the Education Commission

Background Paper

The Learning Generation

The Data Revolution in Education

UNESCO Institute for Statistics

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The data revolution in education

UNESCO Institute for Statistics

The UNESCO Institute for Statistics (UIS) is the statistical office of UNESCO and is the UN depository for global statistics in the fields of education, science and technology, culture and communication.

The UIS was established in 1999. It was created to improve UNESCO's statistical programme and to develop and deliver the timely, accurate and policy-relevant statistics needed in today's increasingly complex and rapidly changing social, political and economic environments.

The UIS is based in Montreal, Canada.

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Executive summary

The Agenda for Sustainable Development and Education 2030 present an ambitious new policy vision for the international education community. This vision places new demands on countries, especially producers and users of education data. For Sustainable Development Goal (SDG) 4, “inclusive and equitable quality education and lifelong learning opportunities for all,” the main challenge for countries is to measure and monitor targets that are characterised by their broad scope, the thematic focus on quality and equity, and the need to enhance national institutional and technical capacities.

The production and dissemination of high quality education statistics is essential for effective planning, as well as for monitoring progress towards national and global education targets. For SDG 4, it is necessary to rely on a combination of data from administrative records, household surveys and learning assessments. Yet for many of the 43 indicators under SDG 4, data are currently incomplete, which makes monitoring difficult or impossible. It can also result in poorly-designed policies, leading to inefficient use of resources. Other challenges for countries faced with the new education agenda include inadequate funding for statistical activities, weak institutions, limited technical capacity, lack of adherence to international norms and standards, and insufficient coordination both at the national level and among national and international stakeholders.

Activities aimed at addressing these challenges can be organized under three broad areas that address both the demand and the supply sides of national education information systems: the enabling environment, data production, and data dissemination and use. Together these activities are part of the data revolution that can respond to the needs of the 2030 education agenda.

At the level of the enabling environment, there is a need for strong national institutions that are well-funded and staffed by qualified individuals. These institutions should be supported by investments in technical capacity and an effort to overcome fragmentation of the education sector across different government agencies. Better coordination it also necessary at the intersection of national governments and international organizations. Donor support is critical, but it should be driven by the needs of countries and national policy and planning priorities.

Data production must also be improved, starting with adherence to existing international norms and standards and agreement on new standards that may be required in response to the demand for new data and indicators. The use of data from a variety of sources demands skills and resources that may not yet be available in all countries.

Lastly, national and international mechanisms for data dissemination and use must be strengthened. Options include the adoption of open data practices, investment in new information technologies for data storage and presentation, and greater data integration and systematic information exchanges among different levels of government and other institutions.

This paper recommends a data revolution in education built on the foundation of national statistical systems, supported by international organizations in a global compact for monitoring the education SDG. In this compact, international organizations that serve UN Member States provide technical assistance, enhance coordination among stakeholders, and support the production of data as a global public good, thus reducing transaction costs for countries in pursuit of the goal of quality education for all.

Key recommendations

Recommendation 1

Fact: *Current roles and responsibilities at the international and national levels are not clearly delineated with regard to international monitoring. At the international level, despite some agreement in the Incheon Declaration, there are still uncertainties as to who shall produce indicators, how the decisions are made on methodologies, and what the global institutional settings should be. At the national level, the focus on equity and learning outcomes implies that new national stakeholders must be involved in the global reporting exercise, which was previously limited to interaction between EMIS departments and the UNESCO Institute for Statistics (UIS). But it remains unclear how this might be organized in practice.*

Recommendation: Establish governance mechanisms to ensure efficient participatory, transparent and robust international monitoring of SDG 4. At the international level, the Technical Cooperation Group (TCG) on the Indicators for SDG 4 – Education 2030 should be sustainably supported as the main platform to develop and apply the required global and thematic frameworks and indicators needed to monitor the education targets. The TCG will provide a technical platform to discuss and develop the indicators used for monitoring Education 2030 targets among Member States and other stakeholders in an open, inclusive and transparent manner. It will recommend necessary actions to improve data availability. At the national level, international reporting must be institutionalised through the creation of SDG 4 focal points that will ensure all data required to monitor SDG 4 are provided to the UIS. Donors should ensure that all countries have sufficient resources to effectively produce international reporting based on national data sources. As the primary data repository for international monitoring in the field of education, the UIS should build a transparent and accessible SDG 4 – Education 2030 database. The database should align with TCG recommendations and use data validated by countries, with quality assured by sound data processing methodologies.

Recommendation 2

Fact: *Despite the key role of national education information systems in the international monitoring architecture, there is too little support for national statistical capacity, not enough coordination among regional and international agencies, and lack of alignment with national policies.*

Recommendation: Create an Education Statistics Trust Fund to support national capacity to collect, produce and disseminate education data. This would include all data sources, from household surveys, administrative data and learning assessments to governance and legislation. The initiative would rely on a dedicated fund for statistical capacity building, which would disburse funding and coordinate support and implementation of national strategies for the development of education statistics. Funding and support will be allocated according to sector-wide strategies in education statistics, which shall be nationally led and supported by development agencies. PARIS21 and the UIS would spearhead the fund, to be integrated into the National Strategies for the Development of Statistics (NSDS) approach. The UIS would be in charge of coordinating with national and regional partners on the ground to ensure that credible national strategies are designed and that all partners are working towards the same objectives. The implementation could rely on an education data cluster, modelled on of what development partners are currently doing in many countries for education in general. Around $152 million would be needed over 10 years to support low- and lower-middle-income countries to improve

their systems, with $27 million to $30 million for computerisation of systems, which could be supported by private sector IT companies (see recommendation 7).

Recommendation 3

Fact: *Many populations remain invisible from the global statistical portrait and therefore out of reach of a potential SDG 4 monitoring dashboard. There are almost 60 million forcibly displaced people worldwide, one third of which are refugees. Among those, more than one half are under the age of 18. But the statistical capacity to measure the educational needs of the forcibly displaced has yet to be improved to a level that would enable the international community to be fully aware of the situation. Children with disabilities are also strikingly absent from all international initiatives that are trying to monitor equity in education, as are orphans and many other vulnerable groups.*

Recommendation: Create a dedicated international task force to make the invisible visible in international statistics. The task force would mobilise all stakeholders towards ensuring that refugees, disabled children, orphans and other vulnerable groups are included in the global SDG 4 dashboard. It would leverage the expertise of its various constituencies to ensure that these vulnerable groups are either included in existing data exercises (sample boost, definition of standard questions for identification, etc.) or that dedicated data collections are implemented to capture the situation of those that cannot be targeted by current data collection exercises. The task force would rely on and relay the work of groups such as the Education in Emergencies Working Group or the Washington Group on Disability Statistics to produce international guidelines for introducing vulnerable populations into all education data collection. It should also support agencies at the front line of the statistical struggle, such as UNHCR and UNRWA, to help develop robust, comprehensive and sustainable education information systems.

Recommendation 4

Fact: *It is clear by now that there are insufficient data for monitoring SDG 4, particularly with regard to equity. Dimensions of equity are not measured in a comparable way across instruments (EMIS, household surveys, learning assessments, etc.), countries (developing and developed), and international agencies. National and international norms and standards are either non-existent or not consistently applied, which can lead to incompatible data and ultimately misinformed policies. Household survey data collection instruments are not harmonised and, as a consequence, indicator values are not always comparable, leading to poorly informed decisions.*

Recommendation: International household survey programmes should be harmonised so that comparable education indicators on school attendance, attainment, literacy, expenditure, equity and other areas can be produced. More support must be given to national statistics offices to carry out these surveys on a regular basis, and ministries of education should be involved so that they use the data more systematically. Efforts to improve measurement should be strengthened and secured as critical platforms for developing and promoting the use of international standards and harmonised methodologies. These efforts include work by the Inter-Agency Group on Education Inequality Indicators to harmonise approaches for using disaggregated survey-based education indicators, and by the global Out-of-School Children Initiative to improve measures of participation of children and youth in schooling. Around $17 million over 10 years would be needed to support national statistics offices in low- and lower-

middle-income countries to expand education sections in household surveys and have data collections carried out at least every five years.

Recommendation 5

Fact: *With the strong emphasis on learning in the SDG agenda, there are two key sets of challenges to address. The first is reconciling the multiplicity of learning assessments within a common framework. The second is reducing the high transaction costs currently associated with the lack of coordination and duplication of efforts. Many measurement exercises (national, regional and global) frequently collect data on basic competencies in mathematics and literacy. Yet these assessments cannot be used in an integrated manner to provide a global picture of learning. In addition, any technical solution must take into account multiple viewpoints. It must identify globally relevant areas of learning; conceptualise how national and regional data can help inform global education measurement; and strike an appropriate balance between global competences and the role of local influences and goals on education.*

Recommendation: Foster a participatory process to enhance and leverage national learning assessments; ensure implementation of sound national learning assessments through international methodological guidance; and secure adequate external funding support for international reporting of quality assured national learning assessment data. This implies defining a universal learning scale (ULS) and the tools to implement and provide country ownership over the measurement of learning for international monitoring. Under the coordination of the UIS, common frameworks for learning will be defined and integrated into a universal learning reporting scale, which will serve as the backbone for supporting reliable national assessments and informing global monitoring by linking national results to a global scale. To ensure data quality, the UIS will develop a data quality assurance framework (DQAF) to certify that data meet statistical standards. A platform for a participatory approach to measurement of learning is needed in support of innovation proposed by the UIS. The Global Alliance to Monitor Learning (GAML) will then serve as a broad-based coalition of international agencies, donors, academics and practitioners. It will be reinforced to support ongoing dialogue among stakeholders to help identify issues and solutions and to gain support from the wider education community for these new approaches. Supporting countries to improve and expand sample-based assessments, including participation in regional and/or international assessments, would require around $297 million over 10 years.

Recommendation 6

Fact: *Education finance data generally cover only government expenditure (and often only partially) and lack the detail needed by policymakers. Data, when available, come from multiple institutions using different classifications, making consolidation difficult. As a result, data availability is insufficient, whether at national or international levels. This prevents objective discussions on the real cost of education service delivery, cost-sharing between governments and households, or equity and efficiency in the allocation of available resources.*

Recommendation: Countries must be supported to improve the quality and coverage of education finance data, using National Education Accounts (NEAs) as a common methodology to cover all sources of funding in a coherent manner. The scope of the exercise should be adapted to national needs and data availability. Where relevant, countries should use a step-by-step approach, but using NEA principles from the outset. Funding should be made available for around one half of low- and lower-middle-income countries to do one full NEA and one update of the accounts over a 10-year period. The other half of countries should be supported through

a more limited programme covering only part of the NEA. For example, countries could start with government expenditure while still following the methodology so that, over time, they can add more sources. Over 10 years, this support to 82 low- and lower-middle-income countries would cost around $16 million. Efforts should be made to establish the tool as the international standard on processing and consolidating education finance data. Work should also be done to grow a strong international partnership around NEA, building on the existing collaboration between the UIS and the IIEP, adding other partners, and linking with other existing initiatives (such as the World Bank's BOOST Initiative on government expenditure data).

Recommendation 7

Fact: *The current state of technology enables the world to grapple with some 2.5 quintillion bytes every day. Google processes 3.5 billion requests per day. Amazon has some 1.4 million servers spread across the world. Yet paper remains the main data collection tool for many ministries of education and national statistics offices. When it comes to education statistics, technology is not sufficiently leveraged. Most institutions dealing with education data are still tied to outdated infrastructures and have staff with limited IT skills.*

Recommendation: Mobilise private sector IT to provide in-kind contributions to national and international agencies involved in the collection and production of education statistics. It is estimated that equipping developing countries with basic IT infrastructure for education data collection, processing and dissemination would amount to some 0.002% of the total annual revenues of the 14 biggest IT companies. Many IT-led philanthropic initiatives have tried to bring technology to the classroom in developing countries. None has tried to bring technology to national offices for education statistics. International agencies such as the UIS, the World Bank and UNICEF could partner with the main IT companies to discuss what is needed and how this could be achieved in practice.

Recommendation 8

Fact: *Many professionals in education believe that data literacy is an essential skill to succeed in twenty-first century life. Yet data literacy is still not part of the common skill set of the education community. At the international level, non-use, misuse and abuse of data are frequent. The result is fear of data and misunderstanding of the role of statistics. There is also little transfer of knowledge between international agencies and national statistics offices to provide country ownership over indicators used for monitoring international development goals. National statisticians are not trained enough to fully grasp the methodological framework behind the SDG agenda. There is also high demand from national statisticians to develop their statistical and analytical skills. They see this as part of the mandate of institutions like the UIS.*

Recommendation: Create an online school of education data and statistics, modelled on current Massive Open Online Courses (MOOCs), to deliver regular and accredited training to national statisticians and practitioners in the field of education. The UIS would coordinate the school, building on its own work and mobilising partner universities to deliver foundational, intermediate and cutting edge training on collection, processing and dissemination of education data and statistics. It could also provide access to open source resources for national statisticians to develop their data collections based on existing methodologies and tools.

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Acronyms and abbreviations

AES	Adult Education Survey
CAPI	Computer-assisted personal interviewing
CBS	Central Bureau for Statistics
CONFEMEN	Conférence des ministres de l'Éducation des Etats et gouvernements de la Francophonie
CSR	Country Status Report
CVTS	Continuing Vocational Training Survey
DDC	District Development Committee
DHS	Demographic and Health Survey
DQAF	Data quality assurance framework
ECOSOC	Economic and Social Council
EFA	Education for All
EMIS	Education Management Information System
ERCE	Estudio Regional Comparativo y Explicativo
ESCS	Economic, social and cultural status
EU-SILC	European Union statistics on income and living conditions
GAML	Global Alliance to Monitor Learning
GEP	General Education and Premises
GPE	Global Partnership for Education
GRA	Global and Regional Activities
HIV	Human immunodeficiency virus
IAEG	Inter-Agency and Expert Group
IAG	Inter-Agency Group
IEA	International Association for the Evaluation of Educational Achievement
ICCS	International Civic and Citizenship Education Study
ICILS	International Computer and Information Literacy Study
ICT	Information and communications technology
IDP	Internally displaced person
IIEP	International Institute for Educational Planning (UNESCO)
IT	Information technology
LLECE	Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación
LSMS	Living Standards Measurement Study
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
MOET	Ministry of Education and Training
MOOC	Massive Open Online Course
NEA	National Education Account
NGO	Non-governmental organization
NSDS	National Strategy for the Development of Statistics
OECD	Organisation for Economic Co-operation and Development
PARIS21	Partnership in Statistics for Development in the 21st Century
PASEC	Programme d'analyse des systèmes éducatifs de la CONFEMEN
PER	Public Expenditure Review
PERCE	Primer Estudio Regional Comparativo y Explicativo
PIAAC	Programme for the International Assessment of Adult Competencies
PILNA	Pacific Islands Literacy and Numeracy Assessment
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment

PMORALG	Prime Minister's Office Regional Administration and Local Government
SABER	Systems Approach for Better Education Results
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SDG	Sustainable Development Goal
SERCE	Segundo Estudio Regional Comparativo y Explicativo
SES	Socio-economic status
SNA	System of National Accounts
SPC	Secretariat of the Pacific Community
STEP	Skills towards Employment and Productivity
TCG	Technical Cooperation Group
TERCE	Tercer Estudio Regional Comparativo y Explicativo
TIMSS	Trends in International Mathematics and Science Study
TVET	Technical and vocational education and training
UIS	UNESCO Institute for Statistics
ULS	Universal learning scale
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
USAID	United States Agency for International Development
VDC	Village Development Committee

1. Introduction

The Agenda for Sustainable Development combined with Education 2030 present an ambitious new policy vision for the international education community. This vision places new demands on countries, especially producers and users of education data. In contrast to the Millennium Development Goals and Education for All, which emphasised universal completion of basic education and reducing educational disparities linked to sex, the focus of Sustainable Development Goal (SDG) 4 is "inclusive and equitable quality education and lifelong learning opportunities for all." This requires the prioritisation of certain key policy areas. The main challenge for countries is to measure and monitor the education targets of the SDGs, which are characterised by their broad scope, the thematic focus on quality (learning outcomes and skills) and equity, and the need to enhance national institutional and technical capacities[1].

Although many countries are challenged in collecting the most basic data on education systems, broader global monitoring efforts will require a wider range of indicators. Moreover, SDG 4 brings the most complex demands with its strong focus on quality education leading to effective learning outcomes, and with the importance given to the development of basic literacy and job-relevant skills of the population. Implementing the agenda on improving learning and the population's knowledge and skills in different domains is complex. This complexity poses a significant challenge to producing data and indicators required for monitoring progress towards SDG 4 targets linked to the quality of education.

Target 4.5 is the elimination of gender disparities and equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous people and children in vulnerable situations. To calculate the parity indices needed to monitor target 4.5, many of the 43 thematic indicators for SDG 4 will have to be disaggregated by sex, location, wealth and other characteristics. As a result, equity-related measures represent about 60% of the total number of point estimates needed for complete monitoring of all targets under SDG 4. The majority is not available in early 2016, according to an inventory conducted by the UNESCO Institute for Statistics.

The range and complexity of what governments and other education stakeholders must do to achieve education progress is impossible without good data. Governments are increasingly expected to run education systems and allocate resources in a way that helps strengthen overall system performance and reduce inequalities in all areas. In addition to inputs, data on outcomes need to be collected regularly so that governments can judge quickly if their attempts to improve the quality and equity of learning opportunities are making a difference. At the same time, bad data can lead to bad decisions. Without data, governments and others formulating policies or managing programmes are at a disadvantage – one cannot assess how best to use inputs or whether policies are actually working, and there is no way to judge whether the situation is getting better or worse.

Section 2 of this paper describes some of the current gaps for monitoring education progress, starting with a description of the main sources of data: administrative records, learning assessments, household surveys, and finance data collections. The discussion of challenges and data gaps is organized around three broad areas that underlie an effective information system: the enabling environment (including institutions and resources), data production (including norms and standards), and data dissemination and use.

[1] The authors acknowledge the contributions of UNESCO-IIEP to content related to education finance measures.

Some are calling for a data revolution to address our main challenges. These are the existing lack of good data to inform key policy issues; methodological challenges; and the need for technical capacity building at the local, national and international levels in response to the emergence of new technologies for collecting, processing and analysing data. The characteristics of a data revolution are described at the beginning of Section 3. The remainder of Section 3 contains concrete proposals to solve the problems described in Section 2.

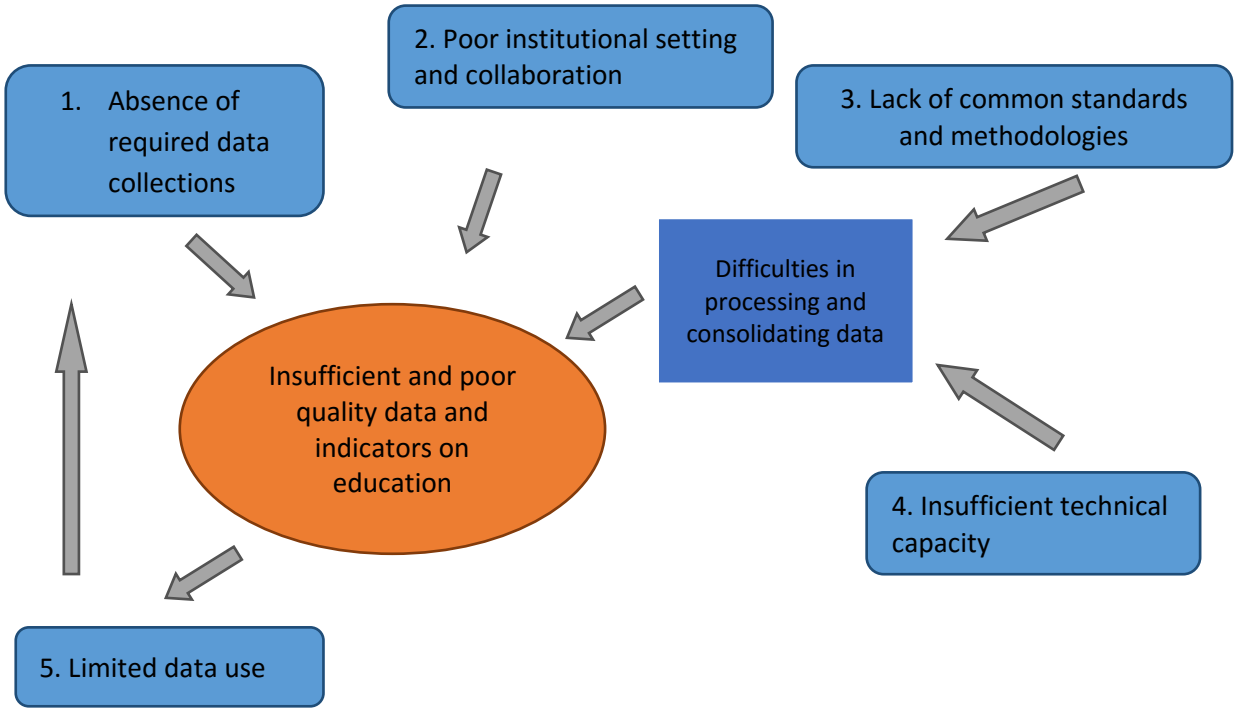
Section 4 presents estimates of the cost of a data revolution. Section 5 concludes the paper with a summary of its main findings.

2. Data gaps and other challenges posed by the SDGs and Education 2030

Monitoring SDG 4 requires reliable, high quality and cross-nationally comparable data from a variety of data sources, compiled at regular intervals. The data must be collected, processed and disseminated based on a common set of norms and standards. The data must also be made easily accessible to policymakers and other stakeholders to ensure that education policy is guided by sound data.

The production and dissemination of high quality education statistics is essential for effective planning, as well as for monitoring progress toward national and global education targets. Evidence-based planning reduces system costs by allocating resources more effectively. Where the required data exist and are timely, the added cost of improving the data is likely much lower than the implicit cost of bad information. Planning with old data inhibits optimal policy implementation, particularly with respect to resource allocation. For example, if enrolment data only become available nine months after a school year begins, there is little a government can do to reallocate teachers to improve student-teacher ratios across the school system for that year. If the government responds one year late and transfers resources based on outdated and inaccurate enrolment information, unnecessary funds will be spent.

Figure 1. Factors that can explain the lack and poor quality of education data



The challenges and constraints that can hinder the production and use of education data at the national and international level can be grouped around five key factors that are linked and reinforce each other *(see **Figure 1**)*. (1) the required data collections may not be carried out, (2) the institutional environment may be weak, (3) there may be a lack of standards and methodologies, (4) technical capacity may be insufficient, and (5) data use may be limited. As a consequence, education data can be difficult to collect, process and analyse.

The sections that follow describe some of these challenges in more detail, after a description of the main sources of data for monitoring education targets.

2.1 Data sources and data gaps for monitoring SDG 4

Some of the key data sources that constitute a comprehensive education data and information system include administrative datasets, data collected through household surveys, learning assessments, and finance and expenditure datasets.

Administrative data are based on information collected in the management of the education system. These are usually used by ministries of education for management and planning purposes, and are typically updated on a regular basis. Most of the international monitoring for the previous global development agenda (EFA and MDGs) was based on administrative data produced by countries and compiled by international organizations.

The new focus on equity and learning, as well as the more comprehensive nature of the SDG 4-Education 2030 agenda, implies that the global community must rely on additional sources – such as household surveys – to produce the full set of indicators required to report on education at the international level. It is well understood, however, that even mobilising new sources does not suffice to produce the full SDG 4 monitoring dashboard. A number of gaps remain.

Household surveys are an important source of data on access, participation and educational attainment. Surveys differ in terms of coverage, frequency, objective and questionnaire design. In contrast to administrative data, they are collected less frequently, and by a variety of organizations and countries. In some cases, the surveys are nationally implemented and in others, administered under the auspices of an international organization.

Learning assessments include national school-based assessments designed to measure specific learning outcomes at a particular age or grade that are considered relevant for national policymakers. They also include cross-national initiatives (either regional or global) that are based on a common, agreed-upon framework and follow similar procedures to yield comparable data on learning outcomes. Assessment data can also be collected from households.

Financial and expenditure data include information on government spending on education. Examples include construction and maintenance of schools, teacher salaries, and household spending on education, including supplies, transport and other costs.

For effective monitoring of the SDGs, a combination of data from a multiplicity of sources is essential. This is especially true for SDG 4, where administrative data, which play a crucial role for national planning purposes, provide only some information needed for monitoring progress towards the goal of inclusive and equitable quality education and lifelong learning opportunities for all. For many of the 43 indicators under SDG 4, other sources of data must be considered. Partial or incomplete data can make monitoring difficult or impossible and result in policies that

are poorly designed, leading to inefficient, ineffective and, in the worst case, counterproductive use of resources.

Several critical gaps are plaguing the current international monitoring dashboard. Some parts of the education system are not well covered. Some populations are excluded and, finally, some aspects of education simply do not have a source of data.

One of the most critical gaps is the fact that a number of population groups are notably absent from the statistical picture. These groups are thus invisible, although they are likely to be the most in need. These include children affected by armed conflict, refugees or internally displaced persons, and children with disabilities.

Another example of an area with data gaps is the measurement of the cost of education. Cost is frequently underestimated because family spending on children's education is not or only partly captured in government statistics. Despite the importance of good data at the national and international level, there are significant gaps when it comes to education financing statistics in terms of (a) coverage and availability and (b) quality and level of disaggregation.

Only one-half of the 202 countries and territories covered by the UNESCO Institute for Statistics (UIS) were able to provide data for total government expenditure on education at least once in the 2012-2014 period. The availability decreases further when data are requested by level of education or for detailed economic transaction, such as how much was spent on paying teachers. For private sources of funding, such as households, only 20% of countries provided any data over the period. For international sources, 30% of countries provided data. For developing countries, these proportions are even lower.

The percentage of countries that collect data required to produce indicators for learning outcomes ranges from 48% in Asia and the Pacific to 72% in Latin America and the Caribbean.

Table 1 provides an overview of the main datasets currently available for monitoring the education SDG, indicating not only the multitude of data sources but also the need for harmonisation and standardisation. While administrative data mainly cover the supply side of the education system – schools, teachers, public spending on education – household surveys complete the picture with information on the demand side, for example families with school-age children or adults participating in literacy programmes.

Figure 2 gives an overview of the availability of education data by sector. For enrolment in pre-primary to secondary education, availability of reliable data is high. For non-formal education, very little data are available.

Table 1. Available datasets on education by source and scope

Dataset	Organization	Main source	Years available	Variables covered
UIS Data Centre	UNESCO Institute for Statistics	Annual survey on education	Annually, 1970-2015	Out-of-school children, entry, participation, progression, completion, literacy, educational attainment, international student mobility, human and financial resources, teaching conditions, adult education, education system, population
EdStats	World Bank	UIS, other	Annually, 1970-2050	Out-of-school children, participation, progression, completion, literacy, educational attainment, human and financial resources, learning outcomes, population
DHS	USAID	Original data	Intermittent, varies by country	Out-of-school children, participation, literacy, educational attainment, other personal and household characteristics
MICS	UNICEF	Original data	Intermittent, varies by country	Out-of-school children, participation, progression, completion, literacy, educational attainment, other personal and household characteristics
LSMS	World Bank	Original data	Intermittent, varies by country	Out-of-school children, participation, educational attainment, expenditures on education, other personal and household characteristics
Eurostat	Eurostat	UNESCO-OECD-Eurostat data collection and other surveys	Data collected annually since 1995 for OECD countries	Entry, participation, progression, completion, international student mobility, human and financial resources, teaching conditions, educational attainment, languages, transition from education to work, education system, population data
OECD	OECD	UNESCO-OECD-Eurostat data collection and other surveys	Data collected annually since 1995 for EU countries	Entry, participation, progression, completion, international student mobility, human and financial resources, teaching conditions, educational attainment, education system, population data
Other household surveys and population censuses	Different providers	Original data	Intermittent, varies by country	Participation, literacy, educational attainment, other personal and household characteristics
PISA	OECD	Original data	Conducted first in 2000, since then every 3 years (2003, 2006, 2009, 2012, 2015)	Reading, mathematics and science at age 15. Achievement score and performance level, background information
PIAAC	OECD	Original data	First round 2008-2013, second round 2012-2016, third round 2016-2019	Household-based assessment. Literacy, numeracy and problem solving in technology-rich environment, foundational reading skills for ages 16-65. Literacy and numeracy score and performance level, background information
TIMSS	IEA	Original data	Conducted first in 1995, since then every 4 years (1999, 2003, 2007, 2011, 2015)	Mathematics and science at Grades 4 and 8. Achievement score and performance level, background information
PIRLS	IEA	Original data	Conducted first in 2001, since then every 5 years (2001, 2006, 2011, 2016)	Reading at Grade 4. Achievement score and performance level, background information
ICILS	IEA	Original data	2013, next study 2018	Student computer and information literacy at Grade 8. Achievement score and performance level, background information

ICCS	IEA	Original data	2009, 2016	Students' knowledge and understanding of concepts and issues related to civics and citizenship, as well as their value beliefs, attitudes, and behaviours. Achievement score and performance level, background information.
PASEC	CONFEMEN	Original data	Established in 1991, intermittent national surveys until 2014. From 2014 onward every 4 years.	Reading and mathematics in Grades 2 and 5, from 2014 onward it assesses Grades 2 and 6. Achievement score and performance level, background information
PILNA	Pacific Community	Original data	2012, 2015	Literacy and numeracy in Grades 4 and 6 of primary education. Achievement score and performance level, background information
SACMEQ	SACMEQ	Original data	SACMEQ I 1995-1999, SACMEQ II 2000-2004, SACMEQ III 2006-2011, SACMEQ IV 2012-2014	Reading and mathematics in Grade 6. Achievement score and performance level, background information
TERCE	LLECE	Original data	Conducted first in 1997 (PERCE), since then every 7 or 9 years. 2006 (SERCE) and 2013 (TERCE)	Languages (reading and writing), mathematics at Grades 3, 6, and Science at Grade 6. Achievement score and performance level, background information
STEP	World Bank	Original data	Launch in 2010, dissemination of result in 2014	Household-based assessment. Literacy and foundational reading skills for ages 15-64. Literacy score and performance level, background information

Note: EdStats contains education data provided by the UIS combined with data from other sources.

Figure 2. Availability of education data by sector

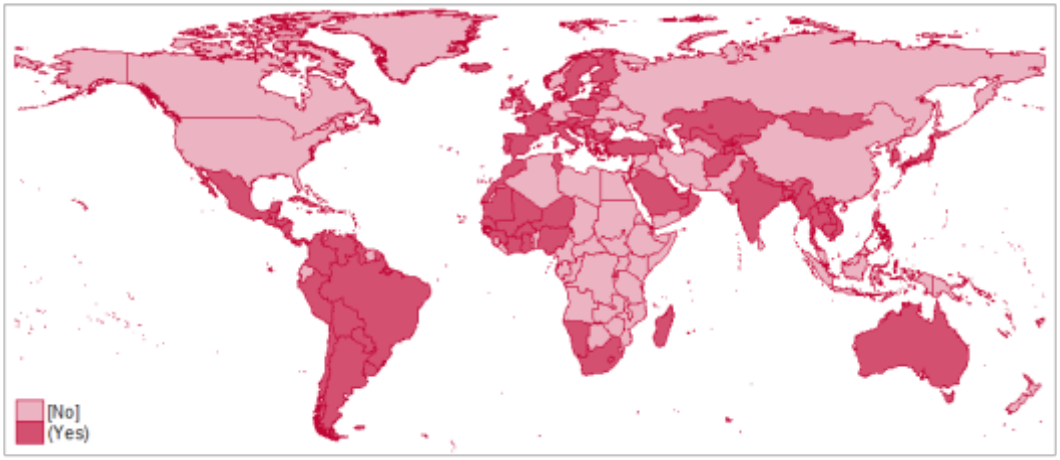
	Collected by UIS (for approximately 150 countries) and jointly by UIS/OECD/Eurostat (for approximately 60 countries)					Collected by: World Bank (LSMS)	Collected by OECD (PISA, PIAAC), World Bank (STEP), CONFEMEN (PASEC), LLECE (SERCE and TERCE)	Collected by: UNICEF (MICS), ICF (DHS), Eurostat (CVTS, AES)
	Enrolment	Graduates	Teachers' count	Teachers' training	Government expenditure	Household expenditure	Learning outcomes/skills assessment	Other sample surveys
Early childhood care and education		N/A						
Primary education								
General secondary education								
Formal TVET								
Non-formal TVET								
Formal adult education								
Non-formal adult education								
Tertiary education								

Data exist, usable, well defined, accessible and with very good coverage
Data exist, usable, well defined, accessible and with good coverage
Data exist, usable, well defined but would need extra efforts to compile nationally and report internationally
Some data exist but with limited coverage/quality/usability
No data/problematic data/require major developments and resources

Source: UNESCO Institute for Statistics

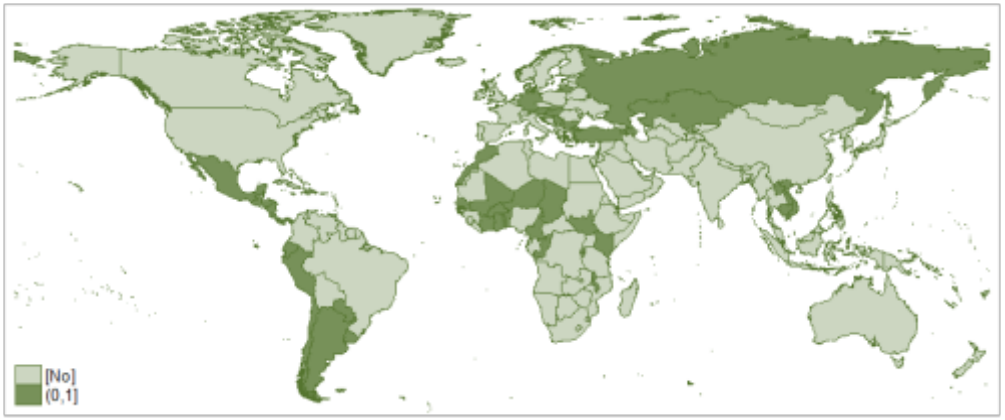
In addition to differences in coverage by sector, there are also large regional variations. As an example, consider the data on national and cross-national learning assessments in **Figures 3** and **4**. National learning assessments of language and mathematics at the end of primary education were carried out in nearly all of Latin America between 2010 and 2015 *(see Figure 3).* Coverage is also high in Western Europe, West Africa and some parts of Asia. In other regions, such as the Arab States and Eastern and Southern Africa, coverage is much lower.

Figure 3. National learning assessments (language and mathematics) at the end of primary education, between 2010 and 2015



Source: UNESCO Catalogue of Learning Assessments

Figure 4. Cross-national learning assessments (language and mathematics) at the end of primary education, between 2010 and 2015



Source: UNESCO Catalogue of Learning Assessments

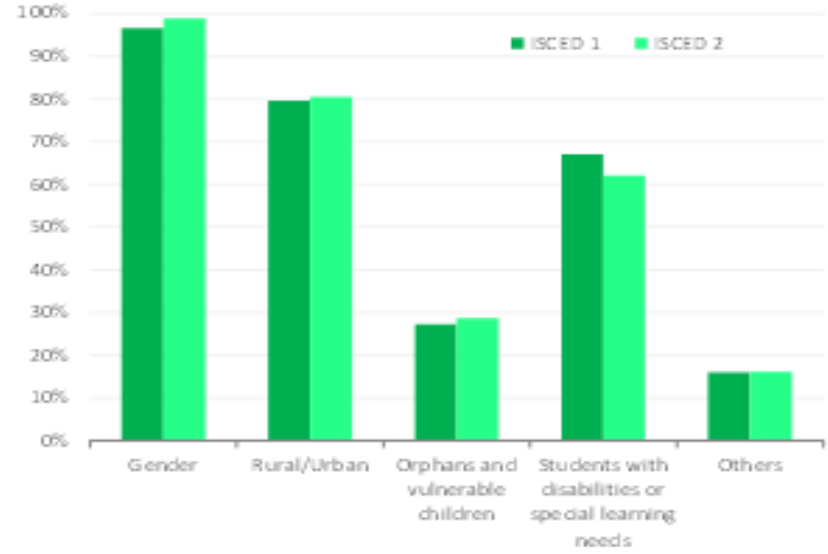
The pattern for cross-national learning assessments of language and mathematics at the end of primary education is very different *(see Figure 4).* Overall, cross-national assessments have been carried out in fewer countries than national assessments. This is true even though five of the seven education targets in SDG 4 focus on learning outcomes for children, young people and adults.

Equity is a particular concern. Figure 2 only indicates availability of data for national aggregates, but one of the most prominent features of the new international agenda is equity. A large share of the data currently not available are so because of the absence of appropriate disaggregation, or because some populations are simply excluded from any data collection.

Table 2 presents a summary of what is currently available in the various data sources highlighted above, as well as in other initiatives. Most equity-focused initiatives that attempt to produce data for the global monitoring of equity in education are actually secondary data sources relying mostly on non-education, non-equity-focused primary sources. They also come from the same primary sources, resulting in large overlaps in the various levels of education covered, equity dimensions and aspects of education. For instance, 90% of all the sources listed in Table 2 cover primary education, while only 20% look at pre-primary education, which is recognised as one of the most cost-effective interventions to enable disadvantaged children to catch up with their peers. The main reason is that most current household surveys do not examine pre-primary education in detail. Similarly, whereas all international multi-source initiatives look at gender inequalities, Table 2 shows that none look at children with disabilities or children in conflict-affected areas. Finally, all international initiatives consider participation in education, but very few provide data on the distribution of educational resources.

The gaps observed above are also particularly interesting to look at in light of what is collected by countries in their national systems. A review of 88 National School Census forms available in the UIS database indicates that nearly all countries collect data on students by sex and location (urban/rural). Data on children with disabilities or special learning needs are collected in 67% of countries *(see **Figure 5**)*. There are, however, populations that are still invisible in national Education Management Information Systems (EMIS): only one quarter of all countries collect information on orphans and vulnerable children, although they are a population group particularly at risk.

Figure 5. Collection of data on vulnerable groups in annual school census in selected countries



Note: Analysis includes 88 countries at the primary level and 87 countries at the lower secondary level.
Source: UIS School Census database

Table 2. Measuring equity with currently existing data sources

					ISCED Level					Equity dimension									Which aspect of education?							
Initiative/ survey	Author	Primary or secondary data source	Education focused	Equity focused	ISCED 0	ISCED 1	ISCED 2	ISCED 3	ISCED 4+	Gender	Rural/urban	Wealth	Disability	Location	Language	Ethnicity	Conflict-affected	Other	Resources/inputs	Access	Participation	Retention/Survival	Attainment	Learning outcomes	Literacy/skills	Geographic coverage
International data exercises (multiple data sources)																										
UIS- Administrative data	UIS	Secondary	Yes	No	○	○	○	○	○	○	✗	✗	✗	✗	✗	✗	✗	✗	○	○	○	○	○	✗	○	World
UIS- Household survey data	UIS	Secondary	Yes	Yes	✗	○	○	✗	✗	○	○	○	✗	✗	✗	✗	✗	✗	✗	✗	○	✗	✗	✗	✗	Developping countries
Educational Attainment and Enrollment around the W	D. Filmer, WB	Secondary	Yes	Yes	✗	○	○	✗	✗	○	○	○	✗	✗	✗	✗	✗	✗	✗	✗	○	○	○	✗	✗	Developping countries
DME-WIDE	UNESCO GEMR	Secondary	Yes	Yes	○	○	○	○	✗	○	○	○	✗	○	○	○	✗	✗	✗	○	○	✗	○	○	✗	World
Ed. Stats/Education Equality	World Bank	Secondary	Yes	Yes	✗	○	✗	✗	✗	○	○	○	✗	○	✗	○	✗	✗	○	✗	○	○	○	✗	✗	Developping countries
Socio-Economic Differences in Health, Nutrition and	Gwatkin et al., WI	Secondary	No	Yes	✗	○	✗	✗	✗	○	✗	○	✗	✗	✗	✗	✗	✗	✗	✗	○	✗	○	✗	✗	Developping countries
data.unicef.org	UNICEF	Secondary	No	No	✗	○	✗	✗	✗	○	○	○	✗	✗	✗	✗	✗	✗	✗	✗	○	○	✗	✗	○	Developping countries
UCW Project	ILO, UNICEF, WE	Secondary	No	Yes	✗	✗	✗	✗	✗	○	○	✗	✗	✗	✗	✗	✗	○	✗	✗	○	✗	✗	✗	✗	Developping countries
UNGEI	UN	Secondary	Yes	Yes	✗	○	○	✗	✗	○	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	○	○	✗	✗	○	Developping countries
OECD.stat	OECD	Secondary	No	No	○	○	○	○	○	○	✗	✗	✗	✗	✗	✗	✗	✗	○	○	○	○	○	✗	✗	OECD countries
International data exercises (single data source)																										
TIMMS	IEA	Primary	Yes	No	✗	○	○	✗	✗	○	○	○	✗	✗	○	○	✗	✗	○	✗	✗	✗	✗	○	✗	High to lower-middle income
PIRLS	IEA	Primary	Yes	No	✗	○	○	✗	✗	○	○	○	✗	✗	○	○	✗	✗	○	✗	✗	✗	✗	○	✗	High to lower-middle income
PISA	OECD	Primary	Yes	No	✗	✗	✗	○	✗	○	○	○	✗	✗	○	○	✗	✗	○	✗	✗	✗	✗	○	✗	High to lower-middle income
DHS	ICF	Primary	No	No	✗	○	○	○	○	○	○	○	○	○	○	○	✗	○	○	○	○	○	○	✗	○	Developping countries
MICS	UNICEF	Primary	No	No	✗	○	○	○	○	○	○	○	○	○	○	○	✗	○	✗	○	○	○	○	✗	○	Developping countries
Regional data exercises																										
UIS- Asia Survey on Teachers	UIS	Secondary	Yes	Yes	✗	○	○	○	✗	○	○	○	✗	○	✗	✗	✗	✗	○	✗	✗	✗	✗	✗	✗	East and South/West Asia
PASEC	Confemen	Primary	Yes	No	✗	○	✗	✗	✗	○	○	○	○	✗	○	○	✗	✗	○	✗	✗	✗	✗	○	✗	Africa (Fench speaking)
SAQMEC	SAQMEC	Primary	Yes	No	✗	○	✗	✗	✗	○	○	○	✗	✗	○	✗	✗	✗	○	✗	✗	✗	✗	○	✗	Africa (English speaking)
LLECE, SERCE, TERCE	UNESCO	Primary	Yes	No	✗	○	✗	✗	✗	○	○	○	✗	✗	○	✗	✗	✗	○	✗	✗	✗	✗	○	✗	LAC
Transmonee	UNICEF	Secondary	No	No	○	○	○	○	✗	○	✗	✗	○	✗	✗	✗	✗	✗	✗	✗	✗	○	✗	✗	✗	CEE/CIS
					20%	90%	60%	40%	20%	100%	75%	75%	20%	25%	45%	40%	0%	15%	50%	25%	65%	40%	40%	35%	25%	

Source: Daga et al. (forthcoming) and author's calculations

The reasons for low data availability for a relatively large number of the indicators under SDG 4 are explored in the sections that follow. Section 2.2 examines the enabling environment, Section 2.3 looks at data production, and section 2.4 is on data dissemination and use.

2.2 Enabling environment

Key messages

- National and international funding for statistical activities is insufficient, and countries' dependence on external finance can lead to donor-driven agendas that are not sustainable.
- Statistical technical capacity in national governments, especially line ministries, is often weak.
- Outdated technologies are used to collect, clean and analyse data, and the infrastructure for dealing with big data and data from multiple sources is not well developed.
- There is little transfer of knowledge and country ownership over indicators used for monitoring international development goals. National statisticians are not trained enough to fully grasp the methodological framework behind the SDG agenda.

The enabling environment for production of education data at the national and international level includes factors such as institutions and availability of financial and human resources. International data are only as good as national data. National systems, therefore, play the key role in the collection, processing, dissemination and use of data on education.

Any production of high visibility statistics meant to be high quality and used for either policy or international monitoring has to be done in a strong enabling environment. This includes clear definitions of roles and responsibilities, adequate coordination and data sharing procedures among stakeholders, commensurate resources, and respect for data quality as a cornerstone of any statistical work. In addition, transparency around the data production process is an important element. The terms and conditions under which statistics are collected, processed and disseminated should be made available to the public. Major changes in methodologies, data sources and statistical techniques should be announced when they are implemented.

Ineffective institutional frameworks, leadership and management cause inefficiencies and contribute to the deterioration of trust in products of the national statistical system. In such a context, policymakers and governments may be reluctant to be guided by available evidence and may not wish to provide data in an open and transparent manner to others.

Funding

Lack of funding is a persistent problem in developing countries. In 2013, only 0.24% of total official development assistance (ODA) was dedicated to statistics (PARIS21 2015). Donor money accounts for the majority of total budgets in several sub-Saharan African countries, where, in many countries, core data collections could not be carried out without external funding (Glassman 2014). Many countries in the region lack a clear view of what a yearly statistical exercise can cost. If a budget line exists and is earmarked to cover the recurrent costs of statistical exercises, it is often not executed, frequently the result of ad-hoc and discretionary budget cuts made by the Ministry of Finance. This is done even though the added cost of improving data is likely much lower than the implicit cost of bad information.

At the same time, a dependence on external finance can lead to a donor-driven agenda of statistical activities at the expense of maintaining a national statistical infrastructure and routine data collections. Moreover, a succession of development partners entering and leaving countries can lead to disruptions in the national system. The lack of cooperation among development partners remains a frequently observed challenge for strengthening systems. Poorly coordinated efforts can have a disastrous impact on ongoing capacity building strategies. In Tanzania, for example, recent parallel EMIS-related initiatives have entailed the duplication of efforts and significant resource waste. As this and other examples show, externally-driven capacity building projects often focus on developing new systems rather than building on what exists. Systems are often replaced and developed by external consultants or contractors with little regard for existing systems. As a result, financial and human resource investments made over time are lost.

A well-functioning enabling environment also implies an environment that nurtures the growth of national capacity to take ownership over its production of education data to monitor the performance of the education sector. Current practices and the focus of development communities do not always seem to be aligned with such objectives, however. Support for Pacific Islands, for instance, has not been effective so far despite the enormous influx of money that has been invested in the region. Support for countries by development partners in the region has been largely disruptive, with too little technology and knowledge transfer and capacity building. This is often a result of donors' project cycles combined with little genuine domestic demand for the kind of activities that have been carried out (Levine 2013). A corollary of this is the fact that countries in the region, following donor agencies' requirements and development partners' main orientations, have focused on developing data systems to report mostly on inputs rather than learning outcomes and equity.

Coordination

Current national systems in less developed countries often lack a sector-wide strategy for the production of education statistics. They may also have other problems that prevent them from generating the data needed for monitoring and supporting effective planning and policymaking. There is a multiplicity of actors, but coordination tends to be weak. Stakeholders can be insufficiently engaged. The needs of the most marginalised are rarely taken into account and do not influence statistical data collection, in spite of the focus on equity in the SDGs.

Statistical staff in line ministries work in difficult conditions, often lacking development opportunities. The most experienced staff members may be hired by donors or the private sector. Budget cuts, aimed at reducing administrative expenses, may disproportionately affect statistical agencies. Inadequate investment leaves statistical agencies unable to take advantage of new technologies. Where training is conducted outside a country, a negative impact is observed as units are depleted during the training period and staff are often not reintegrated into the unit on their return. Moreover, most training is generic and not contextualised to suit national procedures and systems, and is thus not sustained once a capacity building intervention ends.

The education sector is often fragmented across several ministries in charge of different sub-sectors, with no clear identification of responsibilities for data production, and no established protocols for sharing data. National and international household surveys are often under the responsibility of a National Statistics Office with little interaction with the statistical department of the national Ministry of Education, which maintains the Education Management Information System (EMIS). In addition to limited horizontal data exchange (i.e., among different ministries),

there is often limited vertical integration (i.e., among local, regional and national levels of administration). The result of this weak integration at the national level is an incomplete picture of the education system, resulting in limited analysis of available data and inefficient allocation of resources.

Bad governance of the production of education statistics is a major obstacle to the provision of high quality data for monitoring of equity in education. In equity, more so than in other aspects of education monitoring, linkages between all existing data sources are vital to identify bottlenecks and markers of exclusion. In most countries, the production of education statistics is done in silos, separated from other sectors such as social protection, health or civil registration statistics. Communication among all stakeholders involved in the production of education data and indicators is scarce to non-existent. In many countries, education data produced by the National Statistics Office are completely disconnected from the production in the Ministry of Education (see, for instance, the case of Tonga and Samoa in UIS, forthcoming). This is particularly damaging for the monitoring of equity in education, as national household surveys and censuses still constitute some of the main sources of data for snapshots of the state of educational equity in a country. The result is production of education indicators of varying quality, absence of comparability among national sources, as well as a missed opportunity to put in place quality control mechanisms through triangulation of data.

Moreover, the shift from central to decentralised EMIS systems presents a significant challenge. In some cases, the responsibility of service delivery has been entrusted to the states (for example, in Nigeria and Ethiopia) or to a structure other than the Ministry of Education (PMORALG in Tanzania, for instance). Yet such decentralisation or restructuring takes place without the requisite standards being defined at the highest levels.

Similar problems can be observed due to the increasing share of private education institutions, combined with the absence of strong accountability mechanisms for private schools to report to national bodies. This creates blind spots on the national education dashboard. The quality and quantity of education delivered, often to some of the most marginalised groups, is either not assessed or not assessed in the same way as for the public sector.

Inefficiencies and lack of coordination and collaboration are not limited to national contexts. Similar patterns are observed at the international level, including in the UN system. A recent evaluation of UN support to national statistical systems found that “at the country level, the United Nations system entities are not always acting as a coordinated, coherent and integrated system when supporting national statistical capacity development” and that “many countries receive United Nations system support in the form of many separate initiatives, often driven by global agendas, often at the regional level and across a wide range of national partners” (UN 2016).

Major current international exercises are all using the same data sources and do not tap into the wealth of data available from national systems. UNESCO, UNICEF and the World Bank, the three main producers of education data, have invested their resources not only in disseminating but also in producing equity related datasets using exactly the same data sources. This absence of coordination and collaboration results in:

1. a clear bias towards developing countries, although equity issues are not limited to low- and middle-income countries
2. a focus on the same three dimensions – sex, location and wealth – as these are the only ones consistently collected in most surveys

3. the neglect of important dimensions of education such as learning outcomes and inputs (teachers, learning environment, etc.), critical to fostering an understanding of equity issues
4. the production of datasets that are of little value to equity-related policy recommendations due to their lower frequency, limited coverage (analysis is difficult and/or the most marginalised groups of the population are excluded from the sampling design), and difficulty to focus the analysis and recommendations on actionable administrative and political levers (such as administrative divisions in charge of delivering education or schools).

At the international level, the enabling environment is also a cause for concern when it comes to monitoring the situation of those most in need. The education of children in conflict-affected situations is yet to be properly monitored (Montjourides 2013). Agencies in charge of refugees and displaced children are struggling to develop adequate systems to monitor education in emergency situations *(see **Box 1**)* as education data have yet to be part of the local and global response. Education receives only a small share of global appeal in emergency situations (UNESCO 2011). This relegates the inclusion of education data to a lower priority despite the dire need to develop an informed response to the needs of children in emergency situations. Under the current international settings, refugees and IDP children are completely absent from the global education dashboard. This is because there are neither resources to develop appropriate systems nor coordination among UN agencies to ensure the inclusion of refugees in global education numbers.

The problems described above also affect national learning assessments. In recent years, the field of learning assessment has shown significant growth and improvement across the world. However, many countries are still unable to sustain long-term, high-quality learning assessments that are aligned with international standards. The fragmented nature of various initiatives, which are often insufficiently coordinated and not standardised, creates friction, duplication and inefficiencies in the overall system.

Box 1. Invisible from the global statistical education portrait: Refugees and internally-displaced persons

According to the most recent estimates by UNHCR, there are 19.5 million refugees (14.4 million under UNHCR mandate and 5.1 million registered by UNRWA) and 32.3 million internally displaced persons (UNHCR 2015, 2016a). Just above one half of refugees are under the age of 18. The duration of displacement exceeds in many cases the length of an average basic education cycle. To take a contemporary example, the Syrian civil war, which began in 2011, has already lasted longer than a full four-year primary education cycle in the country. Yet little is known about the educational needs of refugee children and the current provision of educational services to this group. At best there is partial evidence, mostly about participation, and often just barely enough to confirm these children's dire educational situation. But this is not enough to plan a robust and coordinated response, much needed under the limited resources available, to address the diversity of educational situations, let alone respond to the international monitoring needs of the SDG agenda.

Two agencies are on the front line of the statistical struggle to depict the educational situation of refugee children and empower data as a meaningful policy tool: the United Nations High Commissioner for Refugees (UNHCR) and the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA). Both agencies face similar and specific challenges in monitoring children under their mandate.

The provision of education in refugee settings is characterised by a multiplicity of stakeholders and a wide diversity of situations. The situation of Syrian refugees is again a vivid illustration of this issue. There are a minimum of 50 different stakeholders involved in the regional response, including ministries of education, international organizations and civil society organizations (UNHCR 2016b). In some contexts, refugees are integrated into national education systems. In others, refugees may not be allowed to attend national schools depending on their nationality. For example, Syrian refugees in Egypt have access to national schools, while non-Syrian refugees do not. As a result of the diversity of settings, data on refugee education is typically fragmented across various humanitarian agencies, including UNHCR, UNRWA, UNICEF, the Education Cluster and NGOs.

In some situations, refugees and internally displaced persons remain mobile, making it difficult to track their education over time and across different systems. UNHCR's overall direction is moving towards integration of refugee children into national education systems to avoid parallel systems. This means that refugees' education should be tracked as part of a national EMIS. However, if this is done, refugee education will in most cases become invisible, as most national EMIS do not collect data on whether students are refugees or not. At the same time, identifying refugee children in national data collections could also raise important protection challenges that national offices need to be aware of.

The diversity of settings and stakeholders also results in a mixed bag of data collection instruments. Currently, UNRWA relies on manual education data collection at the school level for student enrolment, attainment and school premise information. In addition, other paper-based tools are used to collect data on specific populations, such as children with disabilities. UNRWA does, however, use a template to collect education data in a harmonised way and produce agency-wide standardised education indicators. The data collected manually are aggregated and entered into the UNRWA internal information system: the General Education and Premises (GEP) module as part of the School Data Sheets processes. From this, UNRWA is able to generate basic quantitative education indicators disaggregated by sex, such as enrolment headcounts, as well as average yearly repetition and drop-out rates. However, more complex and universal indicators, such as the sex-disaggregated survival rate, cumulative drop-out, or internal efficiency coefficients are still computed manually using data entered into the system.

Both agencies therefore face challenges related to data quality and its usefulness at the programming and planning stage. Asymmetry of information between what is being measured on the ground and global numbers being used at the central level in UNHCR is a particularly critical issue. In UNRWA there are, for instance, time lags related to manual computation that generate differences between the data sets compiled in the GEP and records at the field level. Quality assurance processes are also particularly difficult to implement due to the extremely mobile nature of individual students. The amount and quality of information available at the central level in UNHCR varies a lot due to differences in the quality of education data collection systems among sites.

Finally the importance and usefulness of education data also lie in their advocacy power: to relay to a broader audience the situation of those in need. Yet neither of the two agencies has a public database that would provide a window on the educational situation of refugees and IDPs. UNHCR disseminates a few flagship numbers. We are told that one-half of refugees' children are out of primary school and three-quarters of refugees' children are not going to secondary school (www.unhcr.org/5710da576.html). But there is little methodological detail to demonstrate what the numbers actually entail. UNRWA does not have a public database either but is able to produce more detailed numners than UNHCR, albeit for a much smaller population of concern (UNRWA caters to the needs of 493,500 students). UNRWA education data enable the organization to monitor spending per student and teachers, but also learning outcomes and teaching material (UNRWA, 2016). There is no available information, however, on the number of primary or secondary school-age students under the mandate of UNRWA, thus making it impossible to calculate the rate and number of out-of-school children. UNHCR does publish data on the number of children by age group under their mandate (http://popstats.unhcr.org/en/demographics). However, neither organization publishes a consistent and regular set of education indicators that would enable donors, NSOs and international agencies to monitor education issues throughout the whole education cycle (access, participation, retention, outcomes).

Human capital

Most education planning units are staffed with education professionals who lack the necessary statistical background and qualifications. On the other hand, statisticians and planners able to calculate a whole battery of education indicators may have limited capacity for developing stories behind the data. A deficient statistical culture remains an important drawback to statistical development in countries in sub-Saharan Africa, where technicians frequently resort to simple counting rather than interpreting data. Individuals who acquire relevant technical knowledge in data management and use are often attracted by more highly-paid positions or better working conditions. In addition, as decentralisation shifts more and more responsibilities to sub-national levels, the number of professionals required for data management and use increases exponentially. Because of financial considerations, head teachers, for example, rarely benefit from capacity building, which has a significant negative impact on data quality. At the level of data users, low data literacy can make findings difficult to understand.

Technical aspects

It is often argued that EMIS development projects prioritise software development at the cost of efforts to develop the core capacities of statisticians and planners. Indeed, database software constitutes only one of the elements of a reliable and sustainable EMIS. Nevertheless, it is an indisputable fact that many less developed countries suffer from weak systems. Using such systems is time-consuming and error-prone at different steps of the data processing phase: data entry, import-export, data consolidation, consistency checks, data extraction and reporting. In some cases, the core system functionalities required by statistical units –such as data entry control, estimation and imputation, projections, or archiving facilities – simply do not exist.

An additional limitation in this area is that most systems are developed and can only be maintained by high-level IT technicians, usually within a project setting. In several instances, a national EMIS team was trained in capturing data, but the database itself was located on a server outside the country. National actors had to ask the owner company to extract and produce national statistical outputs. Many countries are not able to incorporate even the smallest changes in their systems, either because the staff who developed them left without leaving any documentation, or because there is no maintenance contract with the company that owns the system. Equatorial Guinea and Congo are dramatic demonstrations of this situation: when these projects came to an end, data simply stopped being produced. Strategies for sustainable software development are essential in the current SDG context.

Only about 22% of primary schools in sub-Saharan Africa have electricity, and Internet connectivity is volatile. This illustrates the context in which EMIS systems are grounded. While there is considerable variation among countries in the region, many Ministries continue to rely on generators and must deal with the resulting instability. In countries where the EMIS needs to be strengthened, the availability and maintenance of basic services thus constitutes a challenge. Projects intended to strengthen EMIS will need to consider and respond to these challenges by integrating innovative hybrid solutions into the project design.

2.3 Data production

Key messages

- There is insufficient data for monitoring the Sustainable Development Goal on education, especially in relation to the key themes of education quality and equity.
- The SDGs emphasise equity but current data sources are often limited in their coverage of marginalised groups, making it difficult to design targeted policies. Some populations are completely absent from the global statistical portrait despite being the most in need.
- Dimensions of equity are not measured in a comparable way across instruments (EMIS, household surveys, learning assessments, etc.), countries (developing and developed), and international agencies.
- National and international norms and standards are either non-existent or not consistently applied, which can lead to incompatible data and ultimately misinformed policies.
- Household survey data collection instruments are not harmonised and, as a consequence, indicator values are not always comparable, leading to poorly informed decisions.
- Efforts to measure learning outcomes are scarce and fragmented, and the lack of a global standard means that results are not comparable.
- Not all countries conduct learning assessments and thus do not know the literacy and numeracy proficiency of children, youth and adults, and they cannot evaluate the performance of national education programmes.

Challenges related to data production concern norms and standards, data collection, statistical techniques, and data validation. According to international frameworks for the evaluation of quality of education statistics, the methodological basis for the production of statistics should be sound and follow internationally accepted standards, guidelines or good practices. It implies at the global level that producing agencies set the example and follow international standard classifications such as ISCED, that they calculate indicators using internationally agreed formulas and methodologies, and that they use the data in a rigorous way to produce an adequate picture of the education sector.

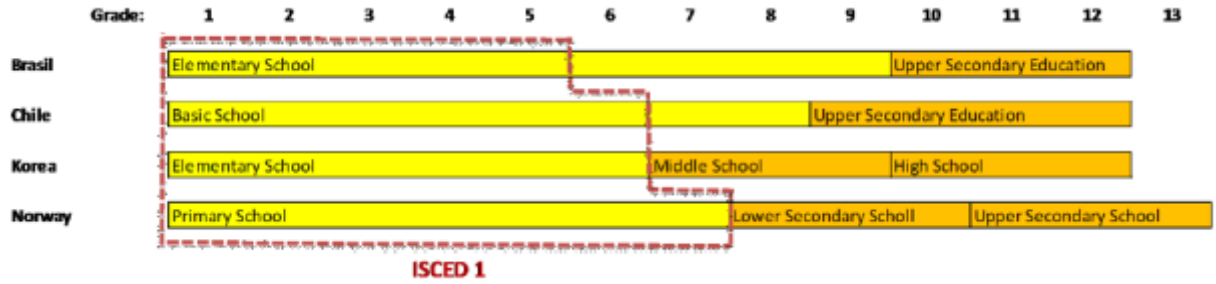
Norms and standards

The production of good data begins with agreement on norms and standards that will be applied at all stages of the process. Without such norms, data from different sources cannot be compared, which is of particular importance to cross-national monitoring of progress towards international goals.

Consider the data sources listed in Table 1. For cross-country comparisons of education statistics, UNESCO has developed the **International Standard Classification of Education**. The most recent version of ISCED was adopted in 2011 (UNESCO Institute for Statistics, 2012). The structure of national education systems differs across countries. To make data on enrolment in primary education and other indicators comparable, national data must be mapped to ISCED. As an example, **Figure 6** shows how data for Brazil, Chile, the Republic of Korea, and Norway can be made comparable by mapping different programmes to the same classification, in this case to identify ISCED level 1, primary education.

In the data sources listed in Table 1, ISCED is not uniformly applied and “primary education” in one country in one database is therefore not necessarily comparable to “primary education” in another country in another database. The data can therefore not be merged without additional processing and harmonisation, which may require considerable effort, depending on the amount of data that has to be treated.

Figure 6. Mapping of national education programmes to ISCED



Source: UNESCO Institute for Statistics

In **household surveys**, questions intended to collect the same piece of information can yield very different results if they are not standardised. For example, to collect data on school attendance, Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) ask whether a child has attended school at any time during a school year. By contrast, other surveys may ask about attendance during a certain reference period, for example during the four weeks preceding the survey interview. Non-standard questions used in the education modules of household surveys cause problems of comparability. Errors in survey design and data collection can even result in faulty data. Where surveys are well designed and implemented, they may not ask the questions needed to collect data required for monitoring specific goals. Often, education is a small module in a large, multi-purpose survey and there is limited room for expansion of the questions on education.

The **definition of disability** also poses problems for data collection and analysis. Persons with disabilities are explicitly mentioned in SDG 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”. However, identifying persons with a disability has long been a challenge for organizations carrying out household surveys. The Washington Group on Disability Statistics has developed a *Short Set of Questions on Disability* that are recommended for collecting data on adults (UN 2015a). But development of a similar survey module for children is only expected to be finalised in 2016 (ECOSOC 2015). Without a standard definition of what constitutes a disability and how it can be identified during data collection, data for persons with disabilities, including data related to SDG 4, are not comparable.

Another example is the measurement of socio-economic status (SES) using data from household surveys or learning assessments. The wealth dimension is measured in different ways, using information on income, consumption or assets owned by a household. The creation of household wealth quintiles or the identification of poor households in a survey sample yields different results depending on the approach used to measure household wealth. There is a risk of using wrong or misleading information to guide education policy design. Across instruments, countries and time, SES is not measured consistently. MICS and DHS use the widely accepted

asset index as a measure of wealth. PIRLS uses a proxy of SES, parental education and household items such as books. TIMSS and PISA use the Economic, Social and Cultural Status (ESCS), a composite index based on parental education, the international socio-economic index of occupational status, and the number of home possessions (Schulz 2006). PASEC uses a simplified SES indicator (see for instance CONFEMEN and Ministère de l'Education Nationale de Côte d'Ivoire 2012). LSMS and EU-SILC use income and consumption. But beyond variations across instruments, critical methodological issues arise when international initiatives compile datasets from multiple sources and, as done in some cases, present them as a single and homogenous source of data without the necessary caveats and metadata to ensure understanding.

Table 3. Measurement of urban/rural characteristics of schools in international and regional learning assessments

No.	Survey	Source	Variable	Location					
1	PISA 2012	School Question-naire	sc03q01	1 = A village, hamlet or rural area [<3 000]	2 = A small town [3 000,15 000]	3 = A town [15 000, 100 000]	4 = A city [100 000, 1 000 000]	5 = A large city [> 1 000 000]	
2	TIMSS 2011 G4	School Question-naire	acbg05a	1 = More than 500,000 people	2 = 100,001 to 500,000 people	3 = 50,001 to 100,000 people	4 = 15,001 to 50,000 people	5 = 3,001 to 15,000 people	6 = 3,000 people or fewer
3	TIMSS 2011 G8	School Question-naire	bcbg05a	1 = More than 500,000 people	2 = 100,001 to 500,000 people	3 = 50,001 to 100,000 people	4 = 15,001 to 50,000 people	5 = 3,001 to 15,000 people	6 = 3,000 people or fewer
4	PIRLS 2011 G4	School Question-naire	acbg05a	1 = More than 500,000 people	2 = 100,001 to 500,000 people	3 = 50,001 to 100,000 people	4 = 15,001 to 50,000 people	5 = 3,001 to 15,000 people	6 = 3,000 people or fewer
5	PASEC 2014 G2	School Question-naire	qd24	1 = A city	2 = A suburb of a large city)	3 = A big town (hundreds of families)	4 = A small town		
6	PASEC 2014 G6	School Question-naire	qd24	1 = A city	2 = A suburb of a large city)	3 = A big town (hundreds of families)	4 = A small town		

7	TERCE G3	School Question-naire	dqdit11	1 = 'Less than 2,000 people"	2 = "Between 2,001 and 5,000 people"	3= "Between 5,001 and 10,000 people"	4 = "Between 10,001 and 100,000 people"	5 = "More than 100,000 people"	
			dqdit12	1 = "An area considered as a rural area"	2 = "An area considered as an urban area"				
8	TERCE G6	School Question-naire	dqdit11	1 = 'Less than 2,000 people"	2 = "Between 2,001 and 5,000 people"	3= "Between 5,001 and 10,000 people"	4 = "Between 10,001 and 100,000 people"	5 = "More than 100,000 people"	
			dqdit12	1 = "An area considered as a rural area"	2 = "An area considered as an urban area"				
9	SACMEQ III	School Question-naire	slocat	1 = "isolated"	2 = "rural"	3 = "In or near a small town"	4 = "In or near a large town or city"		

Source: Altinok (forthcoming)

Absence of standards and comparability among ways to measure the dimension of equity also affects the measurement of rurality, for instance. Each of the existing international and regional learning assessments uses a different way to measure the rural or urban character of the area where the school is located *(see **Table 3**).*

Standards and coding used are of particular relevance for data on **education finance**. In most cases, there is a reasonably well-functioning public financial management system run by the Ministry of Finance, with common classifications and a joint reporting system for all central government ministries. However, central government expenditure is only part of the picture. Lower levels of government, which may also spend on education, do not always follow the same classification system as the central government, making consolidation difficult. This can be particularly problematic in federal or highly decentralised systems where education is mostly the responsibility of regional or local governments. In Ethiopia, basic education is the responsibility of 9 regions and nearly 1,000 *woredas* (local governments), which use a different expenditure coding system from each other, and from the central government.

Where a consolidated government expenditure system covering all levels is in place, data for other sources of funding will usually follow a different set of standards. In countries where donors do not report their support through the country's financial tracking system, there may be a parallel system of donor funding tracking using another set of classifications. This provides only broad aggregates or project-based data that make even simple disaggregation by sector difficult.

Similarly, surveys of private expenditure (household or other) – if they exist – will usually follow their own classifications, often not with the level of detail required for education expenditure analysis.

In all cases, the classification system rarely fits that of the education sector. Even government expenditure data are often not or only partially disaggregated by level of education, type of school, or between teaching and non-teaching staff. This lack of common standards means that even where data can be accessed, they may require significant processing and estimations to be usable within a coherent framework for integrated analysis. This can create problems of double-counting among funding sources.

Problems of cohesion of data at the national level will be exacerbated when data must be reported at the international level for global compilation, as additional manipulations and processing may be required to fit into internationally comparable categories. This challenge is complicated by a lack of consistency over standards and definitions existing even among international organizations involved in the production of education finance statistics. Depending on who produces the data, the tools used, or the needs of a specific data collection exercise sponsored by an international organization, indicators may not be the same even if they appear so, because of different calculation methods.

For example, international initiatives like Public Expenditure Reviews (PER) or BOOST collect and disseminate data on government education expenditure from all sectors. Education Country Status Reports (CSR) include an important chapter on financing, and the Global Partnership for Education has in the past – and will again in the near future – put in place a monitoring framework which includes assessing commitments towards education through a set of financial indicators. At the global level, the UIS collects and disseminates indicators on education financing from over 200 countries and territories, based on an annual data collection for governments.[2] Without agreement on standards and definitions, these different initiatives can produce seemingly similar indicators that are in fact showing different things.

Reliable and actionable data on learning are critical for achieving the Education 2030 vision. In the area of **learning assessment**, three key challenges exist. . First, national, regional and global data on basic competencies in literacy and numeracy are now frequently collected but cannot be used in an integrated manner to create a global picture of learning. Second, if national and regional data are to be used to inform global monitoring, shared technical standards must be developed to ensure that the data are reliable. Third, solutions must take into account multiple viewpoints. This includes identifying globally relevant areas of learning that can and should be measured globally; conceptualising how national and regional data can help inform global education measurement; and finally, striking an appropriate balance between global competences and the role of local influences and goals on education. It will be key for

[2] For more information about these tools, how they are similar and different, and how they compare to National Education Accounts, see UNESCO Institute for Statistics (2015).

stakeholders to resolve what can be defined globally through measurement, and what should be left open to local decisionmaking.

Data collection and completeness

Data collection for **national EMIS** lacks rigour in many less developed countries, particularly in terms of maintenance of a master list of schools. Communication with school registration units is often non-existent. Parallel data collection exercises, carried out without coordination by the EMIS unit, overburden respondents. Data collection follows a "one size fits all" approach: in most countries a single data collection form is used annually but includes data items that are relevant with varying periodicity (e.g., bi-annually, quarterly, monthly or even weekly).

Another problem is that schools may have an incentive for **misreporting data**. An example is if funding is tied to enrolment, which can be exacerbated if there are no sanctions for providing false information. De and Mehra (2016) report an upward bias in enrolment figures for India, for example, where decisions on teacher postings and disbursements are based on a school's enrolment. Late reporting can lead to inconsistent time series and unreliable system level information. Where head teachers only provide data and never receive feedback, which is usually the case, data quality can be seriously undermined.

Data from **private institutions** are often not collected or shared with the government. With the increasing importance of the private sector, this creates serious concerns for data completeness. This is true in particular at the pre-primary level of education, in which non-state actors often not covered by a national EMIS, such as faith-based institutions, can play a prominent role. Schools in the non-formal sector, such as community, NGO-run and unregistered schools, are also often not captured in official statistics (UNESCO Institute for Statistics and UNICEF, 2015). This can leave policymakers and education planners without full knowledge of data for the education sector.

Too many countries still use paper forms for their school census data collection. This is error-prone, time-consuming and often results in partial data collection. In countries where technology-based systems are introduced, it is not rare to have the most remote locations rely on paper while the remainder of the country is connected to a national data exchange system (this is the case in Tonga, for example). As a consequence, data for remote areas tend to be of poorer quality than data for other parts of a country, which can reinforce marginalisation and lead to biased allocation of resources.

As data are aggregated, information can be lost and errors can be introduced. A study by UNICEF and the UNESCO Institute for Statistics (2016) on out-of-school data identifies several barriers in the vertical flow of information from schools to the national level that can result in erroneous reporting of data. There may also be barriers in the horizontal exchange of data among ministries and other government agencies. The end result can be misallocation of resources, caused by wrong and incomplete data.

Household surveys are a critical source of data on targets related to equity, but there is often limited capacity for designing and conducting nationally representative surveys. Another problem for monitoring is that surveys are usually carried out less frequently than the collection of data for administrative systems. International surveys, like the Demographic and Health Surveys (DHS, funded by USAID) and the Multiple Indicator Cluster Surveys (MICS, funded by UNICEF), are typically carried out in participating countries every three to five years. Population

censuses are usually conducted by national statistical offices every ten years, but some countries conduct them more frequently.

The coverage of household surveys is also problematic. Surveys are often the only source of data on children outside of the education system, who are typically not included in EMIS. However, some groups are difficult to reach with household surveys. These include persons without a permanent address, migrants and refugees, persons living in remote regions of a country, or households in areas affected by armed conflict (the latter is the case with the Pakistan DHS). An earlier analysis of those excluded from the count even suggests that the number of out-of-school children could be almost doubled if the "poorest of the poor" were to be included in household surveys (Carr-Hill 2012). Even if this might be an overstatement, it remains true that the most marginalised are usually excluded from household surveys, either by design or in practice, generating significant concerns about the use of what is currently considered the gold standard among sources of data on equity in education.

Some important background characteristics needed for monitoring the SDGs have yet to be introduced in many survey data collections (such as disability, mentioned above). The small sample size of surveys makes it difficult to collect reliable data for small sub-groups of the population and may not allow comparisons among sub-national administrative or geographic regions. An increase in sample size to address these problems is associated with an increase in cost and, in many cases, with lower data quality.

Limited **comparability of data from different sources**, partly caused by differences in the questions used in education modules of household surveys, and limited standardisation of indicator calculation methodology pose problems for interpretation. Even some of the underlying concepts, such as the definition of "attendance" or the reference dates for ages in the sample population can have large consequences on indicator values.

National studies carried out as part of the joint UIS-UNICEF Global Initiative on Out-of-School Children (http://allinschool.org) demonstrate large differences among estimates of the rate and number of out-of-school children depending on the data source and method of data collection (UNESCO Institute for Statistics and UNICEF, 2015). In India, for example, estimates of the primary out-of-school rate generated from survey and census data collected between 2011 and 2014 vary from 3% to nearly 20% (De and Mehra, 2016). Reasons include differences in the types of schools covered, the definition of "attendance", and problems with students' age data. The age of children and youth relative to their age at the start of the school year poses particular challenges because children who may be of official school age at the time of data collection may have been too young to enter school at the start of the school year. If the ages of individuals in the survey sample are not adjusted before indicator calculation, or if adjustment is imprecise, enrolment rates and out-of-school rates are necessarily inaccurate. Here, as with other aspects of data collection and indicator calculation, a standard approach is needed to increase comparability of indicator estimates from different data sources.

Learning assessments face some of the same challenges as household surveys. According to UIS estimates, 80% of countries have conducted a national learning assessment or participated in a cross-national initiative in the last five years. **Tables 4** and **5** list the definitions of literacy and numeracy in various cross-national assessments. Although the definitions are broadly similar, the implementation in the respective data collections and the format of the assessment vary. For instance, some countries use only multiple-choice items while others may use a combination of multiple-choice and constructed-response items. The quality and scope of assessments is also not uniform. As a consequence, different assessments applied to the same

target population can yield different findings on the level of literacy or numeracy in a society, and it is difficult to link and compare the results across countries and across assessments within a country.

Table 4. Definition of literacy in various cross-national assessments

Assessment	Definition of literacy
PIRLS	The ability to understand and use those written language forms required by society and/or valued by the individual.
PISA 2000	Reading literacy is understanding, using and reflecting on written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.
PISA 2009/2015	Reading literacy is understanding, using, reflecting on and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.
SACMEQ	The ability to understand and use those written language forms required by society and/or valued by the individual.
STEP	Understanding, evaluating, using and engaging with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential.

Source: UNESCO Institute for Statistics based on Cresswell, Schwantner and Waters (2015)

Table 5. Definition of numeracy in various cross-national assessments

Assessment	Definition of literacy
PISA 2015	Mathematical literacy is an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts.
SACMEQ	The capacity to understand and apply mathematical procedures and make related judgements as an individual and as a member of the wider society.
TIMSS	Knowing, applying and reasoning.

Source: UNESCO Institute for Statistics based on Cresswell, Schwantner and Waters (2015)

The target population of assessment can vary. Some countries want to assess mid-education level, some at the end of an education level, while others at both the middle and end of education levels. This causes problems of comparability across countries because the number of years of schooling (or duration of a level of education) may vary from country to country. For example, in countries with six years of primary school, mid- and end of education level means Grades 3 and 6, while in countries with four years of primary school, mid- and end of education level means Grades 2 and 4.

As with household surveys, some groups are typically excluded from national learning assessments. As a result, the learning performance of some key populations – such as refugees and internally displaced persons – is not available.

Some types of data may be extremely hard to access, barely usable, or simply not collected at the country level. In most cases, (raw) data on government funding of education are relatively easily available compared to those on other sources of education funding. In fact, several statistical services, either within ministries in charge of education and training or those in charge of finance, planning and budget, may produce a considerable amount of information on

government education financing. Nonetheless, the data must be accessible to education statisticians, which in some countries may not be the case.

For other sources of funding, data may be lacking or barely usable. This is often the case for **household expenditure data**, which may come either from household expenditure surveys, or from school surveys. Expenditures by households (students and their families) include payments for all types of fees *paid to schools* (tuition, registration, examinations, ancillary services) as well items purchased *outside of schools*, such as uniforms, learning materials, and private classes linked to the official curriculum. Data on all payments to schools can come from two types of sources. One is the schools' own accounting books, which can either be collected or compiled (which is highly time- and resource-intensive), or reported through the school census or other surveys. In many developing countries, however, such data are either not compiled at all, or the data are of very low quality. These school-based sources also miss the expenditures that happen outside of schools.

Data on expenses paid both *to* schools and *outside of* schools can also be collected through household surveys, but the type of survey needed is either not available or not regular enough in all countries. The three most commonly analysed international survey programmes are Demographic and Health Surveys (DHS, http://dhsprogram.com), Multiple Indicator Cluster Surveys (MICS, http://mics.unicef.org), and Living Standards Measurement Studies (LSMS, http://go.worldbank.org/IPLXWMCNJ0). Of these, only the latter typically include data on household expenditure on education, as they are primarily conducted to monitor progress in living conditions indicators, such as poverty and health. Another source may be household expenditure or budget-consumption surveys, which often include spending on education. In all cases, the survey is not designed for education specifically, which creates significant methodological and technical challenges related to sampling design[3], interview techniques (data are collected from interviewees' recall[4]), and the way education expenditure is defined and disaggregated. In some cases, the problems can be significant to the point of producing estimations that are statistically invalid.

Despite these shortcomings, household surveys are often the only source available to estimate household expenditure on education, and should be used whenever available. For data on other private entities (corporations, NGOs, etc.), however, there is no regular or reliable way to collect the information in the vast majority of countries. Due to weak statistical capacities in the concerned countries, coupled with relative reluctance to share their financial reports, data on private sources are among the toughest to gather. When available, such data have typically been collected for a one-off study and not as part of a regular exercise.

In cases where a household survey includes data on education expenditure, it may be only for the household as a whole, rather than for each individual, making expenditure by level of education or by type of school difficult to estimate. From one survey to another, or for the same survey conducted at different periods, education expenditure items may also be quite diverse, producing data that may not be comparable between countries or over time.

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[3] These surveys are not specifically conducted for education and their sampling designs are optimised to respond to their original research questions, namely measuring poverty, access to social services, etc.

[4] Respondents are requested to recall expenses made over the preceding one and sometimes two years, resulting in potential errors and omissions.

Lastly, **data production by non-state actors** must be considered. This includes data collections carried out by civil society organizations, private foundations or marketing agencies. Often, these surveys make use of technology, such as the Internet or mobile phones, which reduces the cost of data collection and increases the speed with which results can be made available. However, Melamed (2014) cautions that improper sampling methods may raise questions of representativeness and rigour.

Data processing and indicator calculation

A disproportionate amount of the little resources available is often allocated to entering and processing data. But these resources would be better invested in designing the data collection and analysing the findings. For equity-related issues, good questionnaire design and analysis of data based on sound methods are crucial.

Yet many countries have **limited national capacity for data processing** due to the enabling environment, described in Section 2.1. At the indicator production stage, calculation methods may vary between countries, causing problems with comparability. International organizations, such as those listed in Table 1, may also use different approaches to education indicator calculation so that the results in their respective databases are not always comparable. More generally, limited comparability of data from different sources poses problems for interpretation.

With data from **learning assessments**, some countries may use a more sophisticated model for indicator calculation and reporting, such as the item response theory to scale and report scores, while others may use simple descriptive statistics. Because of these differences, the reported scores will also be different in scale or metric.

At both the international and national level, another issue hindering the adequate monitoring of equity in education is the absence of a baseline population. Many education indicators are population based: their denominator is the total number of individuals in the population of interest (such as children of primary school age, adults 15 years and older, etc.). Yet for many of the most neglected groups – refugees, IDPs, children with disabilities, child soldiers, child labourers, and so on – it is still impossible to have an accurate estimate of the baseline population, not to mention that in most cases education indicators require single-year, single-age estimates.

Another problem is that many processes are not documented but rather remain embedded in the minds of key individuals. This **lack of documentation** leads to a very limited transfer of knowledge and excessive dependence on those individuals. It furthermore becomes critical in the context of high staff turnover, as observed in most countries in sub-Saharan Africa, and jeopardises the regular production of data.

2.4 Data dissemination and use

Key messages

- Mechanisms for data sharing (among different levels of administration within a country, among different government institutions, and among countries and international organizations) are not well developed, resulting in limited analysis of available data and potentially misguided allocation of resources.
- Activities by national and international stakeholders are not well coordinated, leading to duplication of effort, inefficient use of resources and disruptions in the national system.
- Lack of cooperation among development partners remains a problem and poorly coordinated efforts have a negative impact on efforts to develop national capacity.

The last set of challenges described in this paper is linked to the dissemination and use of education data. Dissemination of data is among the most important responsibilities of statistical agencies, not least to inform policymakers. But it is not rare for such agencies to be dysfunctional, with inadequate attention given to analysis and dissemination, so that statistical outputs are difficult to access and use.

In existing international frameworks related to the quality of education data, there are two dimensions linked to data dissemination and use: serviceability and accessibility. The dimension of serviceability refers to the extent to which statistics are useful for planning or policy purposes. It concerns mainly periodicity, timeliness and consistency. Data are timely when they are current or up-to-date as defined by the owner of the data. Data must be on time and available when they are required, or the credibility of the information system diminishes. If data are accurate, serviceability refers to the extent to which they reflect a reality either of the moment or of the past.

In addition to serviceability, data accessibility is a key aspect that is often overlooked. This dimension is based on the principle that data and metadata should be presented in a clear and understandable way and should be easily available to users. Metadata should also be relevant and regularly updated.

Access to data and metadata

Many countries in developing regions still have difficulties producing basic statistical outputs such as an annual digest. This is the case, for instance, in sub-Saharan Africa and Pacific Islands developing states. The exercise is predominantly a manual process and thus time-consuming and error-prone. Websites with education statistics are frequently underdeveloped and difficult to use, in many cases only serving as static repositories with little opportunity for user-driven interaction.

In some cases, access to data – either from administrative records or household surveys – is tightly **controlled**, making it difficult or impossible to carry out analysis that would be useful for national education policy planning and tracking of progress towards national and international goals. Inadequate feedback from users of statistical products means that managers of statistical agencies do not receive appropriate signals to guide investment and new activities.

Access to data and metadata are also particularly important at the international level as they contribute to building countries' understanding and ownership of the monitoring agenda to which they have committed. It is of paramount importance that government statisticians and other stakeholders have a full understanding of the international indicators that are disseminated to report on SDG progress. Yet few international organizations adequately report the critical metadata needed to understand sources, calculation methodologies and caveats behind the data produced on their website.

Where access is not restricted, **household survey data are often underused**. National institutions may not use available household survey data due to low awareness of surveys, limited trust in their data, limited capacity for data analysis, low data literacy, or lack of political will. International survey programmes such as DHS and MICS permit little if any ownership by countries over data and indicators disseminated at the global level.

There is, at least in theory, a validation process for administrative data. But this is not usually the case for indicators derived from household survey data. In addition, unlike administrative data, no single primary repository generally exists for household survey-based indicators.

Lack of integration and coordination

In many less developed countries, national strategies for the development of statistics have not integrated education. Communication between the Ministry of Education and the National Statistics Office can be very limited in terms of EMIS data validation and the integration and use of data from other sources, including household surveys.

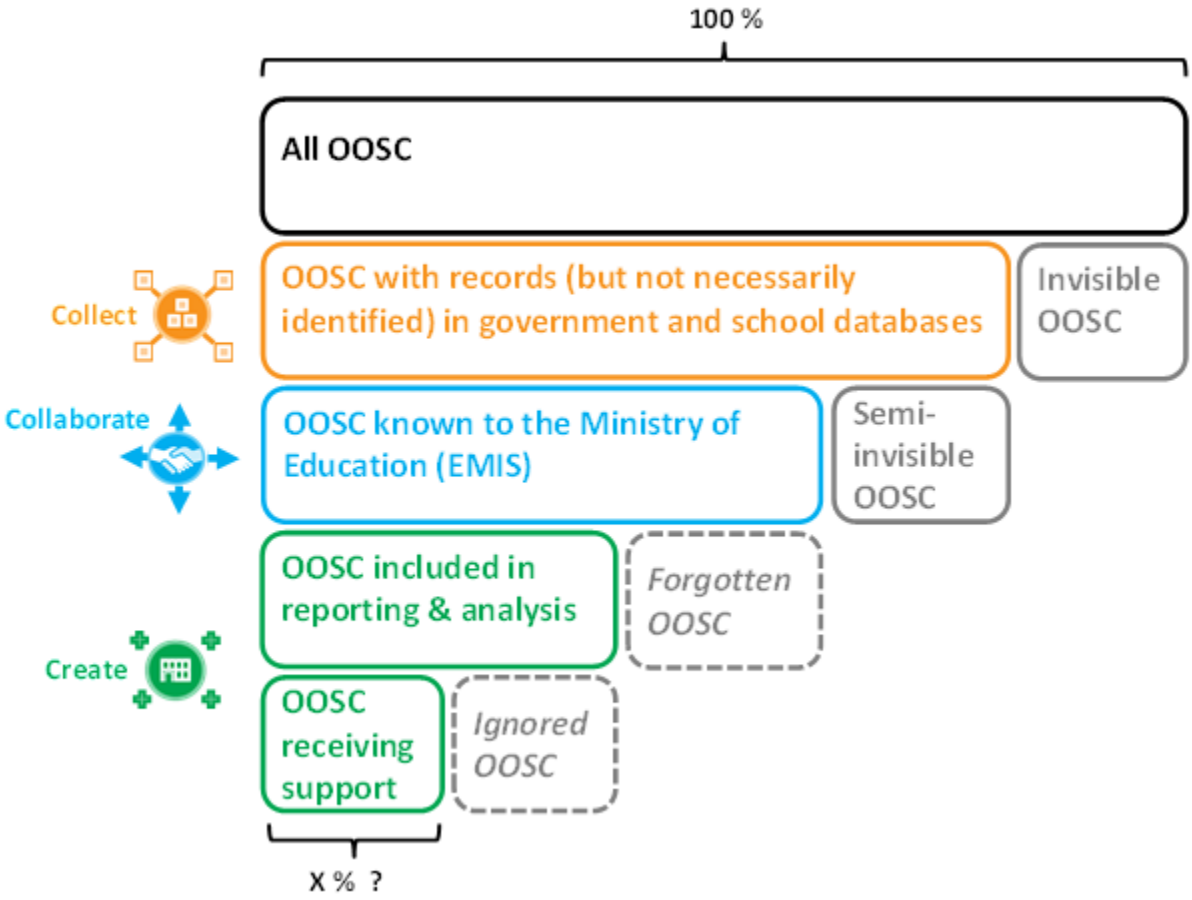
One example of incomplete data due to gaps in coordination and data flows is the case of out-of-school children. **Figure 7** illustrates the case of "semi-invisible" out-of-school children who exist in a government database ("OOSC with records") but not in EMIS. These children, as a consequence, are not counted in statistics on out-of-school children and receive no targeted support. In this case, the national statistical system produces inaccurate numbers on exclusion from education, which in turn leads to suboptimal resource allocation.

Data may be collected and owned by multiple organizations that are not always working with each other. Sometimes it is difficult for one institution to access data coming from another institution. For example, ministries of finance may be reluctant to share detailed data from their databases with ministries of education without a formal legal requirement to do so. In Viet Nam, although the central Ministry of Education and Training (MOET) has the mandate to oversee education policy for the whole country, the responsibility for funding and implementing primary and secondary education programmes is devolved to the provinces and districts. Financial data travel from local departments of finance to the central Ministry of Finance, but with little involvement of the MOET, which has very limited access to the data. As a result, monitoring financial commitments towards education, or linking financial data to data on students, teachers or results to improve planning is nearly impossible for the MOET.

Some data on household expenditure may be available through a household expenditure survey. Owned and implemented by national statistics offices, these may be completely invisible and never used by the Ministry of Education. Similarly, while international NGOs and bilateral and multilateral agencies all keep a record of their assistance to beneficiary countries, such data may not be systematically shared with governments. Even where data on international funding may be compiled by a government-based donor coordination unit, they might not be shared with concerned line ministries.

At the national level, policymakers and planners often base their plans and projections on insufficient or low-quality data. This prevents objective discussions of the real cost of education service delivery, cost-sharing between government and households, or equity and efficiency in the allocation of available resources. The lack of detailed statistics on the use of resources at the school level also hinders policy efforts to improve learning outcomes. Many education sector plans include spending projections, which will be weak without complete and accurate baseline data covering all sources of funding.

Figure 7. Loss of information on out-of-school children due to gaps in database coverage



Source: UNICEF and UNESCO Institute for Statistics, 2016

In the field of learning assessments, too many international initiatives disseminate data that come from the same sources, yet with different methodologies and results. This increases distrust in statistics and confuses users.

Disaggregated data

As data are passed on from lower to higher levels of administration, **aggregation can lead to loss of vital information** that could be used for policy design and resource allocation. For example, if regional education departments receive only school level data, information at the level of individual students is lost. Further information loss occurs if regions aggregate school-level data to the regional level in their reporting to the Ministry of Education (UNICEF and

UNESCO Institute for Statistics, 2016). This means that information that could be used to identify disadvantaged groups is not available at the national level, making it difficult to design interventions that respond to the emphasis on equity in the SDGs.

Policymakers may not always demand higher quality or more disaggregated education data because their understanding of the data may be limited. Sometimes they may not be aware of or not trust certain data sources (e.g., household surveys). In some cases, it may be easier not to know too much. For example, it may be simpler to state that access to education is equitable rather than verify whether that is indeed the case. Because equity issues are sensitive, governments may disseminate national aggregates but rarely go beyond gender disaggregation to report on data for specific population groups.

With finance data, even when coverage of funding by source may be good, the data often lack the required details. In addition to a separation of data by level of education, disaggregating current expenditure among teaching staff compensation, non-teaching staff compensation, teaching materials, and other goods and services is essential for education sector analysis and planning. However, this level of detail is rarely available. In the UIS database, for example, only about 18% of countries were able to report spending on school books and teaching materials for the 2012-2014 period. Available data may seriously underestimate how much is really spent because we know from limited evidence that donors and households sometimes spend more than the government on these key inputs. Given that most countries that can report anything only know how much the government spends on these items, an important part of the picture is likely missing.

Inappropriate data use

Wide-reaching statements are often made based on inadequate data. For example, one well-known development economist stated in January 2016 that “resources per se have little to no statistically significant impact on how much pupils learn” (Economist 2016). This is an oft-repeated statement, but usually backed-up by studies that, because of insufficient data, are only using part of the picture: government expenditure on education. This creates problems. First, because when looking for an impact of “dollar for outcome,” one must count all dollars. For example, Nepal’s government spending on education is about 3.5% of its GDP, but adding donor, household and other sources more than doubles the figure to 9.3%. For Côte d’Ivoire, the same figure goes from 4.7% to 7.1%, reversing which country spends more on education. Second, the composition of spending may matter. It may be reasonable to think that a good balance between salaries and teaching materials could be important. But this requires disaggregated data, which are often unavailable.

All the challenges mentioned above mean that collecting and processing education data is complex and labour intensive. This is exacerbated by weak statistical capacities in developing countries, only a few of which have managed to set up capable and functioning statistical systems – in terms of both material and human resources – to routinely gather, process and use data on education financing. Statistical units at ministries of education are often understaffed, and face high turnover and an ever-increasing number of demands in terms of data production. In addition, education statisticians may be well versed in the production of basic education statistics (students, teachers, schools) but have limited knowledge and understanding of financial data, which requires a different set of skills.

3. Data revolution as response to current challenges

The preceding sections described some of the challenges the international community faces as it tries to establish a system for effective monitoring of progress towards the SDGs. There are significant gaps in terms of norms and standards, data availability, methods to measure key indicators, and coordination among different stakeholders that affect the entire chain of education data production and use. The sections that follow propose solutions to these problems that can be summarised as a "data revolution."

3.1 Characteristics of a data revolution

Key messages

- A data revolution in education needs sustainable funding and commitment, a transparent, inclusive and participatory approach, and technically robust solutions and methodologies.
- As the keystone of the process, countries need to be part of the production of international monitoring indicators through better institutionalisation of international reporting in education, involvement of national statisticians in the validation and quality control of data published by international organizations, and transfer of knowledge to ensure full understanding and ownership of the monitoring agenda.

The picture described in Section 2 is one that has existed for too long. Despite the growing importance of data and monitoring for evidence-based policies and international reporting, countries and international stakeholders have yet to seriously address statistical capacity needs to respond to the SDG 4 monitoring framework. A data revolution for development in general and for education in particular is often called for, yet defined in many different ways (IEAG 2014). What does it mean for countries and stakeholders of the global education community to engage in a data revolution to adequately monitor the SDG 4 and Education 2030 targets? Initial discussions are often associated with *big data* and *data revolution*, but a number of voices have been raised to highlight the fact that a data revolution in development is probably less intricate than it may seem (Crouch 2015).

In particular, if the critical purpose of education statistics is to generate evidence-based decisionmaking at the country level, then the current push for a data revolution in education must include a strong focus on improving national administrative data. Some of the main data sources, like internationally comparable household surveys and learning assessments, can provide key information on system performance. They are convenient for international monitoring but less useful for guiding evidence-based policymaking. On the one hand, focusing too strongly on efforts to build up international and regional learning assessments and household surveys could crowd out the specification of national policy agendas in the design of key data collections. A heavy focus on international data could also misdirect technical resources that should be used to strengthen and sustain nationally-owned information systems led by national statistics offices and ministries of education. The overall result would be weakened support to national statistical systems to achieve the SDGs (Demombynes and Sandefur 2014). On the other hand, neglecting the catalytic potential of these data sources would mean jeopardizing the international monitoring exercise in the short term. This would entail losing the impetus for more and better data generated by the adoption of the new and ambitious international agenda, and slowing down the development of a culture of data for better policies.

The data revolution in education is a new look at current national practices, the global architecture and mindsets to strike the right balance. On the one hand, it must respond to the international pressure of reporting on the set of 43 indicators that have been collectively devised by the global community, led by UN Member States. And on the other hand it must re-focus efforts on building efficient and flexible national statistical systems that should lead to robust national monitoring for evidence-based policies aimed at achieving the SDG 4 education targets. It is against this backdrop that neutral and specialised agencies such as UN system entities can realise their full potential to deliver on their mandate.

This paper highlights the need for systemic change to boost education monitoring to the next level: sustainable, inclusive, transparent, participatory and technically robust. The data revolution should take the form of a monitoring compact. The foundation would be countries' efforts to respond to national policies and systems, complemented by the application of international standards and methodologies that guarantee shared and robust practices and high-quality data. Both layers of action should include establishing an enabling environment, developing sound data production processes, and improving the dissemination and use of education statistics.

Putting countries' statistical capacity at the centre

It is well known to anybody who has worked with national statisticians in developing countries that they are quite far from applying big data techniques to generate education indicators and disseminate data. Some ministries of education are still collecting data on paper, have no website or central database, and lack communication forums for users and producers of statistics to exchange and improve the overall process (Crouch 2015; Levine 2013). Developing statistical capacity for monitoring the SDG 4 targets starts by supporting countries' EMIS at their core.

Donors and development partners should support country-led, sector-wide strategies for the development of education statistics, with strong support by the UNESCO Institute for Statistics and other international organizations. Countries should establish credible plans to align political commitment and the resources needed to deliver on the required monitoring agenda. Communication channels and data exchange among departments and ministries should be implemented to favour integration of the multiplicity of data sources, improve quality control, and ensure consistent and common methodologies for the calculation of indicators.

Finally, countries should nurture a culture of data by disseminating and providing the means for various audiences to take ownership of the education statistics that are produced both for national and international purposes. Support by the international community should target, for instance, the production of reliable and usable Annual Education Digests, training of national statisticians on best practices, leveraging of technology to improve efficiency, and dissemination of education statistics and products.

As the job of national statisticians is becoming increasingly complex and diverse, it is critical to start training them to reflect the evolving nature of their role and ensure that national statisticians become national data scientists.

Developing and sharing international standards and methodologies

Building on data that meet national standards and relate to national systems, the international community should strengthen its framework through the development and application of international standards and methodologies. Producing reliable international indicators to monitor the SDG 4 targets implies several efforts. The community must mainstream the use of standard classifications such as the International Standard Classification of Education (ISCED). It must develop quality standards and assessment methodologies when they are needed (to assess the quality of data from learning assessments, for instance). And it must develop coordination mechanisms for a sustainable, participatory and informed process leading to the production, dissemination and application of such standards.

Enhanced collaboration among standard-generating, funding and implementing agencies is key to the adoption and application of standards and best practices in the production of education statistics. At the moment, support for statistical capacity building in education is insufficiently coordinated at the global level and is often more disruptive than supportive. The production of all international education indicators should follow a robust and transparent process involving countries at several stages to ensure national ownership over the data that will be published and disseminated.

A global SDG 4 monitoring compact

If the revolution had to stress one element for rapid and substantial change, it would be the need for a global compact to ensure sustainable, inclusive, transparent, participatory and technically robust monitoring of SDG 4. Business-as-usual approaches will not work if the global community is serious about achieving and monitoring the SDG targets. Yet the response provided so far is too close to business as usual and might not result in a truly transformative agenda in which data play the role of enablers of change. Prerequisites for an effective global compact include:

- Improved data literacy: A huge amount of data are generated every day. But non-use, misuse, and abuse of data plagues the development community, resulting in fear of data, misunderstanding of statistics, and counter-productive energy spent debating data. A widespread basic knowledge of data and statistics, the way they are produced, and how they can be used could eliminate these problems. (See Lei (2016) as an example of misinterpretation of the intent and purpose of indicators selected to monitor SDG 4). Many professionals in education believe data literacy is an essential skill to succeed in twenty-first-century life. Yet data literacy is still not part of the common skill set of the education community. Improving data literacy will facilitate a data supported agenda but also prevent an agenda driven purely by available data.

- Sustainable financing for strengthening the global statistical capacity: Transformative change will not happen without transformed mind-sets supporting financing and statistical capacity. Past and current practices of the development community have not often translated into significant improvements of national EMIS, even leading in some regions to so-called “EMIS graveyards.”

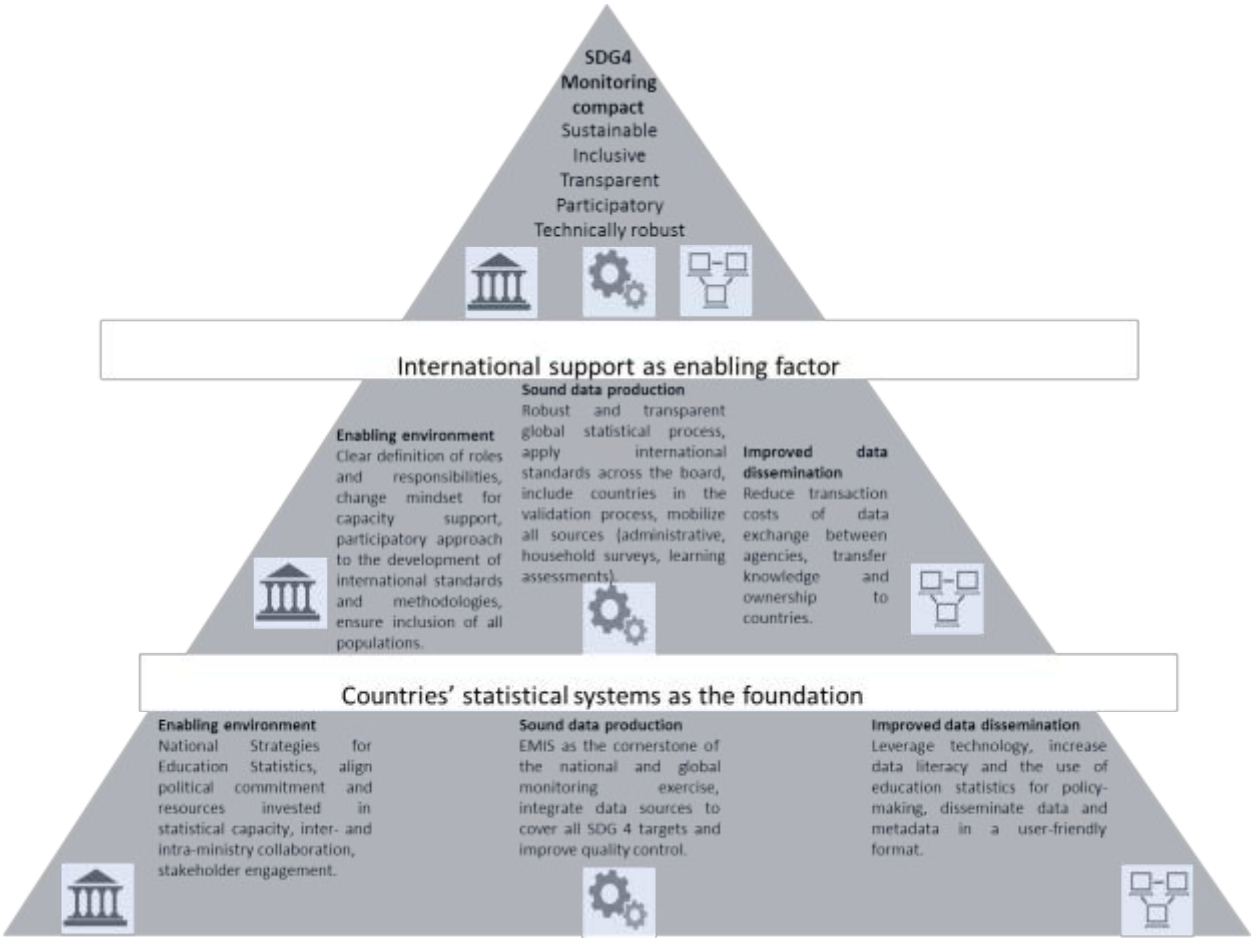
- Firm and unwavering commitment from all stakeholders: A data revolution will require large-scale and intense efforts. All actors involved in the production of education data – including funding, processing, governance and use – must be on board and collaborate in a coordinated and efficient manner. It will be particularly critical to ensure clear

delineation of roles and responsibilities to avoid duplication of efforts, irregular funding and low levels of support at higher political levels.

The data revolution in education needs sustainable funding and commitment, a transparent, inclusive and participatory approach, and technically robust common solutions and methodologies. This is the global compact that the global community should strive for so that education data can become the tool for public good and policy that they ought to be.

Figure 8 is an illustration of the components of a data revolution in education. In this model, national statistical systems are the foundation, aided by international support as enabler. The overarching objective is the establishment of a monitoring compact for the education SDG. Following the same framework, the sections that follow present solutions to the problems described in Section 2.

Figure 8. Characteristics of a data revolution in education



Source: UNESCO Institute for Statistics

3.2 National statistical systems as the foundation for good data and good policy

Key messages

- National statistics offices, ministries of education and other national data producers and users should cooperate more closely. A sector-wide approach to education statistics should be adopted, with high-level political buy-in, embedded in a broader national strategy for the development of statistics.
- Domestic funding for national education statistical systems must be increased and sustainable, and donor interventions must be better coordinated and support national policy priorities.
- Investment in technology and training should be increased to enable the use of data from multiple sources, both on the supply and demand side of the education system to effectively monitor the SDGs.
- Mechanisms for data sharing must be improved through better use of information technology and promotion of open data as a global public good.

Enabling environment

A data revolution is not possible without **strong national statistical systems** and a well-functioning and supportive enabling environment at the country level. Technical capacity is key. Staff must be well trained and motivated, have a good understanding of the data, and work in an environment that enables them to be efficient and productive.

To sustainably improve the scope, coverage, relevance, robustness and sustainability of data processes, it is important to improve integration and harmonisation across institutional settings and governance structures. This involves: mobilising adequate funding; investing in technical capacity and data literacy; analysing the demand for, access to, and use of data; assessing data quality and assuring adherence to international standards and good data practices; and improving linkages between data and decisionmaking. Together, these elements are likely to require a multi-year programme.

The development of sector-wide strategies for collecting and producing education statistics must involve a range of national, regional and global partners. **National initiatives** should be clearly linked to national planning and priorities, identified in consultation with national stakeholders and recognising the need to address inclusion and broader learning goals. This means, among other things, leveraging national assessments rather than diverting resources towards international assessments. In parallel, the data exchange among national and international entities in support of SDG monitoring must be institutionalised. Donors should focus on investment in core national statistical activities rather than special projects (Glassman 2014).

Legal and regulatory frameworks must support the need for good data to guide national education policy. As a part of this, the responsibility of the private sector to report data to the government should be made clear, so that official statistics cover all actors in the education sector.

Data production

The solutions related to **data production** include advocating for sufficient resources; promoting current and future norms and standards; developing new tools, methodologies and frameworks; improving data collection, storage and sharing; supporting national capacity development and providing technical assistance; leveraging new technologies and sharing good practices through technical forums; and improving analysis.

It is important that national **norms and standards** are applied consistently to help ensure uniform quality and interpretation of data. National standards should also be linked to international standards *(see Section 3.3)* to allow cross-country comparisons and monitoring progress towards the SDGs and other international goals.

National EMIS remain the key source and foundation for reliable and timely planning and management of both the national education system and international monitoring. These sources require continued investment and improvement. Current EMIS systems vary considerably from country to country in terms of scope and functionality. OpenEMIS (https://www.openemis.org), conceived by UNESCO, is an example of a royalty-free system that is highly customisable in response to the needs of any given country.

To allow equity analysis, EMIS should include both school-level data and person-level data that go beyond age and sex. They should include a variety of other background variables such as personal, household and school characteristics. Where necessary, national stakeholders should be trained to collect and produce population data that are difficult to capture and measure.

Data collection and entry should be carried out electronically as much as possible. Paper-based collection requires repeated recording of the same information, increasing staff burden, risking errors during data entry and analysis, and requiring data validation checks at various steps of the production process. **Electronic data entry and storage** also improves the timeliness of data and, as long as systems are integrated across the country and across administrative levels, ensures the same information is accessible to all system users. At the same time, safeguards must be put in place to protect the privacy of students, teachers and staff, such as removing personal identifiers or aggregating data in such a manner that individuals cannot be identified.

Linkages between EMIS and other data collection exercises should also be strengthened. For example, to better identify out-of-school children in a country, it may be necessary to link EMIS to data from different sources, such as the civil registry or a national health database. EMIS can also be linked to **learning assessments**, to identify target groups for interventions and to see if investments in the education system have improved student performance.

Considering the prominence of education and the emphasis on equity and disaggregation in the SDGs, a strong case can be made for expanding the scope of education issues covered in **household surveys** and increasing their frequency. As noted in Section 2, currently education is often a small module in larger multi-purpose surveys. Pressure to reduce the cost of surveys and the burden on interviewers and respondents limits expansion. Even so, there is room for innovation, drawing on the experience of established national and international survey programmes, such as Demographic and Health Surveys and Multiple Indicator Cluster Surveys.

The education community should help design surveys to ensure that responses reflect both national and international standards, and include enough background variables to measure group differences. Where possible, the sampling frame should ensure the inclusion of

marginalised populations through oversampling or special studies. Ideally, data should be collected more frequently to allow more timely monitoring and intervention. Better coordination among different survey programmes can prevent duplication of effort and lower the overall cost of data collection.

Despite their shortcomings *(see Section 2.1),* household surveys are often the only source of data available to estimate **household expenditure on education**. However, the education expenditure modules of many surveys do not meet certain minimum requirements. This can be remedied through three concerted efforts. (1) Agree on a standard data processing protocol so that extracted data can be integrated into comprehensive education finance data exercises like an NEA, and into the UIS database for international comparisons and wide dissemination. (2) Improve the coverage and quality of future data by developing common standards and guidelines for future surveys. (3) Support national statistical offices to either include adequate education expenditure modules in general-purpose surveys or to carry out education-specific surveys where relevant and feasible. Alternative methods such as log- or diary-type surveys, where a smaller sample of households are asked to track their expenditure over a period of time, could also potentially provide better quality data at less cost.

To accomplish these objectives, more funding for household surveys must be made available. In parallel, the use of new technologies such as computer-assisted personal interviewing (CAPI) should be promoted to reduce the complexity and cost of collecting, analysing and disseminating high quality data. The end result, improved data, would offer significant benefits for citizens, education planners, analysts and other concerned parties.

To overcome weak technical capacity in ministries of education and national statistics offices, training for national statisticians must be offered. The focus should be on the production and analysis of equity-related **indicators** from EMIS and household survey data, and on learning outcome assessments. In the field of education statistics, related but different indicators are often conflated, such as gross and net enrolment ratios, without a full understanding of their meaning.

Using data collected by non-state actors must also be considered. While often collected with greater speed and timeliness *(see Section 2.3),* this data demand must be carefully validated to determine how representative the findings are for the target group.

Technical advances and decreased cost of storage and computer hardware and software are providing new ways of combining and analysing data from different sources. This facilitates analysis that was impossible or too costly in the past. To keep up with technical change, staff must undergo continuous training, which can in many cases be obtained online.

International organizations play an important role, through funding and training, to enhance the capacity for data production and analysis, similar to their role for improving other aspects of national statistical systems *(see Section 3.3).*

Data dissemination and use

Consultation with national stakeholders, training (for example of staff in national statistics offices), awareness campaigns, investment in improved data quality, improved mechanisms for data sharing among different levels of government, and promotion of open access to data can lead to increased use of data for policy planning and monitoring. As part of this, findings may be tailored to specific audiences.

One problem identified in Section 2 is the **lack of horizontal and vertical integration of data systems** in many countries. Limited data sharing – for example between the Ministry of Education and the National Statistics Office – means that staff in government agencies and other organizations only have access to incomplete information. Under these circumstances, decisions are taken without considering all available evidence. Effective inter-agency collaboration is more difficult without full data awareness. Using a common identifier, such as a national ID number (UNICEF and UNESCO Institute for Statistics, 2016), can help link person-level data in different databases and improve integration among systems.

Increased use of education data is only possible if the data are more easily accessible than at present. In the best-case scenario, data are fully open, and anyone can obtain and use them without restrictions. The United Kingdom is one of the forerunners of **open data** with its https://data.gov.uk website that was launched in January 2010. Other examples include the Kenya Open Data Portal (https://opendata.go.ke), launched in July 2011, and the Ghana Open Data Initiative (http://data.gov.gh), launched in January 2012.

Even without open data it is possible to grant better access to statistics. For example, websites with customisable tables, **data visualisations** and other interactive presentation methods make data more appealing and easier to understand. Advances in technology have led to a proliferation of free and easy-to-use data sharing and visualisation platforms, with graphs and tables that can be designed with specific target audiences in mind.

Sufficient **metadata** are also important. Metadata can make, for example, equity indicators more understandable and results more replicable. Providing education data in a primary and authoritative repository, such as the UIS Data Centre (http://www.uis.unesco.org/datacentre/) – reduces transaction costs for data producers and users. Data offered by a single provider are also more likely to be comparable .

Increased data use

One of the biggest factors standing in the way of improved data quality is the low **demand for data**. This is partly due to limited familiarity with education statistics and indicators, and a resulting reluctance to engage with products of the national statistical system. Low interest springs from a lack of confidence in the data provided by statisticians, combined with decisionmakers' limited understanding of the data's meaning and how it can inform policies. In this context, demand for data can be increased by improving both data quality and the capacity for analysis and interpretation. Increased data literacy investments contribute to more efficient use of resources and prevent misuse of statistics for political purposes.

On the other hand, low demand may also be linked to a **lack of political will** for changing the way that planning, budgeting and policy reform is undertaken. This is a problem that is more difficult to solve than lack of understanding.

Strengthening the monitoring systems for the SDGs calls for the **innovative use of household survey data** as part of a broader data system that draws on the advantages of different types of data for monitoring progress and informing public policy. Household survey data are critical to the SDGs' focus on equity. National coordination mechanisms can ensure that equity indicators produced by different agencies in a country are consistent. For equity indicators produced by international organizations, countries should participate in a validation process before dissemination.

It would also be useful to develop a forum to gather user feedback and to reflect the needs of the most marginalised population groups in the statistical process. Involvement of civil society groups, including children, youth and their families, will give a voice to the intended beneficiaries of education system interventions.

3.3 International support as enabling factor

Key messages

- For effective monitoring of the SDGs and better decisionmaking, close collaboration of all national and international stakeholders in the field of education is required.
- The UN system and international donors must support activities to strengthen national statistical systems to ensure they are well funded and staffed by qualified individuals.
- International norms and standards must be promoted and applied consistently. Data collection, processing and dissemination should be standardised with the help of international organizations.
- National and regional assessment efforts should be supported by providing guidance, assessing methodologies and data quality, and ensuring comparable benchmarks over time and across countries.
    - The Global Alliance to Monitor Learning is a broad-based coalition of international agencies, donors, academics and practitioners seeking to improve learning through a platform to support countries in assessing learning.
    - Regional assessments, like SACMEQ, PASEC, ERCE and new regional assessment initiatives need further support to deliver on their respective missions.
- International household survey programmes should be harmonised so that comparable education indicators on school attendance, equity, expenditure, literacy and other areas can be produced. More support must be given to national statistics offices to carry out these surveys on a regular basis, and ministries of education should be involved so that they use the data more systematically.
    - The Inter-Agency Group on Education Inequality Indicators is a multi-stakeholder effort that seeks to improve measurement by harmonising approaches for using disaggregated survey-based education indicators.
    - The global Out-of-School Children Initiative brings together international agencies and national counterparts as partners to improve children's school participation.
- Countries must be supported to improve the quality and coverage of education finance data, using National Education Accounts as a common methodology. The scope of the exercise should be adapted to national needs and data availability. Where relevant, countries should use a step-by-step approach, for example starting with government expenditure, but using NEA principles from the outset.
    - International initiatives to apply National Education Accounts and other approaches to organizing and analysing education expenditure data serve as a model of collaboration among international organizations, national governments and other stakeholders.
- In the UN system, the UIS must continue to take the lead in setting norms and standards for the production and dissemination of education statistics and in providing global public goods, such as cross-nationally comparable data for evidence-based policymaking, as defined by its mandate.

Effective monitoring of the SDGs and better decisionmaking requires close collaboration of all stakeholders in the field of education. National government agencies, international organizations, donors and aid organizations, NGOs and others must coordinate activities.

In the past, collaboration was sometimes elusive, with different stakeholders working in isolation from each other, leading to inefficiencies and occasionally causing disruption *(see Section 2.2).* The failure to reach the Millennium Development Goal of universal primary education by 2015 can be partly explained by this lack of coordination and collaboration.

To avoid a repeat failure with the education SDG, a new approach is needed, with a partnership of national, regional and global actors. The United Nations play an especially important role, as discussed in the section that follows.

The role of the United Nations

Section 3.2 described the core role of national statistical systems. International organizations must keep this in mind when they design their contributions to an effective SDG monitoring system. An evaluation of UN support for national statistical systems recommended that "the main goal of national statistical capacity development should be on *the use of national statistics for achieving national development goals*", including the SDGs (UN 2016). The same evaluation found, among other things:

- Statistical standards promoted by the UN are appreciated by Member States, partly because they are able to participate in their development.

- The UN system has comparative strengths at the country level (perception of neutrality, close and trusted partnership with governments, long-term commitment to national development) but these are not always effectively used in support of national statistical capacity development or promotion of the use of statistics.

- The UN system is generally seen as relevant to the work of national statistics offices and other government agencies but does not always address highest priority needs for national policymakers.

- Coordination of activities in countries is often a problem, and UN system work on national statistical capacity development is often fragmented.

- Global coordination mechanisms are not linked to the country level and are therefore not grounded in national realities.

Among the conclusions of the evaluation is a recognition that the UN system, in its support for national capacity building, has not done enough to link better data to better lives and to promote the use of statistics to achieve national development goals. Statistics can be used not only to monitor progress but also to identify and analyse the obstacles to achieving development goals.

The UN (2016) evaluation also found that SDGs require a more effective and efficient response by the UN system. At present, the respective roles and division of labour in various UN entities that support national statistical capacity development are not clear. Investment in UN entities in response to the emerging data revolution may be inadequate. Statistical capacity development should be seen as a major priority, and the mandates of key agencies should be reviewed and clearly defined.

The results of the evaluation demonstrate that the UN system plays an important role in national capacity building, although some revisions to past approaches are recommended. More specifically, the UN has clear advantages that put it in a good position to address key problems identified in Section 2 of this paper.

Norms and standards defined by UN entities, which are staffed by experts in their field who work closely with Member States, are a prerequisite for internationally comparable data of high quality. International organizations provide technical training and other support that is crucial for enhancing the technical capacity of national institutions. Moreover, the UN system plays a key coordination role among different initiatives, which helps prevent inefficient and wasteful use of financial and human resources. Lastly, by keeping internationally agreed development goals high on the agenda, the UN can promote the use of good data in support of good policy.

International norms and standards and examples of global partnerships

As explained in Section 2.3, **norms and standards** are the foundation for accurate, internationally comparable data. This is of particular relevance in the post-2015 era, which is characterised by a multitude of data sources with limited comparability, potentially causing uncertainty about available evidence. Standards are necessary at all steps of the data production cycle: collection, processing and dissemination. Standards also help countries compare their performance with each other and identify where they are leading or falling behind.

The challenges described in Section 2 affect administrative data, data collected with household surveys, and learning assessment data. There is a clear need for new methodological standards in the form of rigorously validated instruments, modules and questions, and best practices in design and fieldwork implementation. There is also a need to define new indicator frameworks, and to develop tools and platforms to report data, calculate indicators and assess quality. The creation and adoption of these standards will ultimately lead to greater harmonisation and rationalisation of investments in data by reducing transaction costs and enhancing both the quality and international comparability of education data in general and learning assessment data in particular.

The **International Standard Classification of Education (ISCED)** is an outstanding example of a well-established and widely used framework in the field of education. ISCED is part of the UN International Family of Economic and Social Classifications, which are used to make national data comparable across countries. UNESCO endorsed the first version of ISCED in 1976 (UNESCO 1976), the UNESCO General Conference approved a revision of ISCED in 1997 (UNESCO 2006), and the current version of ISCED was adopted in 2011 (UNESCO 2012).

ISCED is a framework used to classify national education programmes and the resulting qualifications into internationally agreed categories. With the help of ISCED, statistics related to different aspects of an education system – including enrolment, human resources and education finance – can be compared between countries. ISCED is thus a necessary enabling factor for monitoring international goals, such as the education SDG. Without ISCED, comparing the performance of individual countries' education sectors would be extremely difficult.

There are also established **standards for the calculation of education indicators**, maintained by the UNESCO Institute for Statistics in consultation with other UN organizations. The UIS Glossary (http://www.uis.unesco.org/Pages/Glossary.aspx) defines statistical terms related to education and other areas of UNESCO's work, with guidance on data sources, calculation and interpretation.

A focus on equity and the promise to leave no one behind are key features of the SDGs. For example, target 4.5 makes a call to "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" (UN 2015b). Because of this, the importance of household surveys as a source of data for disaggregation is beyond doubt. Yet several challenges stand in the way of the effective use of **household survey data**. Among them is a lack of consensus on key definitions for education indicators, inequality measures and individual characteristics.

Efforts at standardising data collection and processing have increased the comparability of education indicators calculated from household survey data. The **International Household Survey Network (IHSN)** is a mechanism to coordinate and encourage cooperation among international organizations and other agencies active in national and international survey programmes. The development and promotion of technical and methodological guidelines for all stages of the survey cycle is one of the objectives of the IHSN.

Even so, comparability of data from different surveys is still a challenge, as described in Section 2. Additional standards and guidelines for future surveys must be developed so that the data can be more usable, of higher quality, and more comparable across countries than is currently the case. This includes the need to develop and promote standard methodologies for measuring equity-related dimensions. Global initiatives would have to involve some compromise between a globally agreed set of core data and data that reflect different national priorities.

On this foundation, an **Inter-Agency Group on Education Inequality Indicators** was established in early 2016, with the UIS, UNICEF and the World Bank as founding members in collaboration with other agencies active in the field of survey data collection and analysis. The goal of the IAG is to promote and coordinate the use of **household survey data** for education monitoring at the national, regional and global level, ensuring standardised analysis and reporting to complement evidence available through administrative data.

To achieve this goal, the IAG aims to support the following activities over the coming years: prepare guidelines for producers and users of survey data; advise on education questions in surveys; harmonise the processing of survey data; document data requirements and calculation methods for indicators; harmonise the definitions of individual and household characteristics; document, evaluate and pool survey data sources; calculate current and historical values on mean and dispersion; consult with countries; publish indicator estimates; and incorporate information from administrative data.

The benefit will be increased efficiency and consistency in the processing of survey data by different agencies, and more legitimate equity-related survey-based indicators to serve the 2030 education agenda. For countries, better norms and standards for calculating indicators will reduce uncertainty about progress towards national development goals, such as the SDGs, especially with respect to equity. This in turn can increase confidence in the use of household survey data for national monitoring and planning purposes.

The IAG draws partly on the experience of the global **Out-of-School Children Initiative** (OOSCI), another example of an initiative that aims to strengthen the evidence base for national education policymaking. The UIS and UNICEF launched OOSCI in 2010 with the goal of achieving a breakthrough in reducing the number of out-of-school children (UNICEF and UNESCO Institute for Statistics, 2012). To achieve this, OOSCI was designed to improve the availability of data on out-of-school children and children in school at risk of drop-out, with an

emphasis on analysis of disaggregated data from household surveys to develop profiles of excluded children in participating countries. This information is then used to identify barriers to access to education for excluded groups and to make policy recommendations for reducing those barriers. A key aspect of OOSCI is the combination of data from multiple sources, one of the characteristics of the data revolution. OOSCI proposes criteria to examine the quality and reliability of available data, to increase confidence in statistics by policymakers and enhance the usefulness of data for policy planning.

In total, more than 80 countries participated in OOSCI and close to 40 national studies on out-of-school children were completed, as well as several regional studies and one global report (UNESCO Institute for Statistics and UNICEF, 2015). OOSCI was carried out in close partnership with government partners, in an effort to improve the evidence base for more equitable and inclusive education sector plans. OOSCI also led to innovations in the form of new indicators and tools for data analysis. The most recent product is an *Operational Manual* with step-by-step instructions for conducting a national OOSCI study, from forming a study team and obtaining and analysing data, to documenting the findings and developing policy recommendations (UNICEF and UNESCO Institute for Statistics, 2015). The *Manual* documents norms and standards, provides advice on quality assessment, and demonstrates the utility of a variety of data sources for national policymakers and other stakeholders. The UIS and UNICEF played a coordinating role in OOSCI by promoting harmonised methods for statistical analysis and reporting of disaggregated data, as well as equity indicators that are more comparable across surveys and countries than was previously the case.

Another notable product of OOSCI is a forthcoming monitoring framework, a step-by-step guide to help countries identify out-of-school children and children at risk of drop-out, obtain high-quality data with sufficient coverage for disaggregation, analyse the causes of education exclusion, and develop evidence-based policies and interventions to prevent exclusion (UNICEF and UNESCO Institute for Statistics, 2016).

In the field of learning assessment, the **Global Alliance to Monitor Learning** is a multi-stakeholder initiative aimed at improving coordination among actors in the learning assessment arena. The Alliance aims to solve two key sets of challenges: reconciling the multiplicity of learning assessments within a common framework and reducing the high transaction costs currently associated with the lack of coordination and duplication of efforts.

The first set of challenges recognises that many measurement exercises (national, regional and global) frequently collect data on basic competencies. Yet these assessments cannot be used in an integrated manner to provide a global picture of learning. The technical solution requires the development of a scale that links the various assessments together based on an agreed-upon set of shared quality criteria. The second set of challenges demands taking into account the many multiple viewpoints. This includes identifying globally relevant areas of learning; conceptualising how national and regional data can help inform global education measurement; and striking an appropriate balance between global competences and the role of local influences and goals on education. The initiative seeks to:

- establish and promote a common international code of practice on learning assessments
- develop standards, methods and practices in learning assessments and the use of data
- strengthen the sustainability of learning assessment in countries
- help countries identify and secure adequate funding to support long-term learning assessment initiatives.

The Global Alliance will identify the best possible strategies to produce the global indicators necessary to monitor the learning goals in SDG targets 4.1 (learning outcomes at the primary and lower secondary education), 4.2 (early childhood development), 4.4 (work and skills), 4.6 (adult literacy skills), and 4.7 (global citizenship development), including the most effective ways of engaging and supporting countries. Currently the initiative is developing governance structure and management mechanisms.

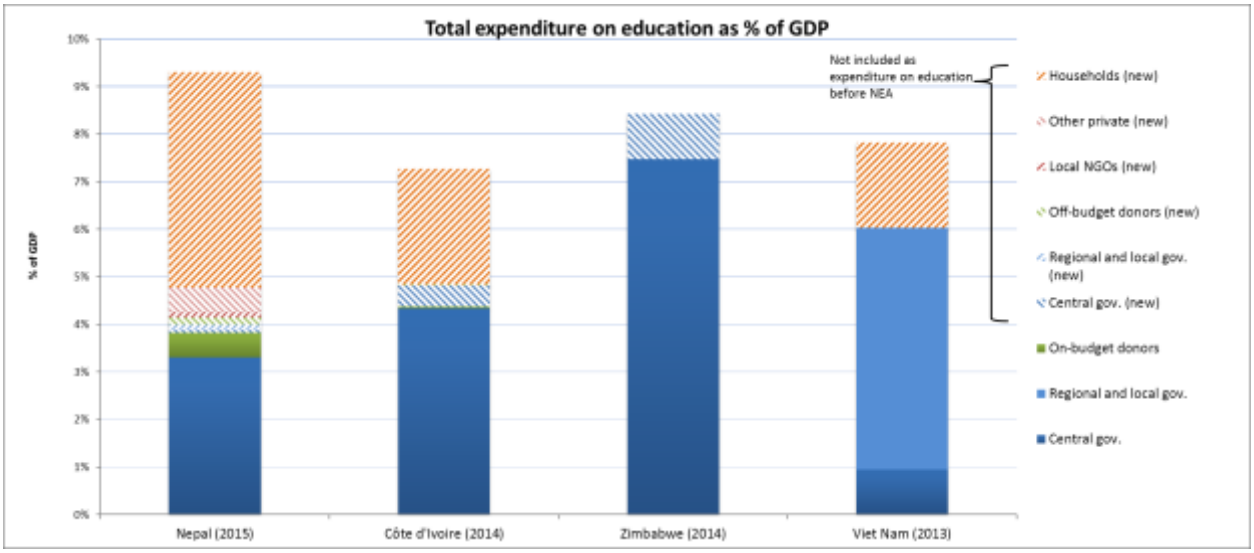
Other possible activities in this field include the development of learning assessments for hard-to-reach population groups. Examples would be citizen-led assessments or household-based learning assessments that target populations that may or may not attend school, and the promotion of early grade assessments to allow early interventions to catch populations at risk before they drop out of school. The UIS could also support knowledge transfer from international assessments into national learning assessments.

To improve the quality and coverage of **education finance data** available at the national and international level, the UIS and the International Institute for Educational Planning (IIEP, including the Pôle de Dakar) implemented a project on **National Education Accounts (NEA)** in eight countries, with support from the Global Partnership for Education.[5] An NEA is a comprehensive, systematic and comparable education finance data collection, processing and analysis exercise highlighting who finances education and how much is spent (by government, private and international sources), where the funds go, what they are being spent on, and who benefits. This methodology allows for analyses that would otherwise be difficult or impossible, such as establishing the true and complete cost of education delivery (rather than focussing only on government funding), cost-sharing mechanisms among different contributors to education funding, and the use of resources at the school level. Although an NEA is meant first and foremost as a national planning tool, the methodology is also designed to facilitate international comparisons.

Figure 9, based on preliminary results of the UNESCO-GPE NEA project, shows how an NEA can result in considerable improvement of data coverage on education expenditure. In Zimbabwe, a thorough mapping of data on government expenditure on education uncovered data not previously accounted for, such as from the civil service commission, which pays the pensions and social benefits of civil servants, including education staff. This increased reported government expenditure by close to 10%. In Côte d'Ivoire, 17 ministries other than the three ministries commonly associated with education services, along with the President's Emergency Programme, were found to be spending considerable amounts on education, resulting in a 9% increase in total government spending. Adding household expenditure and donor funding, expenditure on education as a percentage of GDP grew from 4.4% to 7.3% of GDP (UNESCO Institute for Statistics and IIEP, 2016). In Nepal, the integration of previously ignored expenditure data with data from the central Ministry of Education resulted in almost doubling total reported expenditure on education *(see **Box 2**).* As part of the project, the UIS and the IIEP also published the first international methodological guide on NEA (IIEP and UNESCO Institute for Statistics, 2016), which should eventually become the standard on how to process and consolidate education finance data.

[5] The project, funded by the GPE Global and Regional Activities (GRA) programme, was conducted in eight countries: Côte d'Ivoire, Guinea, Lao PDR, Nepal, Uganda, Viet Nam, Senegal, and Zimbabwe, using the NEA framework. The project started in September 2013 and ended in July 2016.

Figure 9. Expenditure as percent of education in four countries, before and after an NEA



Note: Zimbabwe did not collect data on household expenditure as part of the project.
Source: UNESCO Institute for Statistics and IIEP (2016)

Box 2. Improving institutional collaboration and uncovering new data through a National Education Account in Nepal

Through increased institutional collaboration, the NEA exercise helped uncover and consolidate previously dispersed or unused data on education financing in Nepal. Various institutions with access to different parts of the data puzzle came together with existing but sometimes hidden data consolidated through a common format and classification.

- Data from all ministries and levels of government were collected, including those of district and village development committees that fund education services through grants received from the Ministry of Federal Affairs and Local Development, their own development funds, and direct support from local NGOs. The level of these commitments was not previously known, since although the 75 districts track how much funding they get and how they spend it, they do so through printed reports not following a standard format. These were compiled for the first time as part of the project.
- Data from the Nepal Living Standards Survey was also used through an active participation of the Central Bureau for Statistics, as well as cross-checked with a survey on private institutions carried out by the CBS, to estimate household contributions to education.
- Information gathered through the Association of International NGOs was consolidated with data on local NGO spending obtained through district reports.
- Data on the income and expenditure of public and private schools, collected through the EMIS system but not previously consolidated or used, were obtained and processed by the Department of Education.
- Accounts from institutions supervised by the Council for Technical and Vocational Education and Training and the University Grants Commission were collected and processed.

The institutional collaboration and the consolidation of data from these multiple sources into a common format provided a drastically different portrait of education financing in Nepal. Comparing the sources typically considered before the NEA and the results after the exercise, total education expenditure in Nepal more than doubled from 3.8% to 9.3% in 2014-2015. The data are being used for the next education sector reform planning process, providing a much more complete and accurate picture.

Table 6. Education expenditure in Nepal before and after an NEA

2014-2015	% of new grand total	% of GDP
Education funding typically considered, before NEA		
Central government: Ministry of Education	35.8	3.3
International donors: Grants on-budget	0.2	0.0
International donors: Loans on-budget	4.9	0.4
Total	***40.8***	***3.8***
New data added through the NEA		
Central government: Other Ministries	0.6	0.1
Local governments: DDCs, VDCs	1.2	0.1
Households/parents	48.8	4.5
International NGOs	1.0	0.1
Local NGOS	1.2	0.1
International donors: Off-budget technical assistance	0.7	0.1
Other private sources: Internally generated	5.6	0.5
New grand total	***100.0***	***9.3***

Source: Government of Nepal, IIEP and UNESCO Institute for Statistics (2016)

When it comes to **data dissemination**, it is instructive to see how the UNESCO Institute for Statistics processes data. The UIS obtains data from a variety of sources, processes the data to ensure that the figures are reliable and comparable across countries and over time, and then disseminates the results. By adhering to the same standards, other producers of education statistics can also aim for reliability and comparability across countries. Following international standards is also important for national statistical digests and other products aimed at a domestic audience. For example, the inclusion of equity-related indicators approved for monitoring SDG 4 prevents a disconnect between what is reported at the national level and at the international level.

A systematic long-term programme of methodological work should also be initiated to produce guidelines in a number of other areas, including data collection, data capture, data editing, statistical disclosure control and data quality assessment. This work must cover the collection and analysis of administrative and household survey data, production of equity-related indicators, and design and implementation of learning assessments.

Overall, the goal is to harmonise methodologies and fill the gaps in existing data collections by creating a set of global good practices. Efforts by the UN and other organizations can lead to strengthened national capacity, increased standardisation, better quality of collected data and more meaningful analysis.

3.4 A global monitoring compact for SDG 4

Key messages

- New global governance mechanisms are needed that bring together national statistics offices, international organizations, donors and other stakeholders involved in supporting education statistics and international monitoring, to agree on common principles and provision of support in an efficient, demand-driven and sustainable way.
- New knowledge sharing platforms that build global public good and make the links between data and policy should be developed, based on participation of a broad range of education stakeholders (e.g. for measuring early childhood development, global citizenship skills, etc.).

The main areas of action highlighted in the previous sections cannot operate fully if they are not embedded in a global compact. Within this compact, stakeholders must commit to contributing in a coordinated and well-delineated way to ensure a sound, transparent and inclusive international monitoring exercise. The compact has to recognise the interrelationship between national statistical systems and international monitoring, the need to address the financing gap, and the need to optimise and align development partner support with countries' policies . The global compact could take the form of a multi-pronged strategy with:

- global governance mechanisms to ensure: that the data used for international monitoring flow from countries to international education data repositories; that decisions on international indicators and standards are participatory and reflect a consensus among all stakeholders; and that results of the international monitoring exercise include transparent quality control and data validation mechanisms, and are widely communicated and disseminated to a broad audience

- joint support strategies involving donors, international agencies developing standards and methodologies, and implementation agencies to support nationally-led policy reforms aimed at reinforcing the collection, production and dissemination of education statistics

- specific task forces to tackle the most critical issues such as the production of reliable education data for refugees and internally displaced persons

- knowledge sharing platforms to ensure the dissemination of standards and methodologies and to foster the use of education data for policymaking

- support from the private sector to provide access to more advanced data technologies.

Global governance mechanisms

With the adoption of the Sustainable Development Goals at the UN General Assembly in September 2015 and the Education 2030 Framework for Action in November 2015, greater attention has turned to processes that aim to set out policy ambitions, but also to a framework for monitoring progress towards the education targets under SDG 4. At the level of global monitoring, the **Inter-Agency and Expert Group on SDGs** (IAEG-SDGs) put forward a proposal for global indicators, which the UN Statistical Commission approved in March 2016, the UN Economic and Social Council (ECOSOC) adopted in July 2016, and the UN General Assembly adopted in September 2016.

At the level of thematic monitoring, the **Technical Advisory Group on post-2015 education indicators** includes technical experts from countries in all regions, international agencies and civil society organizations. The group drew on the results of global consultations to set out a proposal for 43 indicators. The proposal was included in the Education 2030 Framework for Action and will require further alignment after the adoption of the final set of global monitoring indicators. It is important to note that the 11 global indicators chosen by the IAEG-SDGs for global monitoring of the seven targets and three means of implementation for SDG 4 on education are also part of the thematic framework.

For both global and thematic monitoring indicator frameworks, a great deal of indicator-related work still needs to be undertaken. Considerable effort has been invested in setting out clear, responsive, communicable indicators to monitor the targets. But some of these indicators are not yet available, and the frameworks have yet to be finalised, in a participatory manner, and assessed in terms of national capacity and needs.

The thematic framework for education includes the indicators proposed for global monitoring and additional indicators that provide more comprehensive coverage of the SDG 4 targets. Additional indicators include participation and completion, learning outcomes and skills, equity dimensions, and legal frameworks that guarantee the provision of education. They are complex and cover multiple concepts relevant for analysing education system functioning . It is therefore necessary to establish formal mechanisms to continually assess the monitoring framework by revisiting the validity and relevance of its indicators. Goals of this assessment are to assure the appropriate documentation to calculate and interpret the statistics, and to identify areas for process improvement.

The **Technical Cooperation Group on the Indicators for SDG4 - Education 2030** (TCG) was established to lead the development and application of the required global and thematic frameworks and the indicators needed to monitor the education targets. Close cooperation among partners will be necessary to strengthen relevant measurement and monitoring capacities of Member States. The UIS actively facilitate best-practice sharing with a view to strengthening country data systems to monitor Education 2030 themes such as equity, inclusion, quality and learning. The TCG's overarching mission is to coordinate efforts over the 15-year-period towards 2030 to efficiently implement the thematic monitoring framework on education. It will also promote country-level production of the data necessary to report on the cross-nationally comparable monitoring measures.

The TCG provides a technical platform to discuss and develop the indicators used for monitoring Education 2030 targets among Member States and other stakeholders in an open, inclusive and transparent manner. The TCG will recommend necessary actions to improve data availability. It will also design and develop methodologies for the production of thematic monitoring indicators on education. Finally, it will periodically assess their coverage, limitations and the potential for better alternatives arising from new methodologies or data sources.

Box 3. Education data for the Pacific: Making the silent "P" talk

Collecting, processing and disseminating education data is an integrated and complex process. Supporting education statistical capacity is therefore difficult through short-cycle, project-based activities happening in silos. A rapid assessment of the state of statistical capacity in the Pacific by the UIS and the Secretariat of the Pacific Community in 2013 led to conclusions that were strikingly similar to conclusions drawn during the same kind of exercise ten years earlier:

- Pacific education data were the least comprehensively and consistently reported of any world region.
- EMIS system quality varies but is generally low.
- A disconnect exists between political commitments and the implementation of monitoring and evaluation frameworks.
- Over-reliance on external consultants leads to a lack of ownership over national databases and little transfer of knowledge to national statisticians.
- Data collected sees limited use.
- Regional statistical capacity receives irregular support.
- Population data used to calculate education indicators exhibit discrepancies.
- Lack of coordination leads to duplication of requests from regional and international stakeholders.

There is a bittersweet joke sometimes heard in the Pacific region's education community. Within the broader region of Asia-Pacific, the Pacific is often referred to as the silent "P," since the Pacific sub-region is often critically absent from the regional picture. This is due to the difficulty of voicing the concerns of small island developing states (which in some cases barely exceed 10,000 inhabitants) in a global region containing giants like China or India.

This state of affairs has led to the establishment of a joint strategy by the UNESCO Institute for Statistics and the Secretariat of the Pacific Community (SPC) to improve education statistics in the Pacific. Building on the technical expertise and comparative advantages of both agencies, this strategy aims to:

1. promote the development of adequate EMIS throughout the region
2. increase the visibility of the region at the international level through higher response rate to the annual UIS data collection, increased completeness of submissions, optimal timeliness and enhanced quality of the data submitted
3. support the use of education data and indicators for national monitoring and evidence-based policies.

One of the most immediate results of the collaboration between the UIS and SPC was improved response rate to the UIS international education data collection. The main instrument for collecting data to produce internationally comparable education indicators is the UIS questionnaire on students and teachers in pre-primary to post-secondary education. Response rate to this survey improved significantly since the UIS and SPC started their joint effort in the region. In the first year of UIS-SPC activities (2013), the number of submissions from countries tripled compared to the previous year. In the 2015 survey round, the number of submissions from the Pacific reached an all-time high, with two thirds of all countries responding to the UIS survey and more indicators being published at the international level due to better data quality.

This improvement in data availability for the Pacific region is the direct result of the combined efforts of the UIS, which follows up more closely with countries struggling with education statistics and international data collections, and the SPC, which implements solutions on the ground.

Development of knowledge sharing platforms

While outputs, including equity, are important objectives of the education cycle according to the SDGs, national policymakers and donors are also particularly interested in ways to improve these outputs. Which actions have the potential to change an inequitable education system? Where should efforts be targeted? Which policy solutions respond to context and needs? To support monitoring for policy recommendations, the UIS is working to establish an **International Observatory on Equity and Inclusion in Education**.

The aim of the observatory is to serve as the entry point to UIS work with data from household surveys and population censuses to ensure sound and regular monitoring of education equity. It will provide access to a flagship database, the **State of the World's Education Equity**. But it will also make tools for data analysis and other resources available to support education equity monitoring, including reporting on SDG 4.5.

The observatory will also act as a platform to generate and disseminate research on a comprehensive framework for monitoring equity, including and beyond the SDGs. It will disseminate knowledge to the global education community to ensure consistent understanding of equity measurement. An innovative, web-based, open data resource will offer all stakeholders access to cross-nationally comparable education equity data in the most cost-effective manner, as a global public good.

4. Financing the data revolution

The SDG and Education 2030 are very ambitious in terms of monitoring, and will require a significant amount of data collection, processing and dissemination from countries. Knowing how much this monitoring will cost is therefore both important and complex. Many decisions must be made in terms of what data collections are needed, and how their costs can be estimated, which are affected by several factors and underlying assumptions. The estimated total global cost will therefore inevitably be a very rough estimation, but should nonetheless give us an idea of the scale of the effort needed.

The proposed framework estimates the annual and total cost of monitoring of the 43 indicators of the Education 2030 agenda over the next 10 years, covering all low-, lower-middle- and upper-middle-income countries. The total cost is estimated based on an average cost per country and then multiplied by the number of countries in these three groups based on income per person.

Not everything can be costed. The realm of what is needed to produce the breadth of data implied by the SDG and Education 2030 agendas is large, and includes several statistical prerequisites that are not specific to the education sector, such as an efficient and transparent Public Financial Management System from which government expenditure on education can be extracted, or good general census data, essential as a basis for all population-based statistics. These types of data collections are not included here, as it is very difficult to estimate how much from them can be imputed to education. Neither are the costs of collecting information on laws and regulations, even though several of the framework's indicators will require this sort of information gathering. This cost is expected to be comparatively low and would be particularly difficult to estimate.

The estimated global costs are presented in **Table 7**. For the main scenario described below, country level costs in the most part domestically funded add up to a total of 1.6 billion over 10 years (three-quarters of the total), as well as those at international level, estimated at around $535 million over 10 years (one-quarter of the total). The grand total would be around $2.2 billion over 10 years or an average of $215 million a year over the period. The annual international costs are equivalent to about 0.4% of total aid to education in 2014. The largest items are, by far, the cost of improving and upgrading school census (administrative) systems (39% of the total when country-level and international costs are added), and significantly increasing sample-based learning assessments in countries (56%). The details of what is included and how these estimates were made are described below.

Table 7. Estimation of the global costs to monitor the Education SDG and Framework for Action over a 10-year period

		Main scenario				*Scenario with full testing*	
Category	**Definition**	**Total 10 years (million US$)**	**Annual average (million US$)**	**Share of total**		***Total 10 years (million US$)***	***Annual average (million US$)***
International level costs		535	54	**25%**		***494***	***49***
Indicator definitions methodology, and piloting	Piloting and testing of indicators from learning assessments and school censuses	5	0.5	0.2%		*0.5*	
Data collection quality control and publication	Support to UIS, PASEC, SAQMEQ, LLECE and others; reports on institutional effectiveness and equity	49	5	2%		*5*	
Technical support and capacity building in low and lower-middle income countries	School census/administrative data	152	15	7%		*15*	
	Learning assessments	297	30	14		*26*	
	Household surveys improvement	17	1.7	1%		*1.7*	
	National Education Accounts	16	1.6	1%		*1.6*	
Country-level costs (total for 135 low, lower-middle and upper-middle income countries)		**1,618**	**162**	**75%**		***1,618***	***162***
School census/ administrative data	Standard/basic costs + upgrade costs, based on average of country with 20,000 schools	688	69	32%		*688*	***69***
Learning assessments	Sample-based assessment in early grade + Grade 6, every 4 years (Grades 3 and 9 also tested in middle-income countries + civics, literacy, skills and IT skills tested for upper-middle, starting year 5)	919	92	43%		*1,245*	*124*
Household surveys	Inclusion of more education questions in general purpose surveys (equivalent to 8% of a standard survey cost) + start-up costs for testing new questions	11	1	0.5%		*11*	***1***
Grand total		**2,153**	**215**			***2,479***	***248***

Country-level costs

1. School-based or administrative data collections, assumed to be carried out every year by countries. The cost includes:

a. A "**basic cost"** of collecting, processing, analyzing, and publishing statistical data from a school census system, based on information provided by experts working in the field, including:
   - Salaries of statistical experts and staff working within Ministries of Education;
   - Regular training programs for school supervisors;
   - Two yearly workshops focusing on needs assessment and reviews, revision of questionnaire, and data release;
   - Data at the school level are gathered by paper and later entered into computers for processing.

b. An "**upgrade cost"** for an average country's school census system, as follows:
   - An initial external evaluation of the quality of the school census system is undertaken, including reliability, analysis, and use, usually led by a consultant;
   - A revision of the school census questionnaire, to include indicators needed for decision making at the local provincial and national as well as those recommended among the education SDG indicators;
   - Over time, countries move away from paper-based school censuses and to an ICT-based data collection system, possibly through using devices that are centrally charged every few days where electricity is not available everywhere. Computerization of data collection at the source would eventually result in a significant savings in terms of processing;
   - Supervisors and school directors are trained on the importance of accuracy and reliability of data, record keeping and reporting, the use of new indicators, and of ICT;
   - The number of professional central staff is increased by over 25%.

The costs are estimated based on an "average" country with 20,000 schools (about the size of Uganda). The basic cost for an average low-income country is less than $350,000 a year, while the upgrade costs are much higher—one-off investments totalling around $1.4 million, plus additional annual costs of around $68,000. Estimates are adapted for three groups of countries: low-, lower-middle- and upper-middle-income, and multiplied by the number of countries in each category to arrive at the total in Table 7. For low- and lower-middle-income countries, technical assistance costs for the upgrade of existing systems are included under international level costs, as most of these countries would likely require external support.

2. Sample-based learning assessments (including participation in international and/or regional learning assessments). The education SDG places a very high emphasis on measuring learning, with assessments implied at Grades 3, 6 and 9 and for youth and adults, covering a large array of subjects. This would require a massive effort from countries, therefore to provide a somewhat realistic picture, it is assumed that not all countries will immediately test the full scope. The **main scenario** assumes that:

a. All low-, lower-middle- and upper-middle-income countries would carry out every 3 years:
   - A random sample-based assessment of reading and math in one grade (e.g. Grade 6), roughly estimated at $600,000 for 3000 students and 250 schools.

- An early grade assessment in Grade 1 or 2, given individually to students who are asked to read a few sentences and answer a few questions. The results are therefore not necessarily reliable and should not be used to indicate "progress", nonetheless they play an important role in encouraging countries to pay attention to the first years of schooling. The in-country costs are estimated at around $150,000, but initial technical assistance is also needed.

b. In addition to the above, lower-middle-income countries would, after 5 years, add sample-based learning assessments at Grades 3 and 9.

c. In addition to the above, upper-middle-income countries would, after 5 years, add a civics assessment, a literacy and skills test of youths, similar to the World Bank's STEP, and an IT skills test.

To indicate how much it would cost to implement the full testing implied by the SDG framework, an **alternative 'full testing' scenario** has also been calculated, where *all* countries do all the tests starting year 6: a sample-based assessment in Grade 3, 6 and 9, an early grade assessment, a civics assessment, a literacy and skills test of youths, and an IT skills test. This alternative scenario increases total costs over 10 years from $US 2.2 to 2.5 billion.

End-of-cycle national examinations, which are given in most countries at the end of secondary education but also in a number of cases at the end of primary or junior secondary education, are *not* included in this costing since they are not directly related to SDG monitoring. Nonetheless, these examinations are usually far more expensive than sample surveys since they cover all students in a given year, and play an important role in determining school curriculum and pedagogy. A review of the cost of end-of-cycle examinations in five countries showed that these costs can be significant, for example $13 million in Tanzania and often requiring 1% to 3% of the national education budget.

3. Household surveys, which are typically of a broader nature and rarely cover only education. The cost estimated for surveys is that of increasing the coverage of education in order to measure achievement of a variety of education SDG targets, such as language, literacy, numeracy, computer literacy, school attendance, household expenditure on education, child's emotional status, whether parents read to the child, books at home, attitudes, and so forth.

As an example, the final report for the 2014 DHS in Kenya is over 300 pages long but only 10 pages are devoted to levels of education of household members, whether they are currently in school, and whether they are literate. Other multi-purpose household surveys with education modules that could be expanded include MICS and LSMS. The assumption is that these surveys would be undertaken every 5 years, which is more or less their current frequency, with the costs estimated as:

- An average of $950,000 for each full survey (based on the average cost of an LSMS), where the size of the education section would be increased from the current 3% on average to 8% of the whole survey, therefore the education portion of the cost is $76,000 per survey.
- Start-up costs of $50,000 are also added (once) to develop and pretest new survey instruments.
- These costs are assumed to be borne by national governments in upper-middle-income countries, while they are covered by international funding for low- and lower-middle-income countries (see below).

International-level costs

International expenditures are broken down into three categories:

1. **Indicator definitions, methodology, and piloting**, with a minimum of eight new "indicator definition" studies undertaken. Given the focus on equity in the education SDG, a major focus would be on designing new measures of equity. Other areas could include: school-based "opportunity to learn" (student and teacher absences, classroom observations of time on task), disability status, literacy and numeracy in early grades, school safety, learner SES, school atmosphere and conditions, and age-by-grade matrix. Another six new learning assessment studies and piloting would be implemented, such as on citizenship, environmental science, HIV and sex education, knowledge and use of instructional technology, or literacy component in household surveys.

2. **Data collection quality control and publication:**
   - As the central agency for education data collection, the budget of the UIS would be increased by $4 million a year;
   - Support would be provided for regional studies (PASEC, SACMEQ, LLECE, and an Asian study to be developed) for another $2 million a year;
   - Using as a guide the World Bank's SABER, UNESCO's DQAF, and other measures, reports on institutional effectiveness would be undertaken (around $150,000 a year) and;
   - Multi-year reports on progress towards equity in education would be prepared (around $250,000 a year).

3. Technical support and capacity building in countries

Support would be provided to the 82 low- and lower-middle-income countries, to improve their capacity for monitoring education progress, including over 10 years:

a. Support for improvements in school census/administrative education data systems totalling $152 million ($1.8 million per country), including assessment of the system, training, external advice and support for computerisation. Out of this amount, the 27 million for the support of computerisation of data collection through the purchase of tablets could potentially be funded by IT companies.

b. Support to improvements and expansion of learning assessments totalling around $297 million ($3.6 million per country), including technical assistance, the cost of participating in international and/or regional assessments, and support for implementation, institutionalisation capacity building and dissemination of data at national level.

c. Support to improvements and expansion of education data coverage in household expenditure surveys totalling $17 million ($0.2 million per country)

d. A programme of support based on the NEA methodology to improve education financing data, where 42 countries are supported for a partial NEA twice ($50,000 each time), and 40 would undertake a full NEA once ($250,000) and an update ($50,000), for a total of $16million over the 10-year period.

5. Conclusion

The ambitious goals and targets of both the Agenda for Sustainable Development and Education 2030 require a concerted effort by the education community to ensure that the current state of national education systems and progress towards the new targets can be assessed. Relevant, reliable and timely data are essential for designing and monitoring good policies. High-quality statistics can help ensure that resources are invested efficiently and effectively in pursuit of inclusive and equitable quality education and lifelong learning opportunities for all by 2030.

At present, countries face a wide range of challenges as they embark on the new education agenda. In less developed countries in particular, challenges are many. Institutional frameworks and technical capacity are often weak, funding is inadequate, data required for monitoring are not collected or insufficiently analysed, international norms and standards are not adhered to or still have to be developed, there is a lack of coordination among national and international stakeholders, and statistical evidence is not used to guide education policy and other interventions.

In relation to the **enabling environment**, there is a need for strong national institutions that are well-funded and staffed by qualified and motivated individuals. Training and investment in information infrastructure is important to replace outdated and inefficient data collection, processing and dissemination mechanisms. In addition, coordination must be improved to overcome fragmentation of the education sector across different government agencies.

International organizations can support statistical activities, build technical capacity, and help coordinate activities by different stakeholders working on parallel data initiatives. But better coordination is necessary with national governments. While donor support is critical, it should be driven by the needs of countries and national policy and planning priorities, not donor agendas.

There are many opportunities for improving **data production** efforts, starting with adherence to existing international norms and standards and agreement on new standards to respond to the demand for new data and indicators. Common standards ensure that data are meaningful and can be compared across countries and over time.

One important aspect of the data revolution in support of the SDGs is the use of data from diverse sources, including administrative records, household surveys, and learning assessments. EMIS have traditionally been the main source of data for education planning, with great potential for being even more informative, and thus need to be strengthened further. At the same time, the emphasis on education quality and equity in SDG 4 means that national and cross-national assessments and data collected with household surveys, including data on education expenditure, will play a more important role in monitoring progress.

The quality of data must be improved through a review of the methods used for data collection, processing and indicator calculation. Using new technologies can help reduce the cost of collection and analysis, and lower error rate. Since bad data contribute to the design of bad policies, all stakeholders should aim for data of the highest possible quality.

Lastly, national and international mechanisms for **data dissemination and use** must be strengthened. A model adopted by several countries is that of open data, made possible in part by recent advances in information technology. This approach not only increases the transparency of national decisionmaking and makes governments and service providers more accountable, it also opens the door to new and unforeseen ways of aggregating and analysing data from different sources. This, in turn, will lead to an increased supply of evidence for policymakers and education planners.

At the national level, opportunities for greater data integration and systematic information exchanges among different institutions and levels of government must be formalised to avoid decisionmaking based on incomplete data. In parallel, efforts to enhance data literacy are needed to strengthen trust in data by all stakeholders.

To address these challenges of the 2030 education agenda, this paper recommends a data revolution built on the foundation of strong national statistical systems, with strong **support from international organizations** such as the UNESCO Institute for Statistics and other entities in the UN system. These organizations serve UN Member States and have the mandate and the experience to define standards and compile and disseminate comparable data.

In addition, these organizations usually provide a wide array of services to facilitate monitoring of global trends through networks that support data production as a global public good and reduce transaction costs for countries. Some new mechanisms are also being created in response to the 2030 education agenda, such as new inter-agency groups that focus on the needs of countries for monitoring targets with currently incomplete or poorly defined data.

The actions highlighted above have to be carried out in a **global monitoring compact for the education SDG** that addresses both the demand and supply sides of national education information systems. A key part of this compact are new global governance mechanisms, such as the Technical Cooperation Group on the Indicators for SDG4 - Education 2030. This group was established to develop and apply the required global and thematic frameworks and the indicators needed to monitor education targets.

Improving the availability, quality and relevance of education data is a gradual process that will in some cases require activities spanning several years. Through their joint efforts, countries, international organizations, NGOs and other members of the international education community can make the changes that are necessary to realise the goal of quality education for all.

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