ICT is likely to be as effective in this area as other subjects (see 4.1.1) |
| 4.a.1 | School Infrastructure | | Two parts of this indicator, computers and internet, are directly ICT but the rest of the parts have little to do with ICT. |
| 4.b.1 | Scholarships | | Online degrees would seem to present an obvious opportunity to greatly increase the impact of scholarship money but it is not (yet) explicitly included as part of this indicator. |
| 4.c.1 | Qualified Teachers | | Computer based in-service training has potential to increase qualified teachers but the record so far is not significant. |

| Target | Short Name | Magnitude of ICT Impact | Justification |
|--------|---|-------------------------|--|
| 4.1.1 | Proficiency of Primary and Secondary students | | While so far ICT has not produced consistent gains among K-12 students, continued experimentation and evaluation may be pointing the way to approaches such as Computer-Assisted-Learning that could easily be rolled out and create widespread gains across an entire education system. |
| 4.2.1 | Early Childhood Development Index | | There appears to be little possibility for large scale impact with early childhood. |
| 4.2.2 | Preprimary Enrollment | | |
| 4.3.1 | Post-Secondary Education | | The most significant problem post-secondary education faces, is massification—the hundreds of millions of secondary graduates who want to further education but currently have no place to go. It is probably physically impossible to meet this challenge without the extensive use of ICT. |
| 4.4.1 | ICT Skills | | Clearly no progress can be made on this indicator without ICT. |
| 4.5.1 | Equal access for all | | ICT has the potential to help integrate disadvantages populations from women to the rural poor in education but ICT is generally more accessible to advantaged populations so without explicit efforts ICT will likely only exacerbate inequalities. |
| 4.6.1 | Literacy | | So far there is no evidence that ICT-based programs can have large impacts on reducing illiteracy. |
| 4.7.1 | Sustainable Development Knowledge | | In order to mainstream sustainable development education rapidly, it will be necessary to share resources globally, which ICT could enable. ICT is likely to be as effective in this area as other subjects (see 4.1.1) |
| 4.a.1 | School Infrastructure | | Two parts of this indicator, computers and internet, are directly ICT but the rest of the parts have little to do with ICT. |
| 4.b.1 | Scholarships | | Online degrees would seem to present an obvious opportunity to greatly increase the impact of scholarship money but it is not (yet) explicitly included as part of this indicator. |
| 4.c.1 | Qualified Teachers | | Currently teacher education has a poor reputation the world over. If one could develop an effective ICT-based model for pre-service or in-service training, the ability to cheaply replicate it at scale would be enormously impactful. |

Appendix H: ICT Opportunity Index

The indicators are rescaled to range from $1/n_d$ to 1 where n_d is the number of countries with data for that particular indicator. The ICT Opportunity Index is then created by taking the Rescaled Internet Access Indicator and dividing it by the Rescaled Indicator of interest. The higher the number that results the more people are accessing the internet in that country compared to the indicator of interest (relative to the rest of the world). In order to make the ICT Opportunity Index results were divided into three groups, High Opportunity=Top 25%, Opportunity=Middle 50%, and Low Opportunity=Bottom 25%.

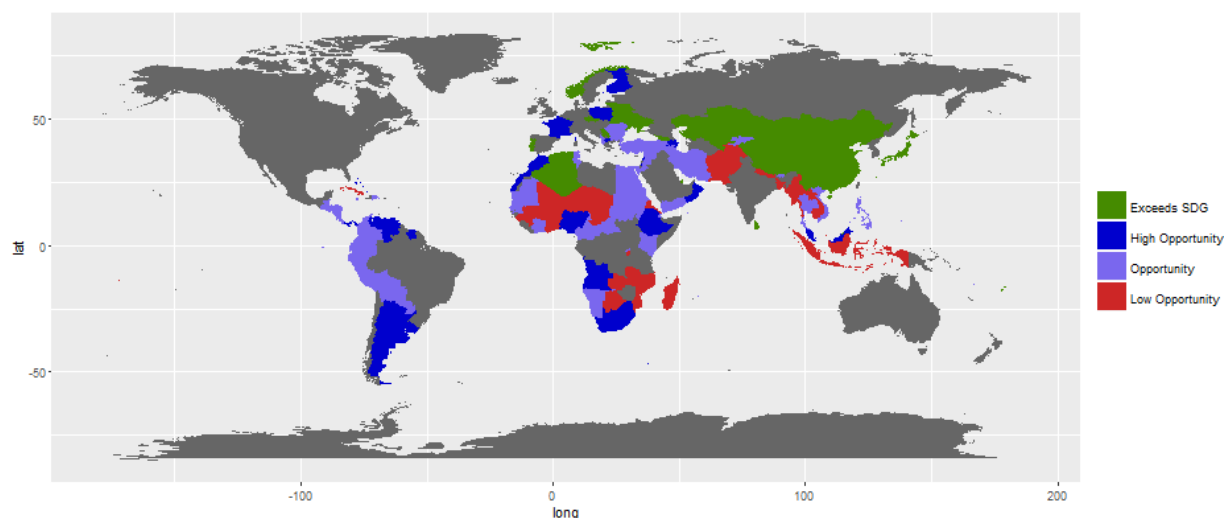
Indicator 4.1.1 Primary Graduation (%)



| High Opportunity Countries | HDI Level | ICT Opportunity Index | Primary Graduation (%) | Internet Access (%) |
|----------------------------|-----------------------------|-----------------------|------------------------|---------------------|
| Senegal | Low Human Development | 12.01877 | 22.33341 | 17.7 |
| Mauritania | Low Human Development | 3.435345 | 23.91544 | 10.7 |
| Chad | Low Human Development | 2.662946 | 21.64667 | 2.5 |
| Lebanon | High Human Development | 1.54664 | 70.01833 | 74.7 |
| Central African Republic | Low Human Development | 1.519105 | 23.26667 | 4.03 |
| Luxembourg | Very High Human Development | 1.382776 | 90.63339 | 94.67 |
| Bahrain | Very High Human Development | 1.318719 | 91.17227 | 90.99998 |
| Angola | Low Human Development | 1.318354 | 37.01685 | 21.26 |
| Qatar | Very High Human Development | 1.305913 | 92.24603 | 91.49 |
| Liechtenstein | Very High Human Development | 1.294241 | 95.83333 | 95.21 |
| Denmark | Very High Human Development | 1.239699 | 99.77603 | 95.99 |
| Czech Republic | Very High Human Development | 1.032283 | 99.48038 | 79.71 |
| Barbados | High Human Development | 1.02457 | 97.03357 | 76.67 |
| Kuwait | Very High Human Development | 1.012798 | 99.97155 | 78.7 |
| Bahamas | High Human Development | 0.9898343 | 99.96514 | 76.92 |
| Lithuania | Very High Human Development | 0.9870813 | 95.21604 | 72.13 |
| Hong Kong | Very High Human Development | 0.9671069 | 99.32491 | 74.56 |
| Azerbaijan | High Human Development | 0.9359858 | 87.09692 | 61 |

| | | | | |
|-----------------------|-----------------------------|-----------|----------|-------|
| Saint Kitts and Nevis | High Human Development | 0.9285672 | 92.47881 | 65.4 |
| Suriname | High Human Development | 0.908051 | 65.54054 | 40.08 |
| Brunei Darussalam | Very High Human Development | 0.8932741 | 99.17187 | 68.77 |
| Poland | Very High Human Development | 0.8775658 | 98.04117 | 66.6 |
| Nigeria | Low Human Development | 0.8658278 | 70.79452 | 42.68 |
| Trinidad and Tobago | High Human Development | 0.8627341 | 97.58736 | 65.1 |
| Montenegro | Very High Human Development | 0.8311293 | 95.45283 | 61 |
| Morocco | Medium Human Development | 0.8118086 | 91.9296 | 56.8 |

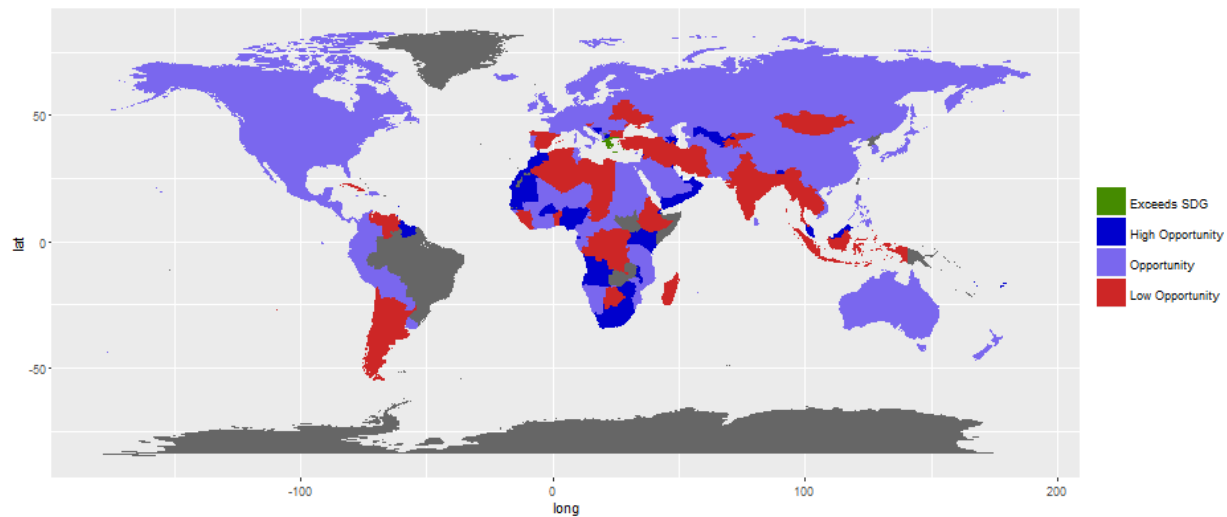
Indicator 4.1.1 Secondary Graduation (%)



| High Opportunity Countries | HDI Level | ICT Opportunity Index | Secondary Graduation (%) | Internet Access (%) |
|--|-----------------------------|-----------------------|--------------------------|---------------------|
| Ethiopia | Low Human Development | 3.137243 | 1.10278 | 2.9 |
| Lebanon | High Human Development | 2.251117 | 39.32621 | 74.7 |
| South Africa | Medium Human Development | 1.780936 | 32.53068 | 49 |
| Morocco | Medium Human Development | 1.415339 | 47.42844 | 56.8 |
| Suriname | High Human Development | 1.361012 | 34.73153 | 40.08 |
| Nigeria | Low Human Development | 1.20048 | 41.92243 | 42.68 |
| France | Very High Human Development | 1.151157 | 86.06122 | 83.75 |
| Finland | Very High Human Development | 1.126774 | 97.01123 | 92.38 |
| Panama | High Human Development | 1.072944 | 49.36209 | 44.92 |
| Angola | Low Human Development | 1.011662 | 24.57946 | 21.26 |
| Bahamas | High Human Development | 0.982338 | 92.5666 | 76.92 |
| Swaziland | Low Human Development | 0.965852 | 32.91403 | 27.1 |
| Venezuela, Bolivarian Republic of | High Human Development | 0.9635476 | 69.82771 | 57 |
| Hong Kong | Very High Human Development | 0.9477384 | 92.98342 | 74.56 |
| Malaysia | High Human Development | 0.9442475 | 84.45114 | 67.5 |
| Macedonia, the former Yugoslav Republic of | High Human Development | 0.9411481 | 85.43497 | 68.06 |
| Antigua and Barbuda | High Human Development | 0.9283837 | 81.41593 | 64 |
| Uruguay | High Human Development | 0.9195806 | 78.9148 | 61.46 |
| Palestine, State of | Medium Human Development | 0.885038 | 71.53946 | 53.67 |

| | | | | |
|----------------------------------|-----------------------------|-----------|----------|-------|
| Argentina | Very High Human Development | 0.8757616 | 87.24584 | 64.7 |
| Oman | High Human Development | 0.8635451 | 96.06541 | 70.22 |
| Azerbaijan | High Human Development | 0.8554605 | 84.1778 | 61 |
| Saint Vincent and the Grenadines | High Human Development | 0.8538367 | 78.05362 | 56.48 |
| Poland | Very High Human Development | 0.833508 | 94.3653 | 66.6 |

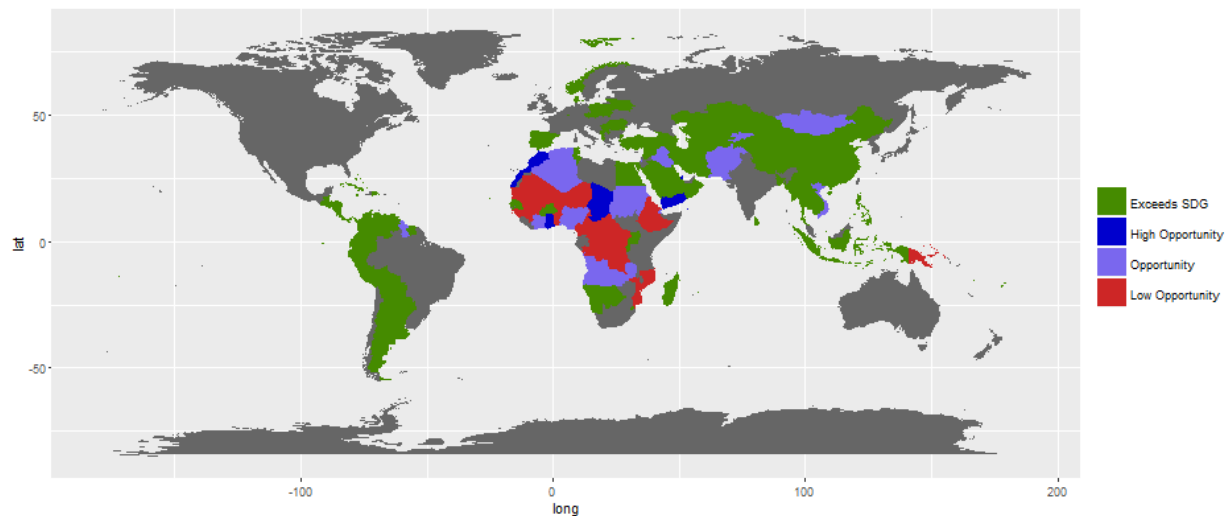
Indicator 4.3.1 Tertiary Enrollment (%)



| High Opportunity Countries | HDI Level | ICT Opportunity Index | Tertiary Enrollment (%) | Internet Access (%) |
|----------------------------|-----------------------------|-----------------------|-------------------------|---------------------|
| Kenya | Low Human Development | 12.46596 | 4.04682 | 43.4 |
| Seychelles | High Human Development | 9.613301 | 6.4694 | 54.26 |
| Malawi | Low Human Development | 9.605898 | 0.79773 | 5.83 |
| Tonga | High Human Development | 7.202991 | 6.3486 | 40 |
| Equatorial Guinea | Medium Human Development | 6.755165 | 3.23475 | 18.86 |
| Qatar | Very High Human Development | 6.543384 | 15.83137 | 91.49 |
| Trinidad and Tobago | High Human Development | 6.176443 | 11.95117 | 65.1 |
| Swaziland | Low Human Development | 5.811572 | 5.32888 | 27.1 |
| Uzbekistan | Medium Human Development | 5.555766 | 8.90016 | 43.55 |
| Luxembourg | Very High Human Development | 5.513196 | 19.40741 | 94.67 |
| Nigeria | Low Human Development | 4.643129 | 10.40532 | 42.68 |
| United Arab Emirates | Very High Human Development | 4.629948 | 22.03907 | 90.4 |
| Vanuatu | Medium Human Development | 4.511442 | 4.7444 | 18.8 |
| Uganda | Low Human Development | 4.499918 | 4.48339 | 17.71 |
| Maldives | High Human Development | 4.369453 | 12.74713 | 49.28 |
| Zimbabwe | Low Human Development | 3.834776 | 5.87175 | 19.89 |
| Suriname | High Human Development | 3.573062 | 12.65156 | 40.08 |
| Bhutan | Medium Human Development | 3.548264 | 10.92693 | 34.37 |
| St. Lucia | High Human Development | 3.40872 | 16.86029 | 51 |
| Guyana | Medium Human Development | 3.373007 | 12.48062 | 37.35 |
| Kuwait | Very High Human Development | 3.279605 | 27.02705 | 78.7 |
| Samoa | High Human Development | 3.157363 | 7.56238 | 21.2 |
| Bosnia and Herzegovina | High Human Development | 3.096262 | 22.10831 | 60.8 |
| Antigua and Barbuda | High Human Development | 3.067807 | 23.48624 | 64 |

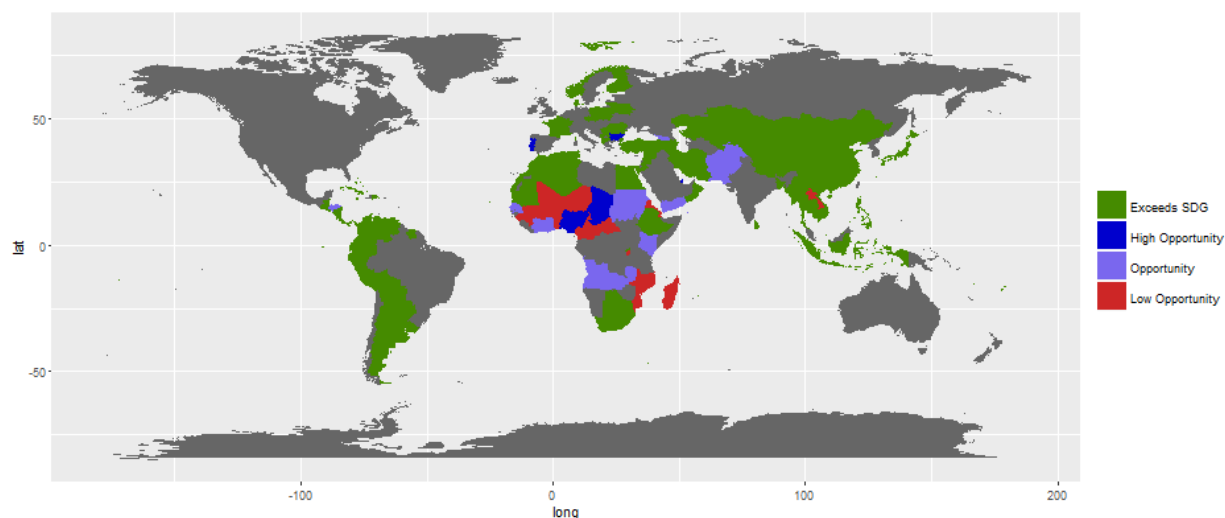
| | | | | |
|-----------------------|-----------------------------|----------|----------|----------|
| Azerbaijan | High Human Development | 2.964456 | 23.15973 | 61 |
| Fiji | High Human Development | 2.914399 | 16.1371 | 41.8 |
| Sao Tome and Principe | Medium Human Development | 2.812704 | 9.75327 | 24.41 |
| South Africa | Medium Human Development | 2.803144 | 19.66282 | 49 |
| Bahrain | Very High Human Development | 2.779823 | 36.83768 | 90.99998 |
| Oman | High Human Development | 2.764757 | 28.57509 | 70.22 |
| Senegal | Low Human Development | 2.687195 | 7.38946 | 17.7 |
| Morocco | Medium Human Development | 2.599117 | 24.57194 | 56.8 |
| Yemen, Rep. | Low Human Development | 2.535638 | 9.9746 | 22.55 |
| Liechtenstein | Very High Human Development | 2.52016 | 42.49668 | 95.21 |
| Brunei Darussalam | Very High Human Development | 2.437015 | 31.72534 | 68.77 |
| Angola | Low Human Development | 2.400003 | 9.92357 | 21.26 |
| Djibouti | Low Human Development | 2.394608 | 4.98506 | 10.71 |
| Micronesia, Fed. Sts. | Medium Human Development | 2.354888 | 14.12186 | 29.65 |
| Burkina Faso | Low Human Development | 2.183152 | 4.77591 | 9.4 |
| Mauritania | Low Human Development | 2.175401 | 5.46516 | 10.7 |
| Malaysia | High Human Development | 1.967303 | 38.53282 | 67.5 |
| Lebanon | High Human Development | 1.961792 | 42.77283 | 74.7 |
| Macedonia, FYR | High Human Development | 1.942327 | 39.35075 | 68.06 |

Indicator 4.5.1 Primary Graduation, Gender Parity Index (GPI)



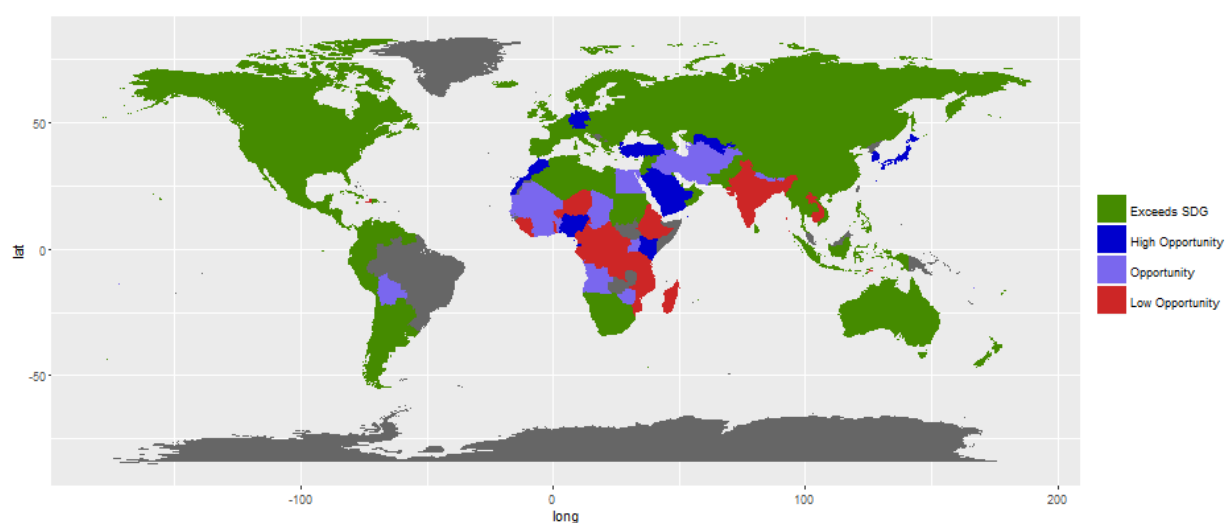
| High Opportunity Countries | HDI Level | ICT Opportunity Index | Primary Graduation GPI | Internet Access (%) |
|----------------------------------|-----------------------------|-----------------------|------------------------|---------------------|
| Chad | Low Human Development | 2.621338 | 0.57142 | 2.5 |
| Qatar | Very High Human Development | 2.429729 | 0.88707 | 91.49 |
| Antigua and Barbuda | High Human Development | 2.022675 | 0.835 | 64 |
| Dominica | High Human Development | 1.371468 | 0.95617 | 62.86 |
| Ghana | Medium Human Development | 1.355357 | 0.68176 | 18.9 |
| Yemen | Low Human Development | 1.320784 | 0.7086 | 22.55 |
| Morocco | Medium Human Development | 1.258877 | 0.94976 | 56.8 |
| Seychelles | High Human Development | 1.251017 | 0.93471 | 54.26 |
| Saint Vincent and the Grenadines | High Human Development | 1.217387 | 0.96062 | 56.48 |

Indicator 4.5.1 Secondary Graduation, Gender Parity Index (GPI)



| High Opportunity Countries | HDI Level | ICT Opportunity Index | Secondary Graduation GPI | Internet Access (%) |
|----------------------------|-----------------------------|-----------------------|--------------------------|---------------------|
| Qatar | Very High Human Development | 2.936592 | 0.84424 | 91.49 |
| Chad | Low Human Development | 2.517317 | 0.38826 | 2.5 |
| Antigua and Barbuda | High Human Development | 1.481408 | 1.02384 | 64 |
| Dominica | High Human Development | 1.444834 | 1.02832 | 62.86 |
| Morocco | Medium Human Development | 1.297598 | 1.03179 | 56.8 |
| Nigeria | Low Human Development | 1.282123 | 0.87336 | 42.68 |

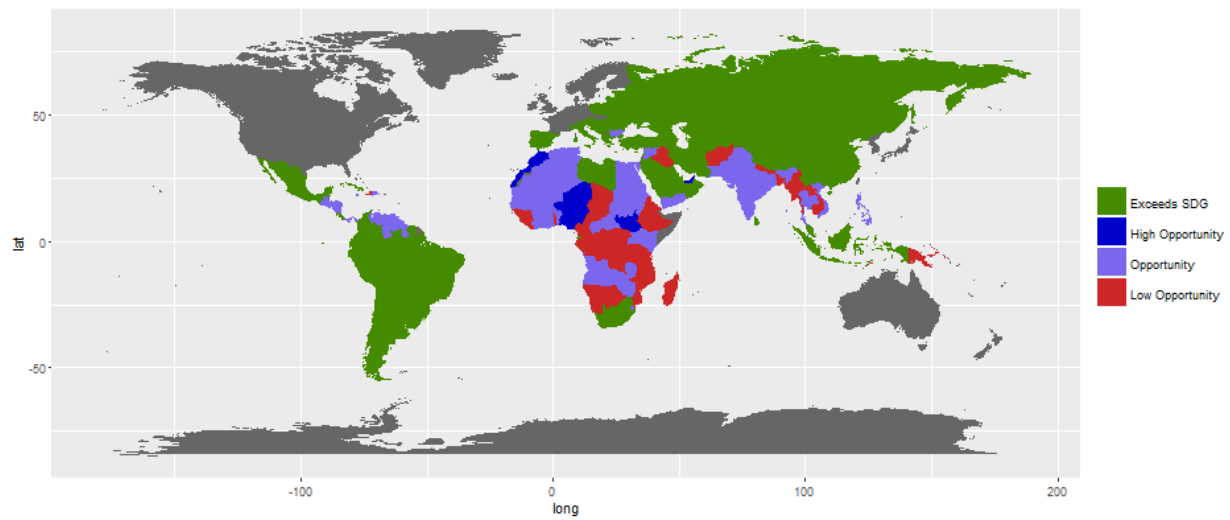
Indicator 4.5.1 Tertiary Enrollment, Gender Parity Index (GPI)



| High Opportunity Countries | HDI Level | ICT Opportunity Index | Tertiary Enrollment (GPI) | Internet Access (%) |
|----------------------------|-----------------------------|-----------------------|---------------------------|---------------------|
| Liechtenstein | Very High Human Development | 15.2387 | 0.55308 | 95.21 |
| Korea, Rep. | Very High Human Development | 8.920203 | 0.75367 | 84.33 |

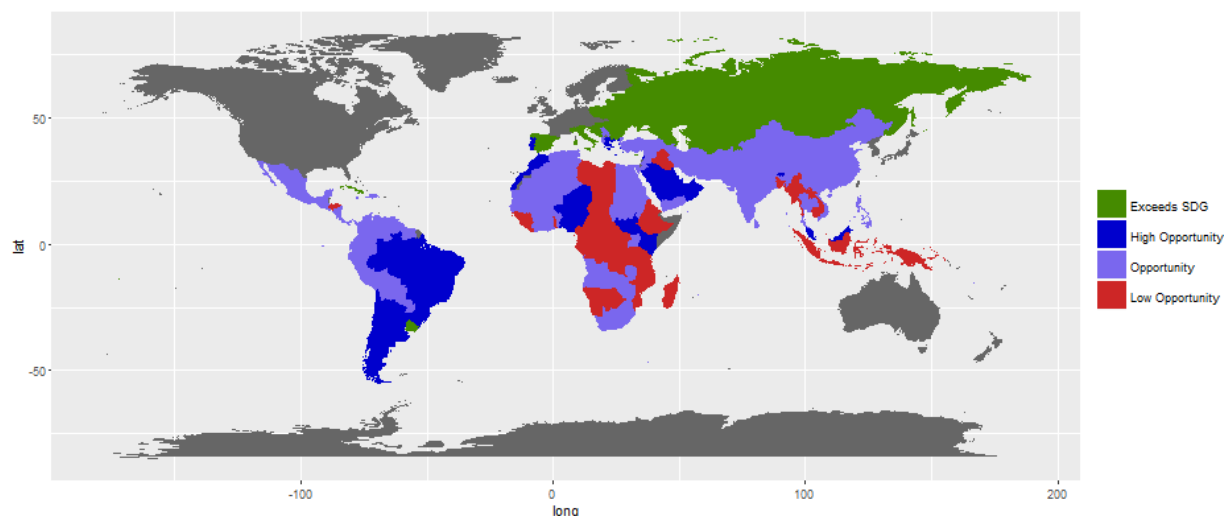
| | | | | |
|-------------------|-----------------------------|----------|---------|-------|
| Japan | Very High Human Development | 7.551935 | 0.91311 | 90.58 |
| Germany | Very High Human Development | 7.093902 | 0.92266 | 86.19 |
| Uzbekistan | Medium Human Development | 5.642213 | 0.64244 | 43.55 |
| Kenya | Low Human Development | 4.994953 | 0.70288 | 43.4 |
| Saudi Arabia | Very High Human Development | 4.988458 | 0.95994 | 63.7 |
| Yemen, Rep. | Low Human Development | 4.959547 | 0.44191 | 22.55 |
| Nigeria | Low Human Development | 4.778885 | 0.71787 | 42.68 |
| Turkey | High Human Development | 4.569828 | 0.85857 | 51.04 |
| Morocco | Medium Human Development | 4.433119 | 0.96192 | 56.8 |
| Equatorial Guinea | Medium Human Development | 4.053911 | 0.44723 | 18.86 |

Indicator 4.6.1 Youth Literacy (%)



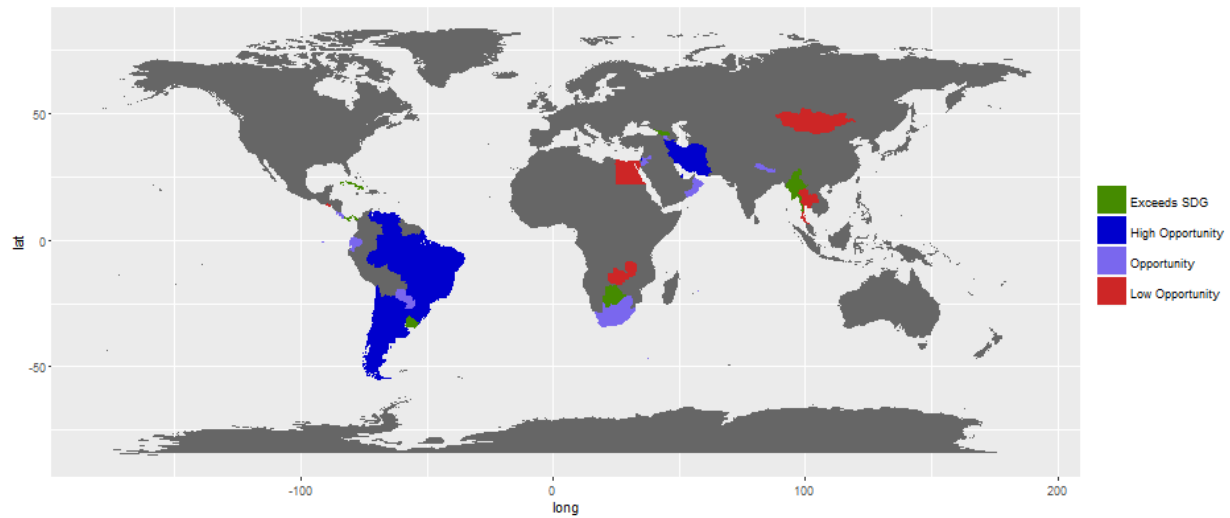
| High Opportunity Countries | HDI Level | ICT Opportunity Index | Youth Literacy (%) | Internet Access (%) |
|----------------------------|-----------------------------|-----------------------|--------------------|---------------------|
| Niger | Low Human Development | 2.245804 | 23.52378 | 1.95 |
| United Arab Emirates | Very High Human Development | 0.9844102 | 95.00645 | 90.4 |
| South Sudan | Low Human Development | 0.8878987 | 36.70227 | 15.9 |
| Nigeria | Low Human Development | 0.7669385 | 66.38354 | 42.68 |
| Morocco | Medium Human Development | 0.758864 | 81.51007 | 56.8 |

Indicator 4.6.1 Adult Literacy (%)



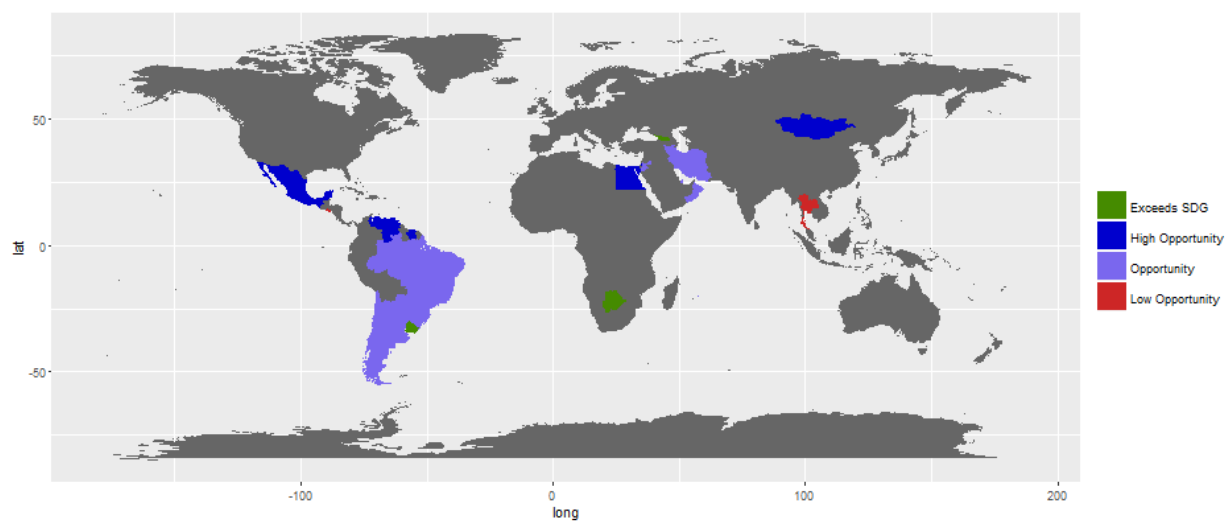
| High Opportunity Countries | HDI Level | ICT Opportunity Index | Adult Literacy (%) | Internet Access (%) |
|--|-----------------------------|-----------------------|--------------------|---------------------|
| Niger | Low Human Development | 2.245804 | 15.4567 | 1.95 |
| South Sudan | Low Human Development | 1.123907 | 26.83128 | 15.9 |
| United Arab Emirates | Very High Human Development | 1.041372 | 90.03384 | 90.4 |
| Nigeria | Low Human Development | 1.01488 | 51.07766 | 42.68 |
| Bahrain | Very High Human Development | 0.9888087 | 94.55679 | 90.99998 |
| Qatar | Very High Human Development | 0.9558901 | 97.74669 | 91.49 |
| Morocco | Medium Human Development | 0.9390742 | 67.08416 | 56.8 |
| Singapore | Very High Human Development | 0.8688803 | 96.54015 | 82 |
| Lebanon | High Human Development | 0.8644211 | 89.61244 | 74.7 |
| Kuwait | Very High Human Development | 0.8435713 | 95.58582 | 78.7 |
| Malta | Very High Human Development | 0.8067176 | 93.30736 | 73.17 |
| Oman | High Human Development | 0.7872971 | 91.9812 | 70.22 |
| Bhutan | Medium Human Development | 0.7777642 | 52.81469 | 34.37 |
| Chile | Very High Human Development | 0.7645167 | 96.70301 | 72.35 |
| Malaysia | High Human Development | 0.7456038 | 93.11788 | 67.5 |
| Brunei Darussalam | Very High Human Development | 0.7319647 | 96.08556 | 68.77 |
| Macedonia, the former Yugoslav Republic of | High Human Development | 0.7107962 | 97.63467 | 68.06 |
| Portugal | Very High Human Development | 0.7010565 | 94.47705 | 64.59 |
| Saudi Arabia | Very High Human Development | 0.6917667 | 94.42635 | 63.7 |
| Argentina | Very High Human Development | 0.6727062 | 97.97376 | 64.7 |
| Greece | Very High Human Development | 0.6610811 | 97.47356 | 63.21 |
| Kenya | Low Human Development | 0.6523037 | 72.15703 | 43.4 |
| Brazil | High Human Development | 0.6490384 | 91.48424 | 57.6 |

Indicator 4.a.1 Computers for Pedagogical Purposes (%)



| High Opportunity Countries | HDI Level | ICT Opportunity Index | Computers (%) | Internet Access (%) |
|-----------------------------------|-----------------------------|-----------------------|---------------|---------------------|
| Venezuela, Bolivarian Republic of | High Human Development | 20.8324 | 48 | 57 |
| Qatar | Very High Human Development | 4.157779 | 58.5 | 91.49 |
| Maldives | High Human Development | 2.326748 | 58 | 49.28 |
| Brazil | High Human Development | 1.331851 | 70 | 57.6 |
| Iran, Islamic Republic of | High Human Development | 1.15158 | 65 | 39.35 |
| Argentina | Very High Human Development | 1.019746 | 81 | 64.7 |
| Chile | Very High Human Development | 1.009472 | 85.5 | 72.35 |
| Palestine, State of | Medium Human Development | 1.004903 | 75.5 | 53.67 |
| Dominica | High Human Development | 0.9763781 | 81.5 | 62.86 |

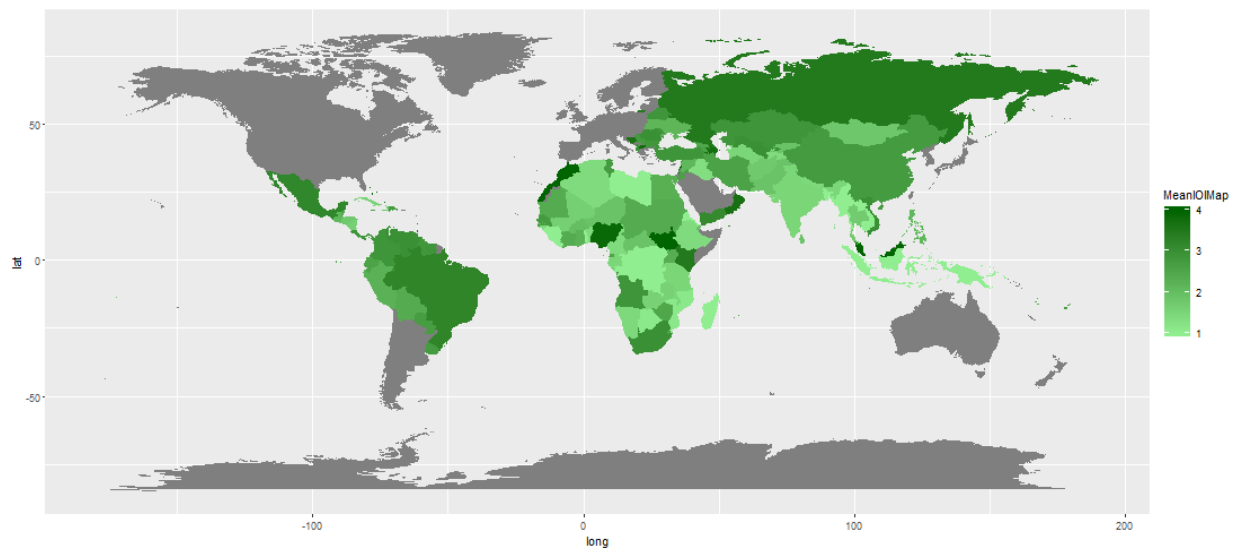
Indicator 4.a.1 Computers with Internet (%)



| High Opportunity Countries | HDI Level | ICT Opportunity Index | Internet (%) | Internet Access (%) |
|-----------------------------------|--------------------------|-----------------------|--------------|---------------------|
| Venezuela, Bolivarian Republic of | High Human Development | 4.858481 | 29 | 57 |
| Palestine, State of | Medium Human Development | 4.345945 | 29.5 | 53.67 |
| Egypt | Medium Human Development | 8.312241 | 22.5 | 31.7 |
| Mongolia | High Human Development | 1.609578 | 33 | 27 |
| Mexico | High Human Development | 1.603437 | 42 | 44.39 |
| Suriname | High Human Development | 1.228638 | 46 | 40.08 |

Countries with the greatest potential for ICT impact on SDG 4 overall according to the IOI

By combining the IOI ratings for each indicator, a list of the countries with the overall greatest potential for ICT impact on SDG 4 could be calculated. The following procedure was followed to calculate this. 1) For each indicator countries have been grouped by quarters, the mean of all those groupings was taken across all 10 of the indicators it was possible to calculate the IOI for. A score of 4 would mean that the country was a high opportunity for every IOI that was calculated for it. 2) Very high development countries were dropped from the list as well as countries which had an IOI for fewer than 50% of the indicators. The map shows the countries of greatest potential in darkest green and the table lists the top 25.



| Countries | HDI Level | Internet Access (%) |
|----------------------------|--------------------------|---------------------|
| Lebanon | High Human Development | 74.7 |
| Malaysia | High Human Development | 67.5 |
| Morocco | Medium Human Development | 56.8 |
| Nigeria | Low Human Development | 42.68 |
| Macedonia | High Human Development | 68.06 |
| Azerbaijan | High Human Development | 61 |
| Antigua and Barbuda | High Human Development | 64 |

| | | |
|---|--------------------------|-------|
| Trinidad and Tobago | High Human Development | 65.1 |
| Oman | High Human Development | 70.22 |
| Kenya | Low Human Development | 43.4 |
| Saint Vincent and the Grenadines | High Human Development | 56.48 |
| Dominica | High Human Development | 62.86 |
| Mexico | High Human Development | 44.39 |
| Palestine | Medium Human Development | 53.67 |
| Yemen | Low Human Development | 22.55 |
| Maldives | High Human Development | 49.28 |
| Albania | High Human Development | 60.1 |
| Barbados | High Human Development | 76.67 |
| Romania | High Human Development | 54.08 |
| Seychelles | High Human Development | 54.26 |
| South Africa | Medium Human Development | 49 |
| Saint Lucia | High Human Development | 51 |
| Uzbekistan | Medium Human Development | 43.55 |
| Venezuela | High Human Development | 57 |
| Viet Nam | Medium Human Development | 48.31 |