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Author(s): Nicholas Spaull and Stephen Taylor
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Access to What? Creating a Composite Measure of Educational Quantity and Educational Quality for 11 African Countries

NICHOLAS SPAULL AND STEPHEN TAYLOR

The aim of the current study is to create a composite statistic of educational quantity and educational quality by combining household data (Demographic and Health Survey) on grade completion and survey data (Southern and Eastern African Consortium for Monitoring Educational Quality) on cognitive outcomes for 11 African countries: Kenya, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe. Doing so overcomes the limitations of earlier studies that focused solely on either quantity or quality. We term the new statistic "access to literacy" and "access to numeracy" and report it by gender and wealth. This new measure combines both quantity and quality and consequently places educational outcomes at the center of the discourse.

> Defining the scope of the problem of "lack of education" must begin with the *objectives* of education—which is to equip people with the range of competencies . . . necessary to lead productive and fulfilling lives fully integrated into their societies and communities. Many of the international goals are framed exclusively as targets for universal enrollments or universal completion. But getting and keeping children 'in school' is merely a means to the more fundamental objectives of . . . creating competencies and learning achievement. (Pritchett 2004, 1)

Introduction and Research Question

A sequential analysis of the access-to-education literature, and subsequent policy dialogues, shows an important development in the thinking of educational researchers. What started out as an almost single-minded focus on access, "Education for All" (EFA), has slowly developed into a more nuanced concept of quality education for all (UNESCO 2005; Lewin 2007). As more and more countries approach universal enrollment, there is a shift away from

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simplistic measures of access to schooling and toward a fuller concept of access to learning. It is now widely accepted that the ability of a country to educate its youth cannot be measured by access to schooling or enrollment rates alone, but rather by its ability to impart to students the knowledge, skills, abilities, cultural understandings, and values that are necessary to function as full members of their society, their polity, and their economy (Pritchett 2013). While access is a necessary condition for this type of education, it is by no means a sufficient one.

As a result of this new consensus view, few would argue that quantity and quality are not intimately related. The interrelationships between these two dimensions of education are many, varied, and complex and important for both academic inquiry and policy analysis. Yet the extant literature on education is almost entirely bifurcated with research focusing on either the quantity of education or the quality of education but rarely on both simultaneously. This is problematic for two reasons: (1) observing the quantity of education without regard for the quality of that education clouds the analysis, primarily because the underlying assumption that enrollment and attainment are correlated with learning is often not true, as will become evident; (2) analyzing educational outcomes for those attending school without taking cognizance of the enrollment and dropout profiles of the countries under review is likely to bias the results. Developing countries with lower enrollments and higher dropout rates perform better on average than otherwise similar countries that have higher enrollments and fewer dropouts (UNESCO 2005, 48). This is largely due to the selection effects involved where the "strongest" (i.e., the wealthiest, most advantaged, and most able) students enroll and then remain in the schooling system (Lambin 1995).

The aim of the current study is to integrate these two dimensions of education by proposing a composite measure of educational quantity and educational quality—which we call access to literacy and access to numeracy—and considering some of the insights that its application offers into the progress of EFA in southern Africa. To construct such a measure, we combine country-specific household data on grade completion (from Demographic and Health Surveys) with cross-national data on cognitive outcomes (from the Southern and Eastern African Consortium for Monitoring Educational Quality—SACMEQ 2007) for 11 African countries, namely, Kenya, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe. To do so, we begin by posing a series of instrumental questions about the situation of EFA in the region:

1. In each country what proportion of children
   a) never enroll,
   b) enroll but drop out before grade 6,

c) enroll and complete grade 6 but without acquiring functional literacy and functional numeracy by this time,
d) enroll and complete grade 6 having acquired basic numeracy and literacy skills, and
e) enroll and complete grade 6 having acquired higher-order numeracy and literacy skills?

2. In each country how do the proportions of children identified in 1 above differ by the subnational categories of
a) gender (boys and girls),
b) wealth (poorest 40 percent, middle 40 percent, and wealthiest 20 percent), and
c) a gender-wealth interaction (poorest 40 percent of girls compared to poorest 40 percent of boys, middle 40 percent of girls compared to middle 40 percent of boys, and wealthiest 20 percent of girls compared to the wealthiest 20 percent of boys)?

From the answers to these questions, we seek to build a joint indicator of educational quality and quantity for the SACMEQ region and to probe the picture that related data paint of the progress of EFA.

Quantity and Quality: The Extant Literature

Education occupies a preeminent role in the fields of sociology, economics, philosophy, and psychology, among others, and especially in their subfields that concern themselves with development, modernization, and social stratification. In the discipline of economics, numerous authors have stressed the economic benefits of education, both to the individual and to society. Ever since the pioneering work of Mincer (1958), Schultz (1961), and Becker (1962), education has been studied by economists in order to understand its contribution to economic growth and the distribution of income. As early as 1981, Easterlin argued that "the spread of the technology underlying modern economic growth depended in large part on the extent to which populations in different countries had acquired appropriate traits and motivation through formal schooling" (1981, 11). More recently Goldin and Katz (2009) have made a compelling empirical case for education's causal impact on economic growth and income distribution. Similarly Hanushek and Woessmann (2008) use cross-nationally comparable data on cognitive outcomes to illustrate the importance of cognitive skills for economic growth.[1] Notwithstanding the above, the motivation behind the EFA movement for either the consumers or providers of schooling cannot be

[1] Hanushek and Kimko (2000); see also Barro (2001), Bosworth and Collins (2003), and Ciccone and Papaioannou (2009).

linked solely to an economic rationale. Improved labor-market outcomes and increased economic growth are only two of a myriad of benefits associated with expanding educational opportunity to those currently excluded from formal education.

These noneconomic benefits may include lower fertility (Basu 2002), improved child health (Currie 2009), reduced societal violence and improved human rights (Salmi 2000), promotion of a national—as opposed to a regional or ethnic—identity (Glewwe 2002), and, finally, increased social cohesion (Heyneman 2003). Over and beyond these singular benefits of education, Sen (1999) and Nussbaum (2006) offer broader theories in which education plays a central role in expanding the capabilities and freedoms of individuals and in enabling them to pursue the sort of lives they have reason to value.

Largely as a result of the above consensus view on the importance of education for development (both social and economic), the EFA initiative was created as a vehicle to facilitate and monitor the expansion of primary education in developing countries. The commitments to universal primary education that were outlined at education conferences in Jomtien, Thailand, in 1990 and reiterated in Dakar, Senegal, in 2000 have been met with widespread approval both within developing countries and by external stakeholders. The movement has also been tremendously successful. Between 1980 and 2010 the proportion of people age 15 and over living in developing countries that had no schooling decreased by 54 percent from 37.7 percent in 1980 to 17.4 percent in 2010, with the average years of schooling increasing from 4.3 to 7.1 years over the same period (Barro and Lee 2013).

Recent education scholarship, however, has begun to draw attention to the increasing disconnect between schooling (quantity) and learning (quality) in developing countries. Filmer et al. (2006, 3), for example, provide a detailed critique of the quantity-dominated Millennium Development Goal on education (goal 2), namely, "To ensure that by 2015, children everywhere, boys and girls alike will be able to complete a full course of primary schooling." They conclude as follows:

> We demonstrate that even in countries meeting the MDG of primary completion, the majority of youth are not reaching even minimal competency levels, let alone the competencies demanded in a globalized environment. . . . While nearly all countries' education systems are expanding *quantitatively* nearly all are failing in their fundamental purpose. Policymakers, educators and citizens need to focus on the real target of schooling: adequately equipping their nation's youth for full participation as adults in economic, political and social roles. A goal of school completion alone is an increasingly inadequate guide for action . . . focusing on the learning achievement of all children in a cohort a [Millennium Learning Goal] eliminates the false dichotomy between "access/enrollment" and "quality of those in school": reaching an MLG depends on both. (Filmer et al. 2006, 1)

There is growing evidence of exceedingly low levels of learning in many developing countries, including India, Indonesia, Malaysia, Mexico, Pakistan, Thailand, Turkey, and South Africa (Muralidharan and Zieleniak 2013; Pritchett 2013; Taylor et al. 2013). Not only are the levels of learning typically low, but the actual learning associated with a year of schooling differs widely across countries. Majgaard and Mingat (2012, 7), for example, demonstrate for a selection of African countries that adults with the same years of schooling differ widely in their reading ability depending on which country they are from. Following logically from the above, Hanushek and Woessmann show that cognitive skills acquired, not simply years of education attained, are an important determinant of human capital and economic growth:

> It is both conventional and convenient in policy discussions to concentrate on such things as years of school attainment or enrollment rates at schools. These things are readily observed and measured. They appear in administrative data, and they are published on a consistent basis in virtually all countries of the world. And they are very misleading in the policy debates. Cognitive skills are related, among other things, to both quantity and quality of schooling. But schooling that does not improve cognitive skills, measured here by comparable international tests of mathematics, science, and reading, has limited impact on aggregate economic outcomes and on economic development. . . . We provide strong evidence that ignoring differences in cognitive skills significantly distorts the picture about the relationship between education and economic outcomes. (Hanushek and Woessmann 2008, 608)

While Filmer et al. (2006) and Hanushek and Woessmann (2008) both use cognitive skills as a proxy for education quality, this is primarily because they are easily quantifiable indicators—if not entirely satisfactory measures—of education quality. If one were to create an indicator to assess comprehensively the quality of education provided, it would have to include outcomes of potential value like artistic creativity, empathy, democratic values, preference for political participation, the extent to which schooling successfully socializes children into their societies, whether children have an increased appreciation for social diversity, inclusivity, and the importance of egalitarian principles (attitudinal modernity; Heneveld and Craig 1996; UNESCO 2005, 30). The most prominent reason why these are not included in empirical studies of education is that they are notoriously difficult to measure reliably. Consequently we, too, use cognitive outcomes—specifically, numeracy and literacy—as a proxy for education quality. This was a pragmatic, rather than conceptual, choice and does not deny the importance of other subjects or the many (as yet) unquantified benefits associated with education. We see the acquisition of basic numeracy and literacy skills as a low benchmark that is a necessary but not sufficient condition for quality

education. It is also important to note that the "quality of education" is frequently used to highlight the conditions of schooling and the caliber of school inputs (UNESCO 2005) and not only educational outcomes. While educational inputs and school resourcing are an integral part of the concept of educational quality, we do not focus on them in the current article.

On a practical level, the existing emphasis on enrollment and attainment in developing countries overestimates the progress that has been made in education because these statistics ignore learning, or its absence. While many more children now have a physical place in a building called a school than in the past, there is mounting evidence that too many of these children are not acquiring even the most basic numeracy and literacy skills.

In the same way that many studies of educational quantity ignore the quality of that education, studies of educational quality itself often make implicit assumptions that exclude the population of nonenrolled youth. Few studies that compare countries on the basis of the results of cross-national school-based assessments take into account differential enrollment and dropout rates (see, e.g., Lee et al. 2005; Fehrler et al. 2009; Hungi and Thuku 2010). This is primarily because the assessments themselves use the school-going population as their sampling frame, excluding individuals who are not in school. By using unadjusted data from the Trends in International Mathematics and Science Study (TIMSS), the Progress in International Reading Literacy Study, or SACMEQ (for example), the researcher makes the implicit assumption that the enrollment and dropout rates of various countries are either equal or inconsequential to the analysis at hand, neither of which is likely to be true—especially in developing countries. As Lambin (1995, 174) explains, "The greater the dropout rate is and/or the smaller the proportion of an age group participating in the study, the better the average performance of those who are taking the test" (see Hanushek and Woessmann 2011). This is largely due to the selection effects involved in which the "strongest" (i.e., wealthiest, most advantaged, and most able) students remain in the schooling system. These enrollment and dropout differentials vary significantly among developing countries and, within countries, among subgroups as well (Filmer and Pritchett 1999; Lewin 2009). The variance makes evident the need to correct learning outcome estimates covering the population for those young people who are not currently in school due to dropout or nonenrollment.

The only three exceptions to the "bifurcated literature" discussion above that we are aware of are the aforementioned article by Filmer et al. (2006), the seminal article by Hanushek and Woessmann (2008), and the recent book by Pritchett (2013). In each of these instances, the authors combine Demographic and Health Survey (DHS) data with microdata from at least one international student achievement test. For example, Hanushek and Woessmann (2008) subdivide the grade 9 age population into "never en-

rolled," "dropout," "finished grade 9 without basic reading skills," and "finished grade 9 with basic reading skills." The authors are thus able to combine measures of both quantity and quality and provide a more accurate depiction of the educational system in those countries. However, the only sub-Saharan African countries featured in their paper are Ghana (using TIMSS 2003) and South Africa (using TIMSS 1999). Given that the world's lowest enrollment rates and highest dropout rates are in sub-Saharan Africa, it is unfortunate that most countries from this region did not participate in any TIMSS surveys and thus were excluded from Hanushek and Woessmann's analysis. Filmer et al. (2006) and Pritchett (2013) both include a variety of developing countries but do not aim, as we do, to develop a single metric for measuring both the quantity of education and the quality of that education. Furthermore, we use a different—and we argue, more correct—measure of quantity than either Filmer et al. (2006) or Pritchett (2013). In this way we hope to contribute to the literature and build on the work of these earlier authors as well as strengthen both the conceptual basis and practical impact of EFA.

Data

In this article, we use the latest data from the SACMEQ survey in combination with data on grade completion from the most recent DHS conducted in each country. SACMEQ is a consortium of African education ministries, policy makers, and researchers who, in conjunction with UNESCO's International Institute for Educational Planning, aim to improve the research capacity and technical skills of educational planners in Africa (Moloi and Strauss 2005, 12). To date, it has conducted three nationally representative school surveys in participating countries: SACMEQ I (1995), SACMEQ II (2000), and SACMEQ III (2007).[2] These surveys collected extensive background information on the schooling and home environments of students and, in addition, tested students and teachers in both numeracy and literacy (Murimba 1991; Ross et al. 2005). SACMEQ 2007 tested 61,396 grade 6 students from 2,779 schools in 14 countries (Hungi et al. 2010). This data set represents the most recent and comprehensive survey on educational quality in sub-Saharan Africa.

For the data on educational quantity, we use the grade 6 completion rate from the most recent DHS of each country. These surveys are an important source of data for public health and social science research and are widely used in both fields. Some of the benefits of using the DHS data over other sources are explained below:

[2] Although SACMEQ IV (2013) has been conducted, the data from this round are expected to be released in 2015.

1. Self-reported enrollment and grade completion rates are often more accurate than administrative records—the quality of which varies widely between countries (UNESCO Institute for Statistics 2010). Unlike country-specific administrative data, the uniformity of the surveys means that DHS data are in fact more comparable across countries and over time.
2. They can be linked with household characteristics like socioeconomic status (Filmer and Pritchett 2001) and not simply gender—which is one of the limitations of administrative data.
3. Grade completion rates, which we regard as the most meaningful measure of the quantity of education for the purposes of this article, cannot be calculated reliably using administrative education data.

It would be remiss not to include a brief list of the limitations of household survey data. These include sampling errors, household nonresponse, exclusion of homeless children from the sampling frame, measurement error, and problems with capturing school attendance. However, given that DHS data have been used in hundreds of peer-reviewed academic publications for a variety of purposes, including educational attainment (Filmer and Pritchett 1999) and enrollment (Hanushek and Woessmann 2008), we do not believe that any of these problems outweigh the serious limitations of the alternative.

Of the 14 SACMEQ countries, 11 have reliable and recent survey data on grade completion, and therefore we include these 11 countries in our analysis. The specific dates that each DHS was conducted in 9 of the 11 SACMEQ countries are Kenya (2008–9), Lesotho (2009), Malawi (2010), Mozambique (2011), Namibia (2006–7), Tanzania (2010), Uganda (2011), Zambia (2007), and Zimbabwe (2010–11). For South Africa, we follow Filmer (2010) and use the South African General Household Survey from 2009, given that the South African DHS data have not been released to date. In order to find a sufficiently recent data set for Swaziland, we use the Multiple Indicator Cluster Survey (MICS) for 2010. MICS and DHS collaborate closely using interagency processes to harmonize their survey tools to ensure maximum comparability (Hancioglu and Arnold 2013). Observing only these 11 countries, the SACMEQ survey tested 49,733 grade 6 students in 2,247 primary schools.

Method

Overview

Educational quality, as proxied by student numeracy and literacy test scores, is a continuous variable, whereas the measure that we adopt for educational quantity is binary (completed grade 6 or not). Variability is

obviously lost on one side of the measure, and some transformation is necessary on the other side in order to create a single indicator of education system performance. We start by making certain assumptions about the numeracy and literacy competency of children who will never complete grade 6. Since we have data on both the educational competencies of the school-going population (from SACMEQ) and also the proportion of a cohort who will complete grade 6 (from DHS), we calculate the proportion of a cohort of children (whether in school or out) who have acquired basic numeracy and literacy skills—what we call the access-to-literacy and access-to-numeracy rates.

Given that the current study aims to combine statistics on quantity and quality, and that the only cross-national measure of education quality available in Africa is at the sixth-grade level, an accurate measure of grade 6 completion was required to make the most of existing data. There are various different proxies and methods for calculating such a measure, including (1) the Net Enrollment Rate (UNESCO 2005, 291), (2) an age-specific Net Attendance Rate using household survey data, (3) Kaplan-Meier survival probabilities (Filmer 2010), and (4) use of the grade completion rate of an older cohort. In preliminary versions of the current analysis, we employed methods 2 (Spaull and Taylor 2012) and 3 (Spaull and Taylor 2014) before settling on method 4 as the most methodologically sound approach, and it is the method implemented here.[3] In the methodological addendum in the online technical appendix, we detail why methods 1–3 are inappropriate as a measure of education quantity (see UNESCO Institute for Statistics 2010; Lewin and Little 2011; Szklo and Nieto 2012, 55).

One method that overcomes the limitations of methods 1–3 is to use household survey data (DHS) but to calculate the grade 6 completion rate for a cohort of children in which practically all children who will complete grade 6 have completed grade 6. Pritchett (2013, 76) employs this method and, using DHS data, calculates the grade 6 completion rate for 15–19-year-olds in each SACMEQ country. However, this underestimates the true extent of grade repetition and late entry in sub-Saharan Africa. If there are children who only complete grade 6 when they are 15, 16, 17, 18, or 19, this method will underestimate the grade 6 completion rate (potentially quite severely). To explain by example, Pritchett (2013, 76) reports that only 54 percent of Ugandan 15–19-year-olds had completed grade 6. Using the same data as Pritchett (Uganda DHS 2006) we find in that year that 23 percent of Ugandan 15–19-year-olds were still enrolled in grades 1–6 and

[3] We are indebted to an anonymous reviewer who highlighted the shortcomings of the methods we used in two earlier versions of this article, particularly the limitations of the Kaplan-Meier method for the current analysis. The reviewer's detailed and constructive comments and suggestions led to significant improvements in our methodology.

therefore could have gone on to complete grade 6. Indeed, DHS data show that the grade 6 completion rate for Ugandan 14–16-year-olds (36 percent) is almost half that of Ugandan 17–18-year-olds (64 percent), making it clear that many Ugandan children only complete grade 6 when they are 17 or 18 years old. It is worth emphasizing that Uganda is by no means unique among SACMEQ countries.[4] While we would agree that systemic overage enrollment is a problem in and of itself, for the purposes of calculating a measure of access to grade 6 and using it to build an indicator of the volume of learning acquired, one has to include students who are overage or risk seriously underestimating access.[5]

In order to decide which cohort of DHS students to use, we calculated the proportion of students currently enrolled in grades 1–6 by age, with the intention of selecting a cohort in which almost no children were still enrolled in grades 1–6. By age 19, less than 5 percent of individuals were enrolled in grades 1–6 in all countries, and thus, to ensure sufficiently large samples in each country we chose the cohort of 19–23-year-olds for the current analysis. In order to decrease the potential downward bias of selecting older cohorts (who have not benefited from very recent expansions), we use the most recent DHS data that are available for each country. Thus, although we are reporting grade 6 completion rates for 19–23-year-olds who are much older than most SACMEQ students in 2007, in 8 of the 11 countries the most recent DHS data were collected in 2009 or later.

On the basis of the results of the numeracy and literacy tests, SACMEQ classifies participants into one of eight categories for reading, ranging from "prereading" (level 1) to "critical reading" (level 8), and similarly for mathematics, where the levels range from "prenumeracy" (level 1) to "abstract problem solving" (level 8). The eight competency levels are described in table A1 in the online technical appendix, and a more detailed discussion can be found in Ross et al. (2005) and Hungi et al. (2010, 6). According to this classification system, if children have not reached level 3 in either reading ("basic reading") or mathematics ("basic numeracy"), they are deemed functionally illiterate and functionally innumerate, respectively. As the SACMEQ researchers Ross et al. (2005, 262) explain, "It is only at

[4] For each country the proportion of students age 15–19 currently enrolled in grades 1–6 is as follows (using the same DHS data as Pritchett [2013]): Kenya (11 percent), Lesotho (8 percent), Malawi (18 percent), Mozambique (35 percent), Namibia (7 percent), South Africa (1 percent), Swaziland (13 percent), Tanzania (6 percent), Uganda (23 percent), Zambia (14 percent), and Zimbabwe (2 percent).

[5] Importantly, SACMEQ takes as its sampling frame all students who are enrolled in grade 6 in a country (irrespective of age), which explains the high proportions of students age 15 and older in each country; a full 22 percent of the SACMEQ 2007 grade 6 sample is age 15. The specific proportions of SACMEQ III (2007) children age 15 and older for each country are as follows: Kenya (23.7 percent), Lesotho (26.7 percent), Malawi (32 percent), Mozambique (30.3 percent), Namibia (18.4 percent), South Africa (7.2 percent), Swaziland (25.6 percent), Tanzania (36.8 percent), Uganda (28.7 percent), Zambia (29 percent), and Zimbabwe (2.1 percent). For the purposes of the current study we needed to calculate the proportion of a cohort who made it into the SACMEQ sampling frame (i.e., made it to grade 6), while the age at which they do so is less important for our purposes.

Level 3 that pupils can be said to read [otherwise they] could be said to be illiterate." By this definition, if students are functionally illiterate they cannot read a short and simple text and extract meaning, and if students are functionally innumerate they cannot translate graphical information into fractions or interpret common everyday units of measurement.[6] This threshold of competency has been used elsewhere in the literature before. For example, Shabalala (2005, 222) also uses the bottom two SACMEQ levels and deems students below this threshold as "non-readers" and "non-numerate" (see also Spaull 2013).

In this article we assume that all children who never complete grade 6 are functionally illiterate and functionally innumerate. Whether these children never enrolled in the first place, or enrolled but dropped out before grade 6, is an important question, to which we return later in the article. For those children who never enroll, it is highly unlikely that they would learn to read, write, and compute at a sufficient level to be able to pass competency levels 1 and 2 on the SACMEQ tests. For those children who do enroll but drop out before grade 6, it is also improbable that they would have acquired these skills before dropping out.[7] Many students who drop out do so because they have failed previous grades or repeated grades multiple times. Those who drop out due to income constraints or remoteness are also statistically less likely to be in the better performing part of the distribution before dropout. Finally, given that many of the students who remain in school do not reach level 3 by grade 6 (our literacy threshold), it is unlikely that those who have dropped out would have already reached level 3 before dropping out. For example, we believe that it is reasonable to assume that the 4 percent of Zimbabwean children who enroll initially but do not complete grade 6 would not have been a more literate group than the 17 percent of Zimbabwean children who complete grade 6 but were not yet literate (see fig. 1). Moreover, given that nonenrolled children are mainly found in poor communities and remote areas (Lewin 2007), it is unlikely that such children would have gained significantly from home-based literacy activities.

In addition to the illiteracy category, we group competency levels 3, 4, and 5 (basic reading, reading for meaning, and interpretive reading) under the heading "basic reading skills" and competency levels 6, 7, and 8 (inferential reading, analytical reading, and critical reading) as "higher-order

[6] The terms "illiterate" and "innumerate" have a number of possible meanings ranging from the inability to write a sentence or complete a one-step arithmetic sum to more demanding definitions that include reading for meaning or using numerical skills in everyday life. We take the latter approach and use the terms "functionally illiterate" and "illiterate" interchangeably in the article. It is of little use if children can write down and read a memorized paragraph if they do not understand what they are reading or writing. Similarly, if children cannot relate basic arithmetic skills into real world situations, these skills are of limited value only.

[7] While there will obviously be exceptions to the rule in which educated parents may teach their children informally at home, this is so small as to be negligible on a national scale.

reading skills." The corresponding numeracy designations are "basic numeracy skills" with competency levels 3, 4, and 5 (basic numeracy, beginning numeracy, and competent numeracy) and "higher-order mathematics skills" with competency levels 6, 7, and 8 (mathematically skilled, concrete problem solving, and abstract problem solving (Ross et al. 2005). Figures 1 and 2 use these designations and follow the approach of Hanushek and Woessmann (2008, 656). This makes it possible to combine educational quantity (enrollment and grade completion) and educational quality (via our cognitive skills proxy) in a single graph.

By using the SACMEQ categories and assuming that children who will never complete grade 6 are illiterate and innumerate, we are able to create a single composite statistic of educational quantity and educational quality. Rather than simply report the grade 6 completion rate, which can be thought of as an access to grade 6 schooling rate, we use the SACMEQ levels and create an access-to-learning rate, what we term the access-to-literacy and access-to-numeracy rates. Figure 1 shows for South Africa that 1 percent of children never enrolled, 4 percent of children enrolled initially but did not complete grade 6, 26 percent completed grade 6 but were functionally illiterate, 44 percent completed grade 6 and acquired basic literacy skills, and 25 percent completed grade 6 and acquired higher-order reading skills. Traditionally one would only see the grade 6 completion rate for South Africa (95 percent), whereas we combine this with the SACMEQ levels and report the access-to-literacy rate. To calculate the access-to-literacy rate, one simply multiplies the grade 6 completion rate (95 percent for South Africa; table 1) by the proportion of the SACMEQ sample who are literate (73 percent for South Africa; table 2) yielding an access-to-literacy rate of 69 percent (95 × 75 percent; see also table 3 for SACMEQ numeracy data). This is the same as summing the proportion of children in South Africa who had acquired basic (44 percent) or higher-order (25 percent) reading skills. That is to say that only 69 percent of the 19–23-year-old cohort in South Africa completed grade 6 and acquired basic literacy skills (table 4). The access-to-numeracy rate is considerably lower at 57 percent, meaning that of the 19–23-year-old cohort in South Africa, only 57 percent will complete grade 6 and acquire basic numeracy skills (table 5).

This highlights the fact that 26 percent of a South African cohort will not acquire basic literacy skills even though they do complete grade 6 (fig. 1) and, for numeracy, that 38 percent of children will not acquire basic numeracy skills even though they do complete grade 6 (fig. 2). Given that these children do not have access to learning (literacy and numeracy, respectively) for our purposes, we group them with those who never complete grade 6. The access-to-numeracy and access-to-literacy rate statistics are meant to complement existing enrollment, grade-survival, and quality as-

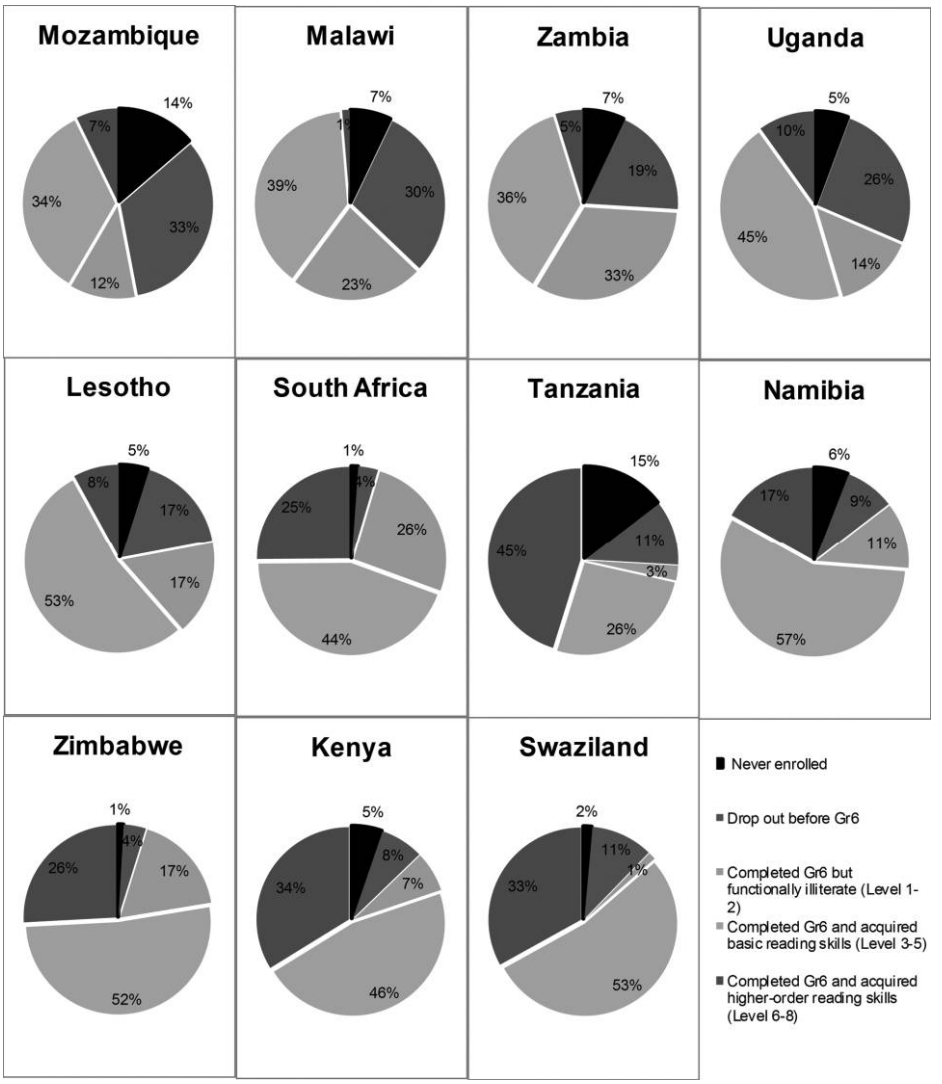

FIG. 1.—Percentage of 19–23-year-olds who never enroll, drop out before grade 6, complete grade 6 but remain illiterate, complete grade 6 and acquire basic literacy skills, or complete grade 6 and acquire higher-order reading skills. Color version available as an online enhancement.

sessment statistics, rather than replace them. There are clear administrative reasons why ministries of education collect separate statistics for access quantity and quality; our only suggestion is that these data be used together to provide a more accurate and holistic picture of access, throughput, and learning.

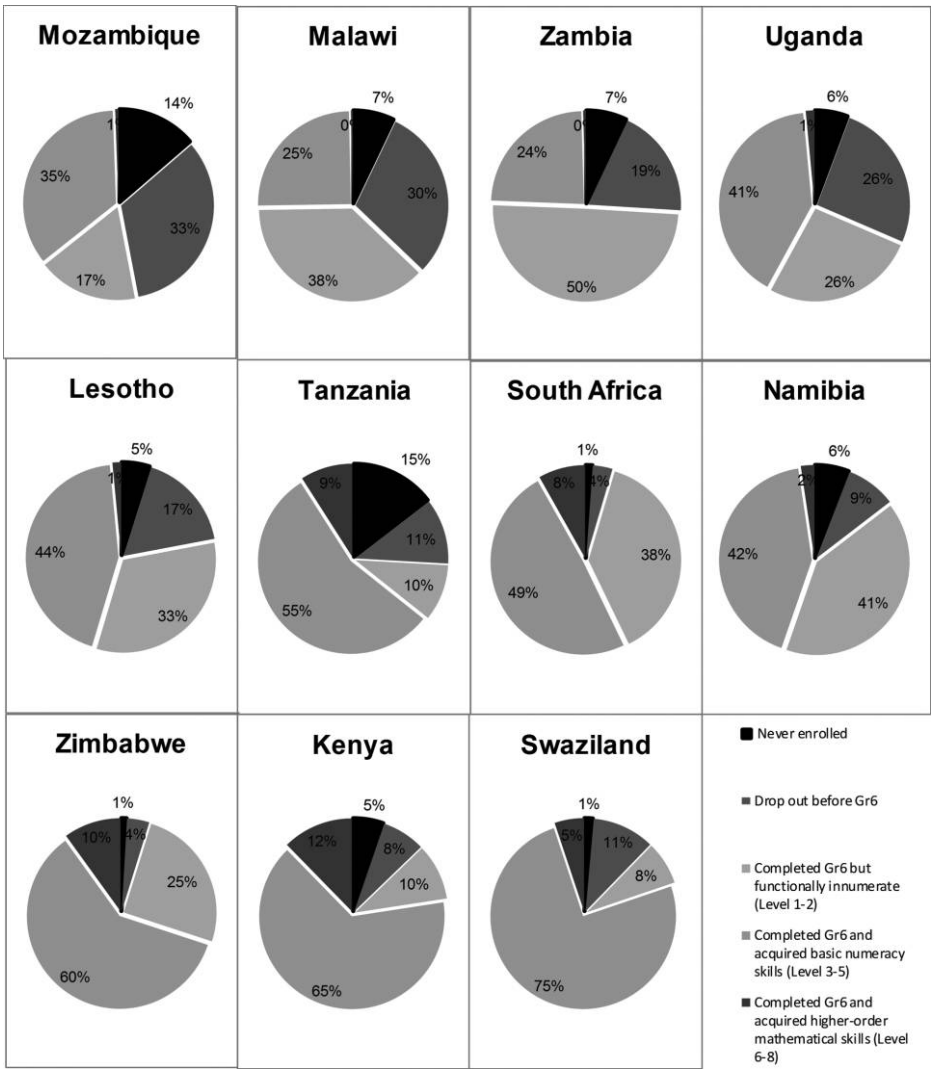

FIG. 2.—Percentage of 19–23-year-olds who never enroll, drop out before grade 6, complete grade 6 but remain innumerate, complete grade 6 and acquire basic numeracy skills, or complete grade 6 and acquire higher-order mathematics skills. Color version available as an online enhancement.

Subnational Differences

While national comparisons of educational quantity and quality are useful in and of themselves, there are also significant subnational differences by gender and wealth for both the quantity of education (Filmer and Pritchett 1999) and the quality thereof (Hungi et al. 2010). Table 2 shows

TABLE 1
GRADE 6 COMPLETION RATE FOR 19–23-YEAR-OLDS (%)

	National	Boys	Girls	Poor40	Mid40	Rich20	Poor40M	Poor40F	Mid40M	Mid40F	Rich20M	Rich20F
Kenya	87	88	86	78	89	94	82	75	90	89	93	95
Lesotho	78	65	90	61	83	96	43	81	73	92	93	98
Malawi	63	67	59	42	65	89	48	37	67	62	89	89
Mozambique	53	63	45	26	52	88	39	15	63	43	89	87
Namibia	85	81	89	76	86	98	72	80	81	90	97	98
South Africa	95	94	97	93	97	99	90	95	97	98	99	99
Swaziland	88	86	94	78	90	95	86	90	82	95	100	96
Tanzania	74	79	70	57	78	92	65	51	80	76	97	89
Uganda	69	70	67	49	72	89	57	43	72	71	86	92
Zambia	74	81	68	52	77	95	66	41	82	72	95	95
Zimbabwe	95	95	96	89	97	99	88	91	97	97	99	100

NOTE.—Authors' calculations using the most recent Demographic and Health Survey in each country.

TABLE 2

STUDENTS IN THE SAMPLE WHO ARE LITERATE (SACMEQ LEVEL 3+), UNCORRECTED FOR THOSE WHO DO NOT COMPLETE GRADE 6 (%)

	National	Boys	Girls	Poor40	Mid40	Rich20	Poor40M	Poor40F	Mid40M	Mid40F	Rich20M	Rich20F
Kenya	92	91	92	88	93	98	87	88	92	93	97	98
Lesotho	79	76	81	73	78	88	68	76	74	81	86	89
Malawi	63	66	60	58	63	69	58	55	66	60	76	65
Mozambique	78	79	77	66	77	88	69	64	79	75	89	85
Namibia	86	84	89	81	87	95	77	83	83	90	94	97
South Africa	73	69	77	58	76	94	54	61	71	82	91	96
Swaziland	99	98	99	98	99	100	97	99	98	99	99	100
Tanzania	97	97	96	95	97	99	95	94	97	97	99	98
Uganda	80	81	79	73	78	91	75	72	79	76	92	88
Zambia	56	58	53	48	52	71	51	45	55	49	74	67
Zimbabwe	81	78	84	75	81	95	70	79	77	84	92	96

NOTE.—Authors' calculations using Southern and Eastern African Consortium for Monitoring Educational Quality—SACMEQ 2007.

TABLE 3

STUDENTS IN THE SAMPLE WHO ARE NUMERATE (SACMEQ LEVEL 3+), UNCORRECTED FOR THOSE WHO DO NOT COMPLETE GRADE 6 (%)

	National	Boys	Girls	Poor40	Mid40	Rich20	Poor40M	Poor40F	Mid40M	Mid40F	Rich20M	Rich20F
Kenya	89	90	88	85	89	94	87	83	90	88	95	94
Lesotho	58	58	59	51	57	70	50	51	55	59	70	71
Malawi	40	44	36	38	40	42	41	31	46	37	47	37
Mozambique	67	70	64	55	66	76	58	53	71	59	80	71
Namibia	52	52	52	38	50	78	38	39	50	51	78	77
South Africa	60	58	62	43	61	88	42	45	58	65	86	90
Swaziland	91	93	90	89	92	95	91	88	93	90	96	95
Tanzania	87	90	84	81	87	93	86	78	91	84	93	92
Uganda	61	63	59	53	59	75	56	52	61	55	77	73
Zambia	33	36	29	26	28	47	28	23	33	25	51	40
Zimbabwe	73	72	75	63	73	93	61	64	72	75	91	94

NOTE.—Authors' calculations using Southern and Eastern African Consortium for Monitoring Educational Quality—SACMEQ 2007.

TABLE 4
ACCESS-TO-LITERACY RATES FOR 19–23-YEAR-OLDS, BY COUNTRY AND SUBGROUP (%)

	National	Boys	Girls	Poor40	Mid40	Rich20	Poor40M	Poor40F	Mid40M	Mid40F	Rich20M	Rich20F
Kenya	80	81	80	69	83	92	72	66	83	83	90	92
Lesotho	61	50	73	45	65	84	29	62	54	75	80	87
Malawi	40	45	35	25	40	62	28	20	44	37	68	58
Mozambique	42	50	35	17	40	77	27	10	50	32	79	74
Namibia	74	68	79	61	74	93	56	67	67	81	91	95
South Africa	69	65	74	53	74	93	49	57	69	80	90	95
Swaziland	86	85	94	76	89	95	83	89	81	94	99	96
Tanzania	72	76	68	54	75	91	62	48	77	74	96	87
Uganda	55	57	53	36	56	81	42	31	57	54	80	81
Zambia	41	47	36	25	40	67	34	18	45	35	70	64
Zimbabwe	78	74	81	67	78	94	61	71	75	81	91	96

NOTE.—Authors' calculations using literacy performance in Southern and Eastern African Consortium for Monitoring Educational Quality—SACMEQ 2007 and grade 6 completion rates from the Demographic and Health Survey, latest year in each country.

TABLE 5
ACCESS-TO-NUMERACY RATES FOR 19–23-YEAR-OLDS, BY COUNTRY AND SUBGROUP (%)

	National	Boys	Girls	Poor40	Mid40	Rich20	Poor40M	Poor40F	Mid40M	Mid40F	Rich20M	Rich20F
Kenya	77	79	76	66	80	89	72	62	81	78	88	89
Lesotho	45	38	53	31	47	67	21	41	40	54	65	70
Malawi	25	30	21	16	26	38	20	12	31	23	42	33
Mozambique	36	44	29	14	34	67	23	8	45	26	71	62
Namibia	45	43	46	29	43	76	27	31	40	46	75	75
South Africa	57	54	60	40	60	87	38	42	56	63	85	90
Swaziland	80	80	85	69	82	91	78	79	76	86	95	91
Tanzania	64	70	59	47	68	86	55	40	73	64	90	81
Uganda	42	45	40	26	42	67	32	22	44	39	66	66
Zambia	24	29	20	13	22	45	19	9	27	18	49	39
Zimbabwe	70	68	71	56	71	92	53	58	70	73	90	93

NOTE.—Authors' calculations using numeracy performance in Southern and Eastern African Consortium for Monitoring Educational Quality—SACMEQ 2007 and grade 6 completion rates from the Demographic and Health Survey, latest year in each country.

the differences in grade 6 completion rates by gender and wealth,[8] as well as an interaction between gender and wealth, using DHS data. We use the same categories as those of Filmer (2010), namely, separating students into one of three categories: the poorest 40 percent of students, the middle 40 percent of students, and the wealthiest 20 percent of students.[9] Due to the large differences in grade 6 completion rates within countries, comparing school quality across subgroups without taking into account subnational grade-completion differentials will necessarily bias the results in cases where subnational completion differences are nontrivial.

In keeping with the above, we calculate the proportion of a cohort (whether in school or out) who are literate and numerate in each country and, within each country, by important subgroups (tables 4 and 5). Given the assumption that children who never complete grade 6 are illiterate and innumerate, it becomes possible to simply multiply the functional literacy rates of boys and girls in grade 6 (from SACMEQ) by the respective grade 6 completion rates for boys and girls (from DHS). For example, in Lesotho the SACMEQ tests showed that 81 percent of girls and 76 percent of boys in school in grade 6 were functionally literate (table 2). However, according to the DHS, only 65 percent of boys will complete grade 6 in contrast to 90 percent of girls (table 1). If one assumes that those boys and girls who never complete grade 6 (35 percent of boys and 10 percent of girls) are functionally illiterate, one can say that 73 percent (81.1 × 90.0 percent) of a cohort of girls in Lesotho are functionally literate. In contrast, only 50 percent (76.1 × 65.5 percent) of a cohort of boys in Lesotho are functionally literate.

In addition to gender, previous studies have shown that large wealth-based differentials also exist for both school quality (Hungi et al. 2010) and enrollments (Filmer and Pritchett 1999). Taking Mozambique as an example, only 26 percent of the poorest 40 percent of children will complete grade 6, compared to 88 percent of the richest 20 percent of children. Unfortunately one cannot simply multiply literacy rates for the poorest 40 percent of children in SACMEQ with the grade 6 completion rates for the poorest 40 percent of children in DHS because these categories do not represent the same underlying population. The poorest 40 percent of children in DHS represent the poorest 40 percent of children in the

[8] There are only two countries where this is a possibility, Swaziland and Tanzania. In both of these countries almost all children who complete grade 6 are functionally literate. Thus, it is sensible to ask whether some children who only complete grade 5 (but not grade 6) may also be functionally literate. To test this we calculated the proportion of children who complete grade 5 but not grade 6 in Tanzania (2.3 percent) and Swaziland (4.1 percent). Given that these are small proportions, even in the event that children with only grade 5 completion were literate, this would not change the overall picture significantly.

[9] To calculate a measure of wealth in SACMEQ, we used multiple correspondence analysis on 31 possession questions in order to create a wealth index.

country, while the poorest 40 percent of children in SACMEQ represent the poorest 40 percent of children who completed grade 6.

This is made clearer using a hypothetical example. Assume that there are 1,000 children in a particular cohort, that the national grade 6 completion rate is 85 percent, and that the grade 6 completion rates for each of the three wealth groups are as follows: of the poorest 400 students only 300 complete grade 6 (75 percent grade 6 completion rate), of the middle 400 students 350 complete grade 6 (87.5 percent grade 6 completion rate), and of the wealthiest 200 students all complete grade 6 (100 percent grade 6 completion rate). Under these conditions, the national grade 6 completion rate would be 85 percent ([300 + 350 + 200]/1,000).

If one were to ignore the grade 6 survival rate differentials for these three groups and simply calculate the poorest 40 percent, middle 40 percent, and richest 20 percent of students using the SACMEQ sample of 850 students, one would get categories that had 340 students in the poorest 40 percent, 340 students in the middle 40 percent, and 170 students in the richest 20 percent category. However, only 300 of the 850 students actually come from the poorest 40 percent of households, not 340, and 200 students come from the richest 20 percent, not 170. Thus if one did not apply a correction to account for the differential grade 6 survival rates, the result would be overestimating the literacy achievement of the poorest 40 percent of children.

Thus, we order the distribution of students in SACMEQ from poorest to wealthiest and then split this distribution according to the grade 6 completion rates of each wealth group in order to obtain SACMEQ wealth groups that are comparable to DHS wealth groups.[10] This process of splitting the SACMEQ sample into groups that are representative of DHS categories is shown mathematically by the following formula:

$$\text{Total SACMEQ sample} = \int_{0}^{\left(\frac{\text{CR}_{\text{poor40}}}{0.4 \times \text{CR}_{\text{total}}}\right) \times N} \text{CN}_{\text{ses}} + \int_{\left(\frac{\text{CR}_{\text{poor40}}}{0.4 \times \text{CR}_{\text{total}}}\right) \times N}^{\left(\frac{\text{CR}_{\text{mid40}}}{0.4 \times \text{CR}_{\text{total}}}\right) \times N} \text{CN}_{\text{ses}} + \int_{\left(\frac{\text{CR}_{\text{mid40}}}{0.4 \times \text{CR}_{\text{total}}}\right) \times N}^{\left(\frac{\text{CR}_{\text{rich20}}}{0.2 \times \text{CR}_{\text{total}}}\right) \times N} \text{CN}_{\text{ses}},$$

where $\text{CR}_{\text{poor40}}$ is the grade 6 completion rate for the poorest 40 percent of 19–23-year-olds in the country, CR_{mid40} is the grade 6 completion rate for the middle 40 percent of 19–23-year-olds in the country, $\text{CR}_{\text{rich20}}$ is the

[10] We use the wealth quintiles created by DHS (variable: hv270).

grade 6 completion rate for the richest 20 percent of 19–23-year-olds in the country, CR_{total} is the national grade 6 completion rate, and N is the total population of grade 6 students obtained by inflating the SACMEQ sample to the population of grade 6 students using the SACMEQ raising factor variable rf2. This is the inverse of the probability of selecting a student into the sample and is derived from the SACMEQ sampling procedure (Ross et al. 2005, 36). The variable CN_{ses} is the cumulative distribution of the grade 6 school-going population, sorted from poorest to wealthiest. The first integral represents the SACMEQ students who correspond to the poorest 40 percent of 19–23-year-olds from DHS, the second integral represents the SACMEQ students who correspond to the middle 40 percent of 19–23-year-olds in the DHS sample, and the last integral represents the SACMEQ students who correspond to the richest 20 percent of the 19–23-year-olds in the DHS sample.

Discussion

The objective of the method presented in this article is to estimate the proportion of a cohort of youth (whether in school or out) who are functionally literate and the proportion who are functionally numerate by the end of grade 6 (the access-to-literacy and access-to-numeracy rates). Figures 1 and 2 provide an introduction to this way of thinking by including on the same graph the proportions of children who never enroll, those who never complete grade 6, those who complete grade 6 but remain functionally illiterate and innumerate, and those who complete grade 6 and acquire either basic or higher-order reading and mathematics skills.

The results presented in figures 1 and 2 summarize the state of primary education in each of the 11 countries. Clearly some countries have a greater problem ensuring that all children enroll, while others have near universal initial enrollment but high dropout before grade 6 (i.e., low grade 6 completion rates). Compare, for example, two neighboring countries, Tanzania and Uganda, and the literacy achievement of their children (fig. 1). In Tanzania a large proportion (15 percent) of children never enroll, while in Uganda, the proportion of children who never enroll is considerably lower (5 percent). Yet Uganda has a far higher proportion of children who drop out before grade 6 (26 percent) compared to Tanzania (11 percent). Furthermore, of those children who do complete grade 6 in Tanzania, almost all are functionally literate (only 3 percent will complete grade 6 but remain functionally illiterate), whereas in Uganda, a considerable proportion of children will complete grade 6 but remain functionally illiterate (14 percent of Ugandan children remain in school and complete grade 6 but are functionally illiterate). Using these three criteria (initial access, dropout, and learning) one can characterize countries in a relatively parsimonious way.

South Africa, for example, is a country with very high initial access (only 1 percent never enroll), very low dropout before grade 6 (only 4 percent enroll but do not complete grade 6), but low learning for those who do complete grade 6 (26 percent complete grade 6 but remain functionally illiterate), with Zimbabwe having a similar profile. By contrast, Zambia has moderately high initial access (only 7 percent never enroll), high dropout (19 percent enroll but do not complete grade 6), and very low levels of learning for those who do reach grade 6 (33 percent will complete grade 6 but remain functionally illiterate), with Malawi having a similar profile.

Figure 2 shows that in all countries there are more children who are functionally innumerate than there are children who are functionally illiterate, with the same holding true for the acquisition of basic and higher-order reading skills compared to basic and higher-order mathematics skills. Clearly children in all countries found the numeracy test more challenging than the literacy test.

A useful way of summarizing the above results is to collapse the proportion of children who acquired basic literacy skills and those who acquired higher-order literacy skills and refer to these children as functionally literate and to collapse the categories of (1) never enrolled, (2) enrolled but never complete grade 6, and (3) completed grade 6 but remained functionally illiterate and to refer to these children as those who are functionally illiterate. The proportion of children in a cohort who have access to literacy (i.e., complete grade 6 and acquire basic literacy skills) is reported in table 4, while those who have access to numeracy (i.e., reach grade 6 and acquire basic numeracy skills) are reported in table 5. For the remainder of the article we refer to the former statistic as the access-to-literacy rate and the latter as the access-to-numeracy rate.

Looking at the national access-to-literacy rates in table 4, one can see that there are effectively three groups of countries: the first group consists of those who have relatively high access-to-literacy rates (>80 percent of a cohort of youth), with this group consisting of Swaziland (86 percent) and Kenya (80 percent). The second group consists of those who have relatively low access-to-literacy rates (60–80 percent) and includes Zimbabwe (78 percent), Namibia (74 percent), Tanzania (72 percent), South Africa (69 percent), and Lesotho (61 percent). The last group consists of those who have extremely low access-to-literacy rates (<60 percent) and includes Uganda (55 percent), Mozambique (42 percent), Zambia (41 percent), and Malawi (40 percent).

Looking at national access-to-numeracy rates in table 5 and using the same grouping as above one can see that only Swaziland is in the top category with an 80 percent access-to-numeracy rate. The countries in the middle category (60–80 percent) are Kenya (77 percent), Zimbabwe (70 percent), and Tanzania (64 percent), and all the remaining countries are

in the low category (<60 percent): South Africa (57 percent), Lesotho (45 percent), Namibia (45 percent), Uganda (42 percent), Mozambique (36 percent), Malawi (25 percent), and Zambia (24 percent).

The exceedingly low levels of literacy and numeracy learning in Zambia, Malawi, and Mozambique are cause for grave concern. Furthermore, figure 1 illustrates that this is not caused primarily by a lack of access since only 7–14 percent of children in these countries never enroll.[11] Rather it is due to dropout and especially due to the high prevalence of what Lewin (2007, 10) refers to as "silent exclusion"—that is, children who are in school but learning so little that they are in effect excluded. In Zambia 33 percent of children in a cohort will enroll in school and complete grade 6 but remain functionally illiterate. Half (50 percent) of Zambian youth will enroll and complete grade 6 but remain functionally innumerate. Even in a middle-income country like South Africa, there is a high proportion of children who remain functionally illiterate (26 percent) and functionally innumerate (38 percent) despite completing 6 years of formal full-time schooling.

Tables 4 and 5 also report the access-to-literacy and access-to-numeracy rates for three important subgroups: (1) boys and girls; (2) the poorest 40 percent, middle 40 percent, and richest 20 percent of children; and (3) the poorest 40 percent of girls and the poorest 40 percent of boys, the middle 40 percent of girls and the middle 40 percent of boys, and the richest 20 percent of girls and the richest 20 percent of boys. We report the gender-wealth interaction primarily because previous studies have shown that girls who are poor face a double disadvantage that is compounded by being jointly part of two groups who are both at risk of being socially excluded from education—girls and the poor (Lewis and Lockheed 2006, 2007). We summarize the differences between the "top" and "bottom" categories for each group in figures 3 (for access-to-literacy rates) and 4 (for access-to-numeracy rates). For example, the access-to-literacy wealth differential is 60 percentage points for Mozambique. This is calculated by subtracting the access-to-literacy rate for the poorest 40 percent of children in Mozambique (17.1 percent) from the access-to-literacy rate for the richest 20 percent of children in Mozambique (77.1 percent). We also calculate the confidence intervals by combining the standard errors from the grade 6 completion rate from the DHS with the standard errors from the proportion literate and numerate from SACMEQ. Given that the two samples are independent, we take the square root of the sum of the squared standard errors.[12]

[11] Given that SACMEQ is a sample of the total school-going population, we created a cumulative distribution of students using the SACMEQ rf2 (raising factor) variable.

[12] Table A7 in the online technical appendix reports the proportion of 19–23-year-olds who never enrolled in school for each of the subgroups. Using table A7 in combination with table 1 allows one to determine whether a low grade 6 completion rate is due to dropout or due to low levels of initial access, an important distinction for policy and research purposes.

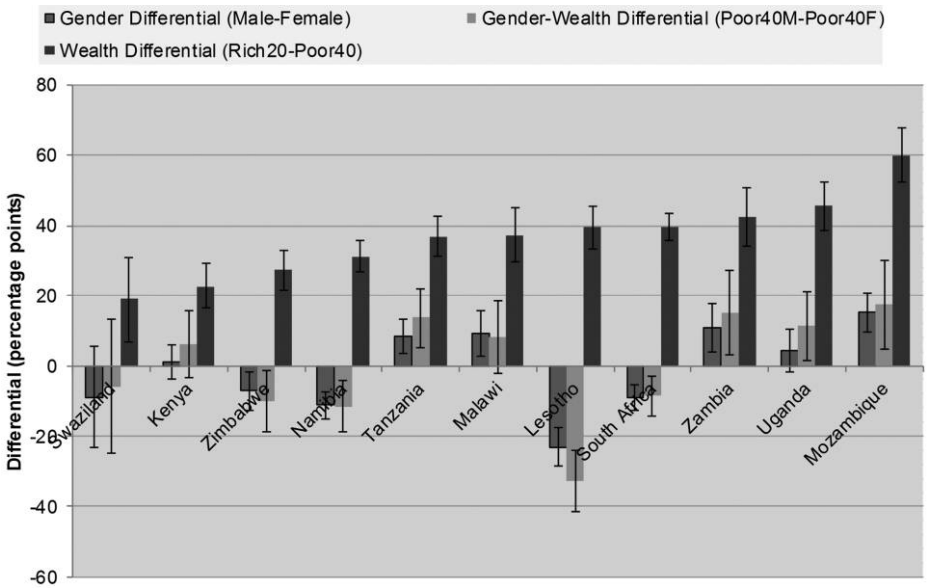

FIG. 3.—Gaps in access-to-literacy rates by gender, gender-wealth interaction, and wealth, shown with 95 percent confidence interval. Color version available as an online enhancement.

The method proposed in this article sheds light on some important topics that have been prioritized for monitoring in the developing world, goals like gender parity and the consensus around the need to reduce inequality based on parental income. Figures 3 and 4 speak to many of these elements. Some notable findings emerging are listed below:

a) In all countries, the access-to-literacy gap between rich and poor is considerably larger than the gap between boys and girls. Even in the country with the largest pro-boy access-to-literacy gap (Mozambique), the gap between rich and poor (60 percentage points) is four times larger than the gap between boys and girls (15 percentage points).
b) In poorer countries (Mozambique, Zambia, Tanzania, and Malawi) boys have higher access-to-literacy and access-to-numeracy rates than girls, driven primarily by higher grade 6 completion rates rather than superior learning outcomes.
c) Only 17 percent of the poorest Mozambican 19–23-year-olds had completed grade 6 and acquired basic literacy skills (for numeracy the figure is 14 percent; tables 4 and 5), primarily due to low initial access (26 percent grade 6 completion rate). Furthermore, poor girls are considerably worse off than poor boys. While 28 percent of the poorest 19–23-year-old boys completed grade 6 and acquired basic literacy

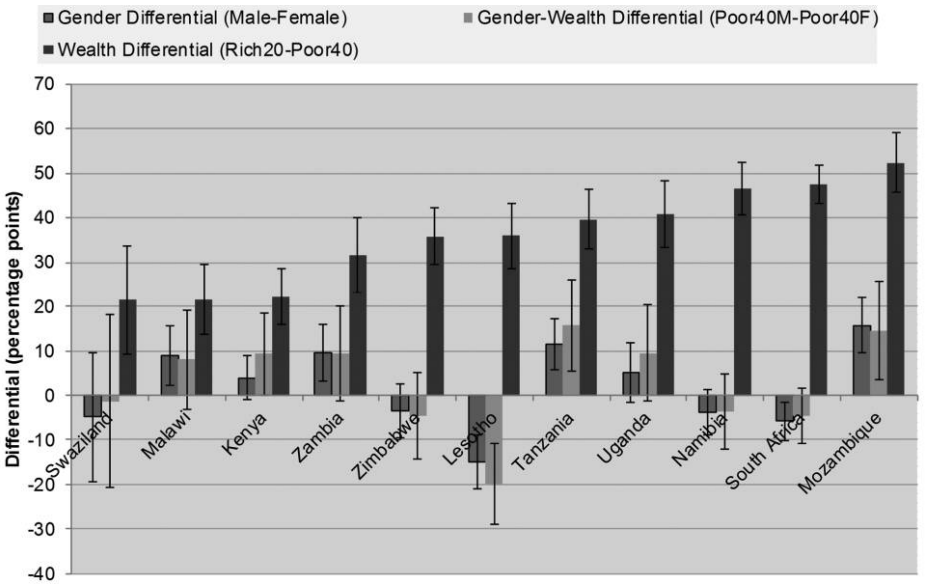

FIG. 4.—Gaps in access-to-numeracy rates by gender, gender-wealth interaction, and wealth, shown with 95 percent confidence interval. Color version available as an online enhancement.

skills, only 9 percent of the poorest 19–23-year-old girls had completed grade 6 and acquired basic literacy skills in Mozambique. Furthermore, in Uganda, Tanzania, Zambia, and Mozambique, the pro-boy difference between poor boys and poor girls is statistically significant.

d) Closer inspection of Lesotho shows an atypical case in which boys are considerably less likely to have access to literacy (and access to numeracy) than girls, with the effect being compounded for the poorest 40 percent of boys. While 73 percent of a cohort of girls will be functionally literate and complete grade 6, the figure for the corresponding cohort of boys is only 50 percent. If one looks specifically at the poorest 40 percent of boys and the poorest 40 percent of girls, the situation becomes even starker. While 62 percent of the poorest girls have access to literacy, only 29 percent of the poorest boys have access to literacy. Looking at table 1 it becomes clear that this trend is driven by the fact that boys (and poor boys in particular) are significantly less likely to complete grade 6 than girls (and poor girls). While 90 percent of girls will complete grade 6, only 65 percent of boys will do so (table 1). Similarly, while 81 percent of poor girls in Lesotho will complete grade 6, only 43 percent of poor boys will do so. Table A7 in the online technical appendix shows that this low grade 6 completion rate is largely due to dropout rather than low initial access. Only 19

percent of poor boys age 19–23 had never enrolled in school. The situation of underparticipation of boys in Lesotho is driven primarily by the cultural and economic tradition of boys (and particularly poor boys) herding livestock (Jha and Kelleher 2006). This leads to a situation in which boys have higher rates of nonenrollment, absenteeism, grade repetition, and dropout (96). It is worth noting that Jha and Kelleher use primary school Net Enrollment Rate (NER) data to illustrate the gap between boys and girls and report that the NER was 83 percent for boys and 89 percent for girls. However, this seriously underestimates the true disadvantage boys face in Lesotho. If one instead compares the access-to-literacy rates for boys (50 percent) and girls (73 percent) and poor boys (29 percent) and poor girls (62 percent), one begins to appreciate how large these differentials really are. These comparisons further illustrate why traditional measures of access or educational quantity (such as NER) are inadequate and inferior relative to this new method.

e) In South Africa, Namibia and Zimbabwe girls have higher access-to-literacy rates than boys, and this is primarily because they do better in school rather than due to grade completion advantages. In contrast, where boys have higher access-to-literacy rates than girls (Mozambique, Tanzania, Malawi, and Zambia), it is primarily because boys are more likely to complete grade 6 (table 1), rather than due to any superior performance in school (tables 2 and 3). That is to say that in countries where the gap is pro-boy, the majority of the difference in access-to-literacy rates between boys and girls is driven by considerably higher dropout (or nonenrollment) rates among girls.

f) The gaps in access-to-literacy and access-to-numeracy rates between the richest 20 percent of students and the poorest 40 percent of students in Mozambique, South Africa, Namibia, Uganda, and Tanzania are truly astounding. While 67 percent of the richest children in Mozambique will complete grade 6 and acquire basic numeracy skills, only 14 percent of the poorest Mozambican children will do so (a gap of 53 percentage points). From table 1, one can see that this is primarily driven by inequalities in grade 6 completion, rather than inequalities in learning (tables 2 and 3). To be specific, in Mozambique the grade 6 completion rates for the poor (26 percent) are only a fraction of the grade 6 completion rate for the rich (88 percent; table 1). The situation in South Africa is completely different: there the access-to-numeracy differential between rich and poor (47 percentage points) is driven almost exclusively by differential school quality (low learning) rather than differential grade 6 completion: 93 percent of poor children in South Africa will complete grade 6, compared to 99 percent of rich children in the country (table 1). However, of those who are in

school (i.e., looking at the SACMEQ sample only; table 3), only 46 percent of poor children are functionally numerate in South Africa compared to 85 percent of rich children.[13]

Quantity, Quality, and the Post-2015 Millennium Development Goals

Over the last 2 decades the Millennium Development Goals (MDGs) developed by the United Nations have been tremendously influential on foreign aid allocations and on the global development agenda more broadly. These goals are set to expire in 2015, at which time new targets will be set. The existing MDG relating to education is worded as follows: "By 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling." In this goal it is implicitly assumed that children who progress through school learn as they go, something that may not in fact be true. Indeed, passing grades in the absence of quality-assured standardized assessments is a very poor indicator of learning. As Pritchett (2004, 11) notes, "The completion of primary schooling or higher in itself does not guarantee that a child has mastered the needed skills and competencies. In fact, all of the available evidence suggests that in nearly all developing countries the levels of learning achievement are strikingly, abysmally low." The statistics reported in this article highlight the prevalence of this in sub-Saharan Africa.

The increased emphasis on learning (quality), rather than a naive focus on schooling (quantity), has prompted a variety of stakeholders to lobby for quality-informed targets for the post-2015 MDG replacements. The United Nations Report of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda, for example, argues for an education-related goal worded as follows: "Ensure every child, regardless of circumstance, completes primary education able to read, write and count well enough to meet minimum learning standards" (United Nations 2013, 36). Similarly, the UNESCO Institute for Statistics and the Center for Universal Education at the Brookings Institution have convened the Learning Metrics Task Force to "catalyze a shift in the global education conversation from access to access *plus* learning" (UNESCO/CUE 2013, 2). The statistics presented in this article—access-to-literacy rates and access-to-numeracy rates—which combine measures of educational quantity and quality, could be one such statistic on which to base the post-2015 MDG replacements.

Conclusion

The aim of the current study has been to create a composite measure of educational quantity and educational quality and to provide some illus-

[13] In a formula, this is $SE_{composite} = (SE^2_{SACMEQ} + SE^2_{DHS})^{1/2}$.

trative examples of its use. Doing so allows for the calculation of the proportion of a particular cohort who are functionally numerate and the proportion who are functionally literate. Building on the conceptual framework of Pritchett (2004) and extending the empirical work of Hanushek and Woessmann (2008), we calculated the proportion of a cohort of youth (19–23 years old) who were functionally literate and functionally numerate for each country and within each country by gender and wealth—what we term the access-to-literacy and access-to-numeracy rates. Importantly, this new method of measuring education system performance distinguishes between those children who have been excluded from school (those who never enroll and those who drop out before grade 6) and those who are in school but have been excluded from learning (those who complete grade 6 but remain illiterate and innumerate). We believe this distinction is an important one both from a research and reporting point of view and from a policy-making and planning perspective.

The results presented here show that learning deficits are considerably greater than access deficits in all of the 11 countries and that late (or delayed) grade 6 completion is widespread in sub-Saharan Africa. Large wealth differentials (greater than 30 percentage points) exist in all countries except Zimbabwe, Kenya, and Swaziland, and pro-boy gender differentials of around 10 percentage points were found in Malawi, Tanzania, and Zambia, rising to 15 percentage points in Mozambique. Lesotho shows an atypically large pro-girl trend in both access-to-literacy and access-to-numeracy rates, driven primarily by boys' lower rate of grade 6 completion, particularly for poor boys.

The current analysis has focused exclusively on 11 countries in sub-Saharan Africa at one point in time (2007). An important extension of this analysis—and one we are currently undertaking—is to look at how access to literacy and access to numeracy have changed over time for different countries and for different subgroups. This type of intertemporal analysis is important when monitoring progress in the expansion of physical access to education and also improvements in learning outcomes. We would like to encourage other researchers to apply this method using different data on learning outcomes. For example, in addition to SACMEQ one could use PASEC (Programme d'Analyse des Systèmes Educatifs de la CONFEMEN) data for francophone West Africa and SERCE (Segundo Estudio Regional Comparativo y Explicativo) for Latin America.

In light of the approaching expiration of the MDGs and the ongoing talks surrounding the form of their replacement, the analysis presented in this article provides strong evidence that any post-2015 educational goals should include explicit learning outcomes as criteria. Achieving Schooling for All (rather than Learning for All) will be an important but hollow achievement and one at odds with the United Nations Millennium Decla-

ration. If children are to realize their full potential, the expansion of physical access to schooling in the developing world must be accompanied by meaningful learning opportunities and achievement. The acquisition of knowledge, skills, and values must be the central aim of educational expansion. In sum, this article refocuses the discussion of education system performance in Africa by providing a composite measure of access to schooling and quality of learning and in so doing places educational outcomes at the center of the discourse.

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Technical Appendix from Spaull and Taylor, "Access to What? Creating a Composite Measure of Educational Quantity and Educational Quality for 11 African Countries"

(CER, vol. 59, no. 1, p. 133)

Methodological Addendum

When trying to calculate a measure of educational quantity, there are a number of possible methods available to the researcher, each of which has its own set of advantages and limitations. Three of the most prominent options are listed below with a discussion of why they were not selected for the present purposes (these were excluded from the full article due to space constraints).

1. *Use the primary school Net Enrollment Rate (NER)*.—These rates are reported in the UNESCO Global Monitoring Reports and are available for almost all countries. The major problems with the NER are first that it is for the full primary school cycle (rather than only grade 6) and second that it is calculated by using administrative data for the numerator and population estimates from a different source for the denominator, leading to potentially large biases (for a comprehensive discussion, see UNESCO Institute for Statistics [2010]).
2. *Calculate age-specific Net Attendance Rates (NAR) from household survey data*.—Instead of using administrative data, one could use nationally representative household survey data on enrollment. This ensures that both the numerator and denominator are sourced from the same data and thus overcomes some of the problems highlighted in 1 above. This was the first approach we employed in a preliminary version of the current analysis in which we used the NAR of the median-aged SACMEQ student in each country (Spaull and Taylor 2012).[14] However, this method overstates access to grade 6 since it assumes that all children of the median age who are attending school have reached, or will reach, grade 6. Given the large variance in ages across grades in sub-Saharan Africa (Lewin and Little 2011), many children of the SACMEQ median age have not yet reached grade 6 and may never reach grade 6.
3. *Use Kaplan-Meier survival probabilities to estimate grade survival*.—In the second iteration of the current study (Spaull and Taylor 2014), we used Filmer's (2010) estimates of grade survival probabilities to grade 6 for the 10–19-year-old cohort in each country. However, this method requires independence between censoring and survival (Szklo and Nieto 2012, 55). That is to say that individuals who are censored, or "lost to follow up" (i.e., no longer in the sample), have the same prospect of survival as those who continued to be followed (i.e., remained in the sample). If this assumption is not met, the resulting probabilities will be biased. In Filmer's educational application of the method, the number who have dropped out of school is analogous to the number in the medical sample who died, while the number of children who are delayed (i.e., who have not dropped out of school but are behind their age-appropriate peers) are analogous to those who are "lost to follow up" (censored observations) in the medical sample. Because the Kaplan-Meier method assumes that censored observations have the same probability of survival as those who remain in the sample, Filmer is essentially assuming that those who are delayed have the same probability of dropping out of school as those who are not delayed (i.e., those who are progressing at the appropriate rate), something that is almost certainly not true. Research has consistently shown that overage students are more likely to drop out than their age-appropriate peers (Lewin and Little 2011). In addition to the above, students who drop out before grade 6 may still return and complete grade 6, leading to a further underestimation of grade 6 completion.

[14] The gaps in learning outcomes between the richest 20 percent and the poorest 40 percent of students reflect more than merely the "value added" by schools. While the quality of schools may well differ by wealth, those schools serving poorer communities also must work with children who had less effective early childhood stimulation, less educational support at home, worse nutrition, etc. Differences in functional literacy and numeracy by wealth thus reflect wider societal inequalities, rather than merely the school "value added."

Table A1. SACMEQ Competency Levels

	Range on 500-Point Scale	Skill
Reading competency level:		
Level 1—Prereading	<373	Matches words and pictures involving concrete concepts and everyday objects. Follows short simple written instructions.
Level 2—Emergent reading	373–414	Matches words and pictures involving prepositions and abstract concepts; uses cuing systems (by sounding out, using simple sentence structure, and familiar words) to interpret phrases by reading on.
Level 3—Basic reading	414–57	Interprets meaning (by matching words and phrases, completing a sentence, or matching adjacent words) in a short and simple text by reading on or reading back.
Level 4—Reading for meaning	457–509	Reads on or reads back in order to link and interpret information located in various parts of the text.
Level 5—Interpretive reading	509–63	Reads on and reads back in order to combine and interpret information from various parts of the text in association with external information (based on recalled factual knowledge) that "completes" and contextualizes meaning.
Level 6—Inferential reading	563–618	Reads on and reads back through longer texts (narrative, document, or expository) in order to combine information from various parts of the text so as to infer the writer's purpose
Level 7—Analytical reading	618–703	Locates information in longer texts (narrative, document, or expository) by reading on and reading back in order to combine information from various parts of the text so as to infer the writer's personal beliefs (value systems, prejudices, and/or biases).
Level 8—Critical reading	703+	Locates information in a longer texts (narrative, document or expository) by reading on and reading back in order to combine information from various parts of the text so as to infer and evaluate what the writer has assumed about both the topic and the characteristics of the reader—such as age, knowledge, and personal beliefs (value systems, prejudices, or biases).
Mathematics competency level:		
Level 1—Prenumeracy	<364	Applies single-step addition or subtraction operations. Recognizes simple shapes. Matches numbers and pictures. Counts in whole numbers.
Level 2—Emergent numeracy	364–462	Applies a two-step addition or subtraction operation involving carrying, checking (through very basic estimation), or conversion of pictures to numbers. Estimates the length of familiar objects. Recognizes common two-dimensional shapes.
Level 3—Basic numeracy	462–532	Translates verbal information presented in a sentence, simple graph, or table using one arithmetic operation in several repeated steps. Translates graphical information into fractions. Interprets place value of whole numbers up to thousands. Interprets simple common everyday units of measurement.
Level 4—Beginning numeracy	532–87	Translates verbal or graphic information into simple arithmetic problems. Uses multiple different arithmetic operations (in the correct order) on whole numbers, fractions, or decimals.
Level 5—Competent numeracy	587–644	Translates verbal, graphic, or tabular information into an arithmetic form in order to solve a given problem. Solves multiple-operation problems (using the correct order of arithmetic operations) involving everyday units of measurement or whole and mixed numbers. Converts basic measurement units from one level of measurement to another (e.g., meters to centimeters).
Level 6—Mathematically skilled	644–720	Solves multiple-operation problems (using the correct order of arithmetic operations) involving fractions, ratios, and decimals. Translates verbal and graphic representation information into symbolic, algebraic, and equation form in order to solve a given mathematical problem. Checks and estimates answers using external knowledge (not provided within the problem).
Level 7—Concrete problem solving	720–806	Extracts and converts (e.g., with respect to measurement units) information from tables, charts, visual, and symbolic presentations in order to identify and then solve multistep problems.
Level 8—Abstract problem solving	>806	Identifies the nature of an unstated mathematical problem embedded within verbal or graphic information and then translates this into symbolic, algebraic, or equation form in order to solve the problem.

SOURCE.—Southern and Eastern African Consortium for Monitoring Educational Quality—SACMEQ 2010.

Table A2. Demographic and Health Survey Grade 6 Completion Rate for 19–23-Year-Olds, with Standard Errors (%)

	National	SE	Boys	SE	Girls	SE	Poor40	SE	Mid40	SE	Rich20	SE
Kenya	87.21	1.00	88.36	1.13	86.20	1.43	78.49	2.07	89.44	1.36	93.92	1.35
Lesotho	77.97	1.00	65.48	1.52	90.00	.84	61.13	1.70	82.95	1.14	95.82	.81
Malawi	62.86	.99	67.10	1.26	58.85	1.11	42.21	1.32	64.57	1.36	89.23	.89
Mozambique	53.01	1.37	62.79	1.57	44.93	1.62	25.64	1.72	52.07	1.94	87.94	.96
Namibia	85.42	.84	81.42	1.25	88.98	.88	76.18	1.59	85.99	1.07	97.57	.71
South Africa	95.42	.33	94.16	.48	96.64	.37	92.58	.67	97.24	.30	98.90	.33
Swaziland	87.73	2.41	86.39	6.98	94.43	2.10	77.90	5.53	89.78	2.67	95.38	2.47
Tanzania	74.12	1.41	78.50	1.45	70.24	1.79	57.37	2.43	78.00	1.36	92.36	1.19
Uganda	68.53	1.34	70.49	1.54	67.05	1.72	48.98	2.19	71.56	2.09	89.46	1.20
Zambia	74.03	1.22	80.91	1.36	67.98	1.60	51.58	2.26	76.89	1.56	95.21	1.11
Zimbabwe	95.21	.46	94.73	.61	95.59	.56	89.41	1.16	96.98	.48	99.29	.33
	Poor40M	SE	Poor40F	SE	Mid40M	SE	Mid40F	SE	Rich20M	SE	Rich20F	SE
Kenya	82.49	2.21	74.96	2.97	89.97	1.57	88.93	2.12	93.03	2.00	94.57	1.53
Lesotho	42.63	2.09	81.26	1.88	73.40	1.85	92.29	1.05	92.77	1.60	98.14	.62
Malawi	48.50	1.90	37.03	1.50	67.39	1.89	61.80	1.67	89.25	1.18	89.20	1.28
Mozambique	39.05	2.68	15.22	1.90	62.93	2.45	43.45	2.24	88.92	1.14	87.03	1.33
Namibia	71.82	2.24	80.37	1.95	81.33	1.66	90.15	1.07	96.84	1.28	98.15	.75
South Africa	90.42	.94	94.69	.76	96.59	.50	97.87	.34	98.76	.52	99.03	.41
Swaziland	85.99	6.53	90.49	7.09	81.88	11.09	95.19	2.57	99.75	.26	96.41	2.84
Tanzania	64.78	2.71	51.29	2.85	79.62	1.82	76.36	2.17	97.19	1.09	88.56	1.79
Uganda	56.85	2.92	43.00	2.72	72.13	2.37	71.09	2.64	86.39	2.32	91.60	1.24
Zambia	65.71	3.08	40.54	2.69	81.92	1.68	72.20	2.34	95.21	1.63	95.21	1.40
Zimbabwe	87.72	1.60	90.71	1.35	97.26	.62	96.75	.73	98.83	.71	99.64	.23

Table A3. Proportion of the SACMEQ 2007 Sample Who Are Literate (SACMEQ Level 3+), Uncorrected for Those Who Do Not Complete Grade 6, with Standard Errors (%)

	National	SE	Boys	SE	Girls	SE	Poor40	SE	Mid40	SE	Rich20	SE
Kenya	91.96	1.00	91.45	.97	92.48	1.39	87.58	1.97	92.88	.75	97.51	.55
Lesotho	78.80	1.30	76.06	1.71	81.09	1.31	72.89	1.90	78.00	1.48	87.73	1.68
Malawi	63.40	1.77	66.40	2.04	60.31	1.95	58.29	2.77	62.56	2.04	69.45	2.26
Mozambique	78.49	1.13	79.46	1.25	77.34	1.42	66.48	3.07	76.66	1.48	87.65	1.22
Namibia	86.37	.76	83.50	.99	89.01	.81	80.61	1.28	86.60	.90	94.94	.76
South Africa	72.74	1.19	68.83	1.32	76.52	1.25	57.76	1.60	76.13	1.17	94.08	.85
Swaziland	98.52	.40	97.96	.53	99.09	.33	97.65	.79	98.76	.33	99.50	.26
Tanzania	96.50	.52	96.77	.65	96.24	.62	94.54	.98	96.64	.70	98.71	.39
Uganda	79.65	1.30	80.82	1.39	78.50	1.51	72.53	2.09	77.62	1.45	90.67	1.16
Zambia	55.91	1.68	58.25	1.88	53.45	2.15	48.34	2.41	51.72	2.00	70.85	2.41
Zimbabwe	81.50	1.55	77.64	1.95	84.47	1.72	74.92	2.24	80.55	2.05	95.12	1.37
	Poor40M	SE	Poor40F	SE	Mid40M	SE	Mid40F	SE	Rich20M	SE	Rich20F	SE
Kenya	87.18	1.57	87.97	2.68	92.48	1.08	93.50	1.18	97.03	.93	97.68	.79
Lesotho	67.88	2.83	75.97	1.99	74.24	1.98	81.32	1.70	86.44	1.89	89.10	1.93
Malawi	58.48	3.27	54.93	3.30	65.77	2.67	60.20	2.57	75.95	2.70	64.91	2.53
Mozambique	69.26	3.34	63.69	4.60	79.36	1.67	74.54	2.07	88.56	1.36	84.90	1.66
Namibia	77.35	1.75	83.49	1.46	82.76	1.30	89.66	.98	93.88	1.08	96.83	.71
South Africa	54.14	1.77	60.71	1.92	71.08	1.57	81.74	1.18	91.32	1.28	96.39	.85
Swaziland	96.93	.99	98.68	.55	98.48	.49	99.01	.38	98.87	.59	100.00	
Tanzania	95.05	1.42	93.53	1.37	97.03	.74	96.78	.91	98.64	.53	98.46	.63
Uganda	74.59	2.30	72.26	2.30	78.79	1.76	75.85	1.83	92.37	1.43	88.46	1.51
Zambia	51.02	2.87	45.43	3.56	55.14	2.38	49.05	2.69	73.57	2.64	66.92	3.37
Zimbabwe	69.92	3.25	78.72	2.25	77.35	2.26	83.71	2.45	91.90	2.59	96.43	1.76

Table A4. Proportion of the SACMEQ 2007 Sample Who Are Numerate (SACMEQ Level 3+), Uncorrected for Those Who Do Not Complete Grade 6, with Standard Errors (%)

	National	SE	Boys	SE	Girls	SE	Poor40	SE	Mid40	SE	Rich20	SE
Kenya	88.77	1.04	89.92	1.07	87.59	1.47	84.65	1.89	89.44	.97	94.40	1.04
Lesotho	58.19	1.59	57.72	1.93	58.59	1.74	50.64	2.03	57.05	1.82	69.79	2.40
Malawi	40.12	1.80	44.50	2.07	35.61	2.18	37.87	2.86	40.22	1.97	42.10	2.36
Mozambique	67.27	1.26	70.38	1.42	63.58	1.69	55.41	2.27	65.97	1.77	75.69	1.59
Namibia	52.31	1.35	52.39	1.56	52.24	1.48	38.28	1.82	50.38	1.53	77.60	1.71
South Africa	59.83	1.38	57.53	1.55	62.05	1.46	43.08	1.74	61.30	1.37	88.40	1.13
Swaziland	91.41	.93	92.76	.92	90.07	1.17	89.00	1.34	91.53	1.10	95.13	.86
Tanzania	86.76	1.07	89.67	1.05	83.96	1.45	81.30	1.92	86.80	1.21	93.49	.88
Uganda	61.26	1.58	63.45	1.76	59.14	1.81	52.86	2.25	58.64	1.74	74.62	1.89
Zambia	32.68	1.42	36.09	1.75	29.08	1.73	25.73	2.03	28.34	1.50	47.16	2.89
Zimbabwe	73.45	1.70	71.76	2.34	74.76	1.84	62.80	2.60	73.36	1.90	92.69	1.44
	Poor40M	SE	Poor40F	SE	Mid40M	SE	Mid40F	SE	Rich20M	SE	Rich20F	SE
Kenya	86.98	1.74	83.34	2.40	90.06	1.15	87.85	1.59	94.86	1.56	93.83	1.40
Lesotho	49.85	2.90	50.51	2.24	54.70	2.42	59.00	2.36	69.71	2.92	71.17	2.91
Malawi	40.61	3.11	31.45	4.11	45.86	2.73	37.29	2.50	46.63	3.21	36.71	3.08
Mozambique	58.08	2.79	52.99	3.79	70.98	2.03	59.43	2.44	80.25	1.94	71.37	2.12
Namibia	38.24	2.17	38.70	2.09	49.65	2.04	50.95	1.77	77.95	2.05	76.73	2.00
South Africa	41.66	2.12	44.58	1.99	57.97	1.68	64.51	1.49	85.97	1.56	90.49	1.28
Swaziland	90.56	1.60	87.55	1.65	93.33	.96	90.14	1.67	95.63	.98	94.62	1.29
Tanzania	85.60	2.03	77.51	2.82	91.10	1.13	83.66	1.55	92.72	1.33	91.94	1.33
Uganda	56.31	2.60	52.30	2.66	61.08	1.93	54.61	2.30	76.71	2.27	72.56	2.23
Zambia	28.31	2.74	22.89	2.20	33.44	2.10	24.94	1.95	51.42	3.34	40.48	3.67
Zimbabwe	60.94	3.76	64.03	2.56	71.81	2.85	75.07	2.22	90.79	2.27	93.63	2.11

Table A5. Access-To-Literacy Rates for 19–23-Year-Olds by Subgroups—Combining SACMEQ and DHS, with Standard Errors (%)

	National	SE	Boys	SE	Girls	SE	Poor40	SE	Mid40	SE	Rich20	SE
Kenya	80.19	1.42	80.80	1.49	79.71	2.00	68.74	2.86	83.08	1.55	91.59	1.46
Lesotho	61.44	1.64	49.80	2.29	72.98	1.55	44.56	2.55	64.70	1.86	84.06	1.87
Malawi	39.86	2.03	44.56	2.39	35.49	2.24	24.60	3.07	40.40	2.45	61.97	2.43
Mozambique	41.61	1.77	49.90	2.01	34.75	2.15	17.05	3.52	39.92	2.44	77.08	1.55
Namibia	73.77	1.13	67.99	1.60	79.20	1.19	61.41	2.04	74.47	1.40	92.63	1.04
South Africa	69.41	1.23	64.81	1.40	73.95	1.31	53.47	1.74	74.03	1.21	93.05	.91
Swaziland	86.44	2.44	84.63	7.00	93.56	2.12	76.07	5.59	88.66	2.69	94.90	2.48
Tanzania	71.52	1.50	75.96	1.59	67.60	1.89	54.24	2.62	75.37	1.52	91.17	1.25
Uganda	54.58	1.87	56.97	2.07	52.64	2.29	35.52	3.03	55.54	2.55	81.12	1.67
Zambia	41.39	2.08	47.13	2.32	36.33	2.68	24.94	3.30	39.77	2.54	67.46	2.65
Zimbabwe	77.59	1.62	73.55	2.05	80.75	1.81	66.98	2.53	78.12	2.10	94.44	1.41
	Poor40M	SE	Poor40F	SE	Mid40M	SE	Mid40F	SE	Rich20M	SE	Rich20F	SE
Kenya	71.92	2.71	65.95	4.00	83.20	1.90	83.14	2.42	90.27	2.20	92.38	1.72
Lesotho	28.94	3.52	61.74	2.74	54.49	2.71	75.05	2.00	80.19	2.48	87.44	2.03
Malawi	28.36	3.78	20.34	3.63	44.32	3.27	37.20	3.07	67.79	2.94	57.89	2.84
Mozambique	27.05	4.29	9.69	4.98	49.94	2.97	32.39	3.05	78.74	1.77	73.89	2.13
Namibia	55.55	2.84	67.10	2.44	67.31	2.11	80.83	1.45	90.91	1.67	95.04	1.03
South Africa	48.95	2.00	57.49	2.06	68.65	1.65	79.99	1.23	90.20	1.38	95.46	.94
Swaziland	83.35	6.60	89.30	7.11	80.64	11.10	94.24	2.60	98.62	.65	96.41	2.84
Tanzania	61.57	3.06	47.97	3.16	77.26	1.97	73.90	2.35	95.88	1.21	87.20	1.90
Uganda	42.41	3.71	31.07	3.56	56.83	2.96	53.93	3.21	79.79	2.73	81.03	1.96
Zambia	33.52	4.21	18.42	4.46	45.17	2.92	35.42	3.57	70.05	3.10	63.71	3.65
Zimbabwe	61.33	3.62	71.40	2.62	75.23	2.34	80.99	2.56	90.82	2.68	96.07	1.78

NOTE.—Given that SACMEQ and DHS use different samples in their surveys, the samples are independent and thus the composite standard errors are simply the square root of the sum of the squared standard errors of each sample; i.e., $(SE1^2_{DHS} + SE2^2_{SACMEQ})^{1/2}$.

Table A6. Access-To-Numeracy Rates for 19–23-Year-Olds by Subgroups—Combining SACMEQ and DHS, with Standard Errors (%)

	National	SE	Boys	SE	Girls	SE	Poor40	SE	Mid40	SE	Rich20	SE
Kenya	77.42	1.44	79.45	1.56	75.50	2.05	66.44	2.80	80.00	1.67	88.66	1.70
Lesotho	45.37	1.88	37.79	2.46	52.73	1.93	30.96	2.65	47.32	2.14	66.88	2.53
Malawi	25.22	2.05	29.86	2.42	20.96	2.44	15.99	3.15	25.97	2.39	37.56	2.52
Mozambique	35.66	1.86	44.19	2.12	28.57	2.34	14.21	2.85	34.35	2.63	66.57	1.85
Namibia	44.68	1.59	42.65	2.00	46.48	1.73	29.16	2.42	43.33	1.87	75.71	1.85
South Africa	57.09	1.42	54.18	1.62	59.96	1.51	39.88	1.87	59.61	1.40	87.43	1.17
Swaziland	80.20	2.58	80.14	7.04	85.05	2.40	69.33	5.69	82.18	2.89	90.73	2.62
Tanzania	64.31	1.77	70.39	1.79	58.98	2.30	46.64	3.10	67.70	1.81	86.34	1.48
Uganda	41.98	2.07	44.72	2.34	39.65	2.49	25.89	3.14	41.96	2.72	66.76	2.24
Zambia	24.19	1.88	29.20	2.22	19.77	2.36	13.27	3.04	21.79	2.16	44.90	3.10
Zimbabwe	69.94	1.76	67.98	2.41	71.47	1.93	56.15	2.84	71.15	1.96	92.03	1.48
	Poor40M	SE	Poor40F	SE	Mid40M	SE	Mid40F	SE	Rich20M	SE	Rich20F	SE
Kenya	71.75	2.82	62.47	3.81	81.03	1.94	78.12	2.65	88.26	2.53	88.74	2.08
Lesotho	21.25	3.58	41.05	2.92	40.15	3.05	54.45	2.58	64.67	3.33	69.85	2.98
Malawi	19.69	3.65	11.65	4.37	30.91	3.32	23.05	3.01	41.62	3.41	32.75	3.34
Mozambique	22.68	3.87	8.07	4.24	44.67	3.19	25.82	3.32	71.36	2.25	62.11	2.50
Namibia	27.47	3.11	31.10	2.86	40.38	2.63	45.93	2.06	75.49	2.42	75.31	2.14
South Africa	37.67	2.32	42.21	2.13	55.99	1.75	63.14	1.53	84.91	1.65	89.62	1.35
Swaziland	77.86	6.72	79.23	7.28	76.42	11.13	85.80	3.06	95.39	1.01	91.22	3.12
Tanzania	55.45	3.39	39.76	4.01	72.54	2.15	63.89	2.66	90.12	1.72	81.42	2.23
Uganda	32.01	3.91	22.49	3.80	44.06	3.06	38.82	3.50	66.27	3.24	66.47	2.55
Zambia	18.60	4.12	9.28	3.47	27.39	2.69	18.01	3.04	48.96	3.72	38.55	3.92
Zimbabwe	53.46	4.09	58.08	2.90	69.84	2.91	72.63	2.34	89.72	2.38	93.29	2.12

NOTE.—Given that SACMEQ and DHS use different samples in their surveys, the samples are independent and thus the composite standard errors are simply the square root of the sum of the squared standard errors of each sample; i.e., $(SE1^2_{DHS} + SE2^2_{SACMEQ})^{1/2}$.

Table A7. Proportion of 19–23-Year-Olds Who Never Enrolled in School from the Demographic and Health Survey, with Standard Errors (%)

	National	SE	Boys	SE	Girls	SE	Poor40	SE	Mid40	SE	Rich20	SE
Kenya	5.26	.72	2.81	.54	7.40	1.20	10.41	1.67	3.32	.91	2.20	.79
Lesotho	4.87	.46	9.26	.87	.63	.19	10.42	1.01	2.32	.38	.90	.39
Malawi	7.09	.45	6.03	.55	8.09	.61	12.43	.94	5.96	.60	1.32	.35
Mozambique	13.67	.84	7.95	.85	18.39	1.21	22.10	1.60	14.03	1.31	2.81	.50
Namibia	5.89	.46	7.41	.66	4.53	.54	8.80	.96	6.20	.67	1.08	.49
South Africa	1.13	.21	1.29	.26	.98	.23	1.38	.45	.99	.18	.74	.27
Swaziland	1.42	.32	2.44	1.09	1.89	.94	3.08	1.02	.82	.23	.57	.25
Tanzania	14.56	1.16	10.44	1.19	18.20	1.49	27.71	2.34	10.10	.98	2.61	.68
Uganda	5.68	.61	5.29	.74	5.97	.71	11.33	1.47	3.03	.56	2.03	.49
Zambia	7.03	.56	3.28	.54	10.33	.95	13.87	1.31	5.18	.69	2.09	.75
Zimbabwe	.91	.18	.71	.20	1.06	.29	1.70	.39	.75	.32	.21	.13
	Poor40M	SE	Poor40F	SE	Mid40M	SE	Mid40F	SE	Rich20M	SE	Rich20F	SE
Kenya	5.70	1.35	14.56	2.59	1.66	.62	4.96	1.71	1.14	.70	2.96	1.19
Lesotho	18.72	1.77	1.40	.48	4.29	.71	.39	.21	2.08	.88	.00	.00
Malawi	9.88	1.11	14.52	1.29	6.04	.96	5.88	.68	1.34	.46	1.29	.54
Mozambique	10.48	1.67	31.12	2.47	9.89	1.55	17.31	1.65	2.59	.55	3.00	.76
Namibia	9.93	1.31	7.70	1.15	8.31	.98	4.32	.79	1.52	.84	.74	.41
South Africa	1.46	.49	1.32	.48	1.25	.29	.74	.19	.80	.42	.69	.35
Swaziland	6.29	4.48	3.66	3.18	1.98	.96	.95	.80	.00	.00	2.17	1.97
Tanzania	20.39	2.38	33.71	2.96	8.00	1.26	12.21	1.55	.00	.00	4.65	1.21
Uganda	8.65	1.65	13.36	1.75	3.55	.96	2.61	.67	3.33	.94	1.12	.49
Zambia	5.03	1.21	20.78	2.11	3.32	.78	6.92	1.14	1.40	.95	2.72	1.22
Zimbabwe	1.92	.58	1.53	.50	.27	.22	1.15	.55	.00	.00	.36	.00