



# Access to Education in Rural Areas of Mali

## Shortening the Distance to Education for All (EFA)

2013

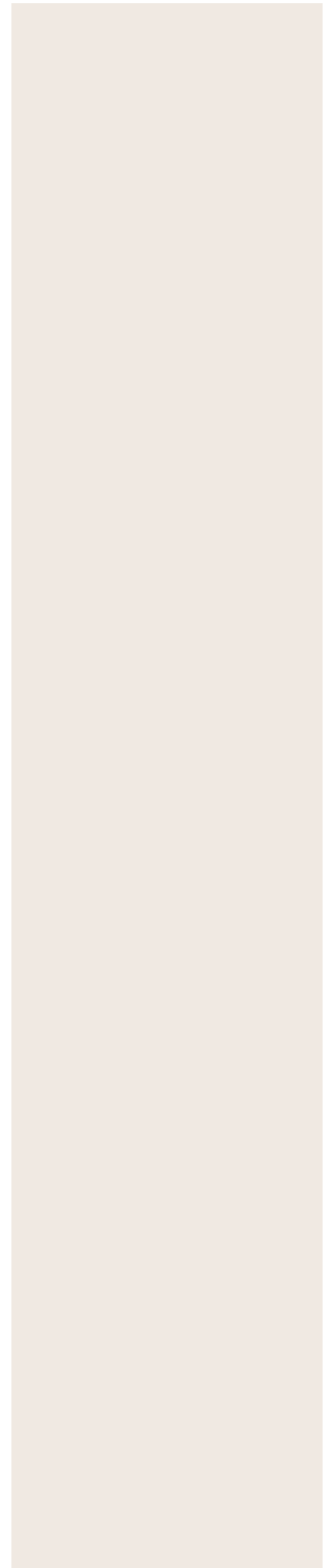
**EDC** Learning  
transforms  
lives.

## **Acknowledgements**

The author of this article is Douglas Lehman, who led the contributions of Education Development Center, Inc., to the work described herein. Other important contributors to the work include representatives of Mali's Ministry of Education, Literacy, and National Languages, Gaiwé François Atchina, the Regional Action Plan/Decision-Making Program, the United States Agency for International Development, and Education Development Center, Inc.

## **Photography**

Jennifer Davis: cover, p. 7, p. 1, p. 3, p. 20, p. 31; Karl Grobl: p. 4, p. 17, p. 32; Highlands Museum & Discovery Center: p. 18 (top and bottom).



# Table of Contents

|   |    |
|---|----|
| Acknowledgements .....  | ii |
| Photography .....   | ii |
| Executive Summary .....   | 1  |
| Introduction.....   | 3  |
| The Situation in 2005 .....   | 4  |
| The Challenge of Reaching EFA .....   | 4  |
| Addressing Disparities: Limited Progress.....   | 5  |
| Table 1: Gross Enrollment Ratio in Three Regions in 2002–2003 and 2006–2007 .....   | 5  |
| A Closer Look: Measuring the Distance to EFA .....  | 7  |
| Considering Catchment.....  | 7  |
| Figure 1. Map, with georeferencing data, of a portion of the Diéma CAP in western Mali.....   | 8  |
| Table 2. Percentage of Settlements by Distance Between the Village and the School for Each Georeferenced CAP.....                                     | 9  |
| Graph 1: Villages, by percentage, in terms of distance to the nearest school in 12 CAPs, 2005. ....   | 9  |
| The Effect of Distance on School Attendance .....   | 10 |
| Figure 2: Map, with georeferencing data, of a portion of the Diéma CAP in western Mali. ....  | 10 |
| Graph 2: Study on the Effect of Distance on Enrollment (April 2006–May 2007).....   | 11 |
| Teacher Distribution and Incomplete-Cycle Schools.....  | 12 |
| Graph 3: Distribution of class sizes in mono-grade classrooms in public, community, and Franco-Arabic primary schools, 2005–2006.....                 | 12 |
| School/Teacher Optimal Configuration Exercise .....   | 13 |
| Figure 3. Map of Takouti and environs used for School/Teacher Optimal Configuration exercise.....   | 14 |
| Table 3. Decreased Enrollment Related to Distance Between Village and School. ....  | 14 |
| Figure 4. School Placement, Group A.....  | 15 |
| Figure 5. School Placement, Group B.....  | 15 |
| Figure 6. School Placement, Group C.....  | 16 |
| Shortening the Distance to EFA: Weighing the Strategies .....   | 17 |
| Distance, Transportation Systems, and Single-Teacher Schools (STSs) .....   | 17 |
| The STS Strategy in Mali.....   | 20 |
| School/Teacher Optimal Configuration .....  | 20 |
| Implementing a System that Incorporates Single-Teacher Schools: Issues and Responses.....   | 21 |
| How Many STSs? .....  | 22 |
| Table 4. Number of Localities by School-Age Population and Size of Corresponding School, Georeferenced Zones .....                                    | 23 |
| Table 5. Number of Localities by School-Age Population and Size of Corresponding School, Nationwide Projection.....                                   | 24 |
| Graph 4. Class Size in Monograde Classrooms in Public, Community and Franco-Arabic Schools, Primary Level, 2005–2006.....                             | 26 |
| Graph 5. Projected Improved Distribution of Class Sizes According to Size, Public, Community and Franco-Arabic Schools, Primary Level, 2005–2006..... | 26 |
| Factoring in Villages that Do Not Have Schools .....  | 26 |
| Graph 6. School-Age Population Grouped by Size of Community, 2006.....  | 27 |

|  |    |
|--|----|
| <b>Estimating Numbers and Types of Teachers Needed</b> .....                             | 27 |
| Table 6. Estimated Need for Teachers as per the Type of Training, 2006.....              | 28 |
| Table 7. Projected Need for Teachers by Type of Training, EFA Scenario in 2015–2016..... | 28 |
| <b>The Pedagogy of STS</b> .....   | 29 |
| <b>Study Tour</b> .....  | 30 |
| <b>In Conclusion</b> .....   | 31 |
| <b>Glossary and Abbreviations</b> .....  | 32 |



## Executive Summary

This article covers a body of work conducted in Mali from 2005 to 2009 that aimed to improve access to quality basic education in rural areas of Mali. The work was conducted by technical assistants from Education Development Center, Inc. (EDC), in collaboration with their counterparts in Mali's Ministry of Education, Literacy, and National Languages (MEALN), and was based on methodologies developed in the World Bank-funded Rural Access Initiative. The work was designed to help the Government of Mali accelerate progress toward Education for All (EFA)<sup>1</sup> by better understanding the specific context of children, particularly girls, from poor families living in scattered rural communities. The MEALN's information system showed that although Mali was making progress toward EFA, the country would likely not meet the 2015 target date. Further, there were regional and urban/rural gaps that weren't closing quickly enough, likely signaling that the existing strategies for achieving equal access to education were not sufficient to address the remaining problems.

Using Geographic Information Systems (GIS), all rural communities and schools in target districts were plotted on maps. At the time, the MEALN's norm for school catchment areas was that all children living within five kilometers of a given school were "covered" by that school. Using GIS, it was possible to plot those villages that were theoretically "covered" by a given school. In the next phase of the work, data collectors went into isolated rural schools to identify each child's village, hamlet, or rural community. After the school visit, the data collectors visited each village or hamlet that sent at least one child to the school. School-age children population data were gathered for each of these communities, producing a gross enrollment ratio by community. The village-level data were then grouped by the distance from school (i.e., villages with schools, villages less than two kilometers from a school, villages between two and three kilometers from a school, etc.).

---

*The Malian Ministry of Education, Literacy, and National Languages (MEALN), with the support of Education Development Center, Inc. (EDC), took a closer look at how well the education system was providing access to education in sparsely populated Sahelian areas where progress toward Education for All seemed to lag. The Ministry's findings led it to a new twist on an old solution—the single-teacher school.*

---

<sup>1</sup> Mali is among 189 nations that have adopted the six EFA goals. This article addresses primarily Mali's efforts to reach Goal #2, ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to, and complete, free and compulsory primary education of good quality. See <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-all/efa-goals/>

The data showed that school attendance declined dramatically when children were asked to leave their own community to attend school in another. In fact, for those villages without schools and situated less than two kilometers from a village with a school, school attendance was roughly half that observed in the villages with schools. For those villages without schools and located between two and three kilometers from a village with a school, school attendance was between one quarter and one third of that observed in villages with schools. Several factors come into play, and although it's nearly impossible to determine the exact weight of each factor, some of the most important are (1) student commute time, (2) "cultural distance" from one village to another (rivalry, inter-village conflict, ethnicity, etc.), (3) security, particularly for girls, and (4) domestic labor load, particularly for girls.

Prior to the advent of the automobile, school systems in many countries, including those in most of today's developed countries, relied on small, local schools. The small schools, with a staff of one or two teachers, were quite numerous and the distance between them minimal. When school transportation became an option, most small rural schools were closed and children from outlying communities were bused to school. Strikingly, in Mali and across Sahelian Africa, the school systems rely mostly on larger three- and six-teacher schools, yet there is no transportation system in place.

The reliance on larger schools in sparsely populated rural areas is compatible with a pedagogical approach that has come to dominate in Mali and in the region: The teacher uses frontal teaching techniques where children respond as a group to questions asked by the teacher, and much class time is spent on rote memorization and copying down what the teacher has written on the blackboard. Larger schools—where there are enough students so that in a given class there is only one grade of learners—are compatible with frontal teaching, essentially enabling the trend. Small schools, on the other hand, are quite incompatible with most frontal teaching techniques, since teachers have students from different grades present in the same room. Teachers in one-room schools—or single-teacher schools (STSs)—generally rely heavily on pedagogical materials to provide most of the course content. This frees up the teacher to monitor progress among the different groups of learners and assist those students in specific areas where needed.

Shifting to small rural schools should have another key benefit for the Malian school system. Not only will small communities have access to quality basic education, but the need for new teachers should ease a bit, as there will be fewer rural classrooms with low enrollments. The primary driver behind low enrollment in rural schools has been the underutilization of multi-grade teaching techniques. Once the STS becomes part of the regular school system landscape, rural school teachers will be better equipped to handle several grades in a classroom.

In October 2007, the Malian MEALN formally decided to develop a pedagogical model compatible with teaching in an STS. EDC has assisted the MEALN with this aspect of the work as well, and by the start of the 2011–2012 school year, there were 49 STSs operating in rural Mali. Demand from outlying villages has been strong, and the MEALN is working to develop the teacher training capacity to meet that demand.



## Introduction

Great progress has been made globally in enrolling out-of-school children since the adoption in 2000 of the Education for All (EFA) goals—from 1999 to 2008, an additional 52 million children enrolled in primary school<sup>2</sup>—but the pace of progress remains too slow to achieve the milestones by the 2015 target. One major challenge has been low enrollment and completion rates in rural areas of many developing nations.

This article presents the process the Malian Ministry of Education, Literacy, and National Languages (MEALN; in French: *Ministère de L'Education, de L'Alphabétisation et des Langues Nationales*) went through, in partnership with its technical assistance provider, Education Development Center, Inc. (EDC), to understand the challenges it faces in reaching EFA, particularly in rural areas. EDC's technical assistance was funded by the United States Agency for International Development (USAID) through the Regional Action Plan/Decision-Making Program (RAP-DM)<sup>3</sup>, which was led by the Academy for Educational Development. Innovative research helped the MEALN recognize that previously held assumptions about the relationship between distance to school and enrollment were significantly flawed. The research demonstrated that a different strategy was needed to accelerate the pace of enrollment growth.

The article then analyzes the implications of the strategy Mali selected to address this problem—the creation of small rural schools, supported by a newly developed pedagogical model and materials. As the MEALN and Malian communities are discovering, small rural schools—including single-teacher schools (one-room schools)—have the potential to increase enrollment, reduce inefficiencies, and promote the use of quality teaching, bringing EFA closer to reality.

---

*Small rural schools have the potential to increase enrollment, reduce inefficiencies, and promote the use of quality teaching, bringing Education for All closer to reality.*

<sup>2</sup> <http://unesdoc.unesco.org/images/0019/001907/190743e.pdf>

<sup>3</sup> EDC was a subgrantee to the Academy for Educational Development (AED), the primary recipient of RAP-DM award under the Educational Quality Improvement Program 2 (EQUIP2). EDC was responsible for providing on-site technical assistance on education planning to the Ministry of Education, Literacy, and National Languages. For the sake of brevity, in this paper, RAP-DM refers to the technical assistance provided by EDC as part of the USAID-funded, AED-led project.



## The Situation in 2005

### The Challenge of Reaching EFA

The Malian MEALN had been working to ensure that Mali reach its goal of EFA by 2015, but in 2005, it still had a long way to go. Access to schooling had been improving rapidly since 1995, but data from the MEALN indicated that the pace of improvement was not sufficient to achieve EFA by the target date. The MEALN statistical yearbook<sup>4</sup> reported the country's gross enrollment ratio (GER) at 72.2 percent during the 2004–2005 school year, and the school completion rate for grade 6 was only 43.2 percent. For completion rates to be 100 percent in 2015, all seven year olds would need to be enrolled in grade 1 by 2010 so they could reach grade 6 by the 2015–2016 school year. In 2005, the gross intake ratio (total number of new entrants in the first grade of primary education, regardless of age, expressed as a percentage of the population of theoretical entrance age to primary education) was only 65 percent. Although the intake ratio had been climbing at a rate of 2.3 points per year, it would need to leap 7 points annually to meet the EFA target of 100 percent enrollment in grade 1 in 2010. This massive expansion of access to school had to happen while a concomitant push for improvement in the quality of the learning environment and progress in learning outcomes was in process.

In the 2004–2005 school year, 63 percent of enrolled students were in public schools with the remainder in private schools (8 percent of total), community-run schools (18 percent of total), and *medersas*<sup>5</sup> (9 percent of total). Community schools and *medersas* depended largely on local community financing despite the Malian government's efforts to provide modest subsidies.

At the same time, the school system was experiencing a related problem even where children were enrolled in school. Many rural schools (63 percent of all rural schools in 2005–2006) did not offer the full, six-year cycle of the primary curriculum and many schools recruited first-graders only once every two, three, or even six years. Reliance on incomplete cycle schools leads to high drop-out rates and is not EFA compatible.

4 *Annuaire National des Statistiques Scolaires de l'Enseignement Fondamental 2004–2005, Ministère de l'Education Nationale, Cellule de Planification Statistique, 2005.*

5 In the Malian context, the *medersa* is a school that provides basic education in French and Arabic and may also offer a course of religious education. Koranic schools offer religious education.



The inefficient distribution of teachers presented yet another challenge. In a country with heavily overcrowded classrooms, many schools in rural areas had very small classes, often with only one-tenth the number of students found in classes in schools located in urban areas or in large villages. For example, 3,009 classes in public, community, and *medersa* schools had 20 or fewer students in 2005–2006, whereas the national target was 50 students per teacher. These phenomena suggested inefficiencies that would worsen if the school system expanded from larger settlements into the small villages and hamlets of the semi-arid Sahel using the standard model of six grades per school with a teacher for each grade, or even using a three-classroom model in which each teacher teaches two grades.

## Addressing Disparities: Limited Progress

Mali had already begun efforts to reach its EFA goals by 2015, in part through the Education Sector Investment Program (in French: *Programme d'Investissement Sectoriel de l'Education*, or PISE), which was launched in 2001. One of the central PISE strategies was to reduce disparities in the education system; it specifically focused on the gender, geographical, and economic dimensions of disparity. Mali's Education Management Information System (EMIS) showed, for example, that on the national level, the gross enrollment ratio (GER) for girls in grades 1–6 rose from 56.4 percent in 2002–2003 to 68.0 percent in 2006–2007, whereas for boys, the GER rose from 77.9 percent to 87.5 percent over the same period. Thus, the “gender gap” went from 21.5 percentage points in 2002–2003 to 19.5 percentage points in 2006–2007. In four years, roughly one-third of the time remaining to reach EFA in 2015, girls' GER improved 11.6 points, which is less than a quarter of the distance it needed to progress to reach a GER of 109 percent,<sup>6</sup> whereas for boys, the GER's progress of 9.6 points out of a total of 31.1 points to get to a GER of 109 percent represented nearly one-third of the progress necessary to get to EFA.

The data revealed that the pace of progress was, at the time, insufficient for both groups, but for girls, the pace was less than two-thirds what it needed to be. With respect to gender equity, the fundamental issues had not yet been resolved: The gap between boys' and girls' enrollment rates had narrowed only slightly. The fundamental shift in favor of girls' education had yet to occur.

For disparity correlated to geography, the EMIS provided data on the enrolment disparity between regions. Table 1 below shows an example of the kind of data available.

Table 1: Gross Enrollment Ratio in Three Regions in 2002–2003 and 2006–2007

| Region    | GER in 2002–2003 | GER in 2006–2007 |
|-----------|------------------|------------------|
| Mopti     | 46%              | 56%              |
| Koulikoro | 77%              | 81%              |
| Bamako    | 126%             | 121%             |

<sup>6</sup> A GER of 109 percent is necessary for universal schooling if the repetition rate declines to 8 percent. The reason for this is that repeaters take more than six years to complete the course of study and they increase the overall number of students in the system.

The gap in GER between Mopti and Koulikoro narrows from 31 to 25 points whereas between Mopti and Bamako the gap shrinks from 80 to 65 points. Over four years, a period representing one-third of the time remaining before EFA, Mopti's GER increased 10 points out of the 63 points between its 2002–2003 GER of 46 percent and the goal of 109 percent, amounting to less than one-sixth of the distance to EFA. From one region to another there had been a certain reduction of disparity, but the overall progress was far from sufficient to reach EFA. And the data, however compelling, did not provide insight into what was happening within the regions, particularly between urban and rural populations; while the District of Bamako is urban, both Koulikoro and Mopti have large urban centers, peri-urban zones, and vast rural areas.

Mali's Education Management Information System (EMIS) did not provide enrollment ratio data for urban and rural areas, which made it difficult to quantify the disparity between them. Studies had been done that provided data on rural and urban enrollment, but the quality of the studies had not risen to the point where the MEALN was publishing the data in its statistical yearbooks. Further, even if the all the disparity data were available, the rural areas include a great diversity of settlement patterns and population densities with some populations living in large villages, others in smaller villages and hamlets, and some living on isolated farms or in nomadic camps. Within rural areas, patterns varied widely.

In 2004, the norm for rural school coverage was five kilometers. This meant that all villages, hamlets, and other settlements located less than five kilometers from a school were considered "covered" by that school's catchment zone, roughly 78 square kilometers. The standard school size was generally six grades with a teacher for each grade. There was also a three-classroom model in which each teacher taught two grades. Many rural schools, however, did not offer the full six-year program, owing to either a general lack of teachers or a lack of teachers qualified to teach multiple-grade classrooms.

In short, the Malian MEALN, via its EMIS, had a lot of good information about disparity among regions and between genders. The MEALN also had a clear set of strategies in place and was seeing progress, albeit slow, toward EFA. The information that was missing was why these strategies were not on pace to get Mali close to its goal of EFA by 2015.



## A Closer Look: Measuring the Distance to EFA

Beginning in 2004, RAP-DM, funded by USAID, provided policy-related technical support to the MEALN. With the support of RAP-DM implementing partner EDC, the Ministry decided to take a closer look at how well the education system was providing access to education in sparsely populated Sahelian areas where progress toward EFA seemed to lag. A better understanding of the supply-and-demand issues would be necessary to ensure that the country's EFA strategies were as effective as possible. The first step in the process was to examine whether Mali's EFA strategies were favoring those population groups that had been lagging the most in the EFA effort: children from rural areas, girls, and children from poor families. Enrollment among poor, rural girls appeared to be climbing faster than the national average, but not to the extent required to reach EFA. This limited progress suggested that the EFA strategies then in use were not as effective as they could be.

### Considering Catchment

Like most countries in West Africa, Mali had been using a school catchment area norm that specified that all children living in a given radius around a school were considered to be "covered" by that school. This resulted in a requirement that many children enroll in "consolidator" schools outside their villages and hamlets. The International Institute for Education Planning (IIEP) indicated that in some contexts a home-to-school commute of less than three kilometers is "reasonable."<sup>7</sup> In Mali's case, the norm was five kilometers, meaning that any child within five kilometers of a school was expected to attend that school.

In developed countries, the school catchment area concept is widely used, but it is coupled with a school transportation system. Prior to the availability of such transportation systems, today's developed countries relied on smaller, village-based schools, and children were rarely asked to leave their own community to attend school elsewhere.

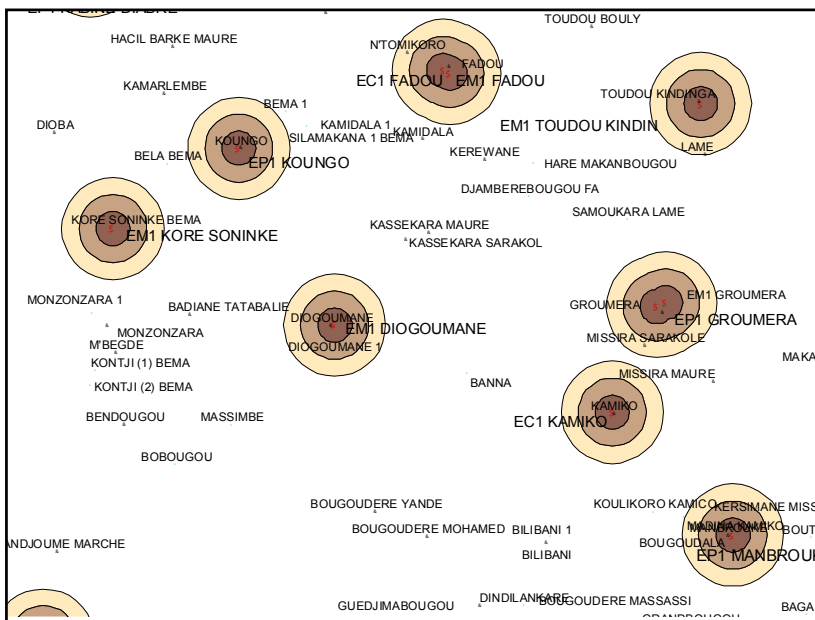
Since there was no transportation system in place in Mali, children were expected to get to school by their own means, most often on foot. EDC helped the Malian MEALN study the effect of home-to-school commuting on attendance in an effort to determine

<sup>7</sup> *Training Materials in Education, Planning, Administration and Facilities*, "School mapping and micro-planning in education," Françoise Caillods, International Institute for Education Planning, UNESCO, p. 24.

whether improvements could be made in the catchment area approach in order to eliminate distance as a barrier to schooling, particularly for low-income, rural girls.

In an early phase of this work, 12 of the country's 70 educational administration districts, or CAPs (in French: *Centre d'Animation Pédagogique*),<sup>8</sup> were georeferenced, identifying all the schools, villages, and hamlets within them. The term "georeferencing" means that each point is precisely located by using a Global Positioning System (GPS), which gives the latitude, longitude, and altitude to the nearest meter. The georeferencing methodology used by the MEALN in 2005 differed from that used during the 1998 census, in that every hamlet was georeferenced as a distinct locality as opposed to being considered as associated with a larger village. For each georeferenced point, the following additional data were also noted: the type of point (village, hamlet, school, etc.), the municipality in which it is located, and a rapid estimate of the number of dwellings in the case of villages or hamlets. Figure 1 shows an example of georeferencing data.

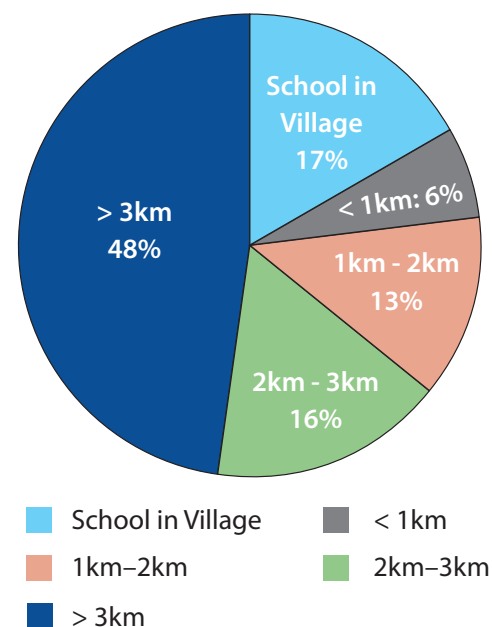
Figure 1. Map, with georeferencing data, of a portion of the Diéma CAP in western Mali. Each school in the zone has three shaded buffer zones, one at one kilometer, one at two kilometers, and a third at three kilometers. The villages are noted with black dots and are recognized as "administrative villages" in the national census. The hamlets are indicated by lighter dots; hamlets are generally assimilated to the nearest village in the national census.



8 The Malian school system was subdivided into 70 CAPs, of which 12 were in the District of Bamako and 58 covered the rest of the country. The CAP's zone is the geographical area covered by the CAP's pedagogical support team.

Using ArcGIS software to manage the georeferenced data, it was possible to identify the number of villages and hamlets within a specific distance of the nearest school. Graph 1 shows that 17 percent of the settlements had a school, but 48 percent were located more than three kilometers from a school.<sup>9</sup> Although this graph does not provide information on the total population living in each of the categories shown, it is probable that the villages with schools were among those with the largest populations.

Graph 1: Villages, by percentage, in terms of distance to the nearest school in 12 CAPs, 2005.



The georeferencing team successfully located 97 percent of the schools that were in the Ministry’s database, but the overall number of schools georeferenced was 35 percent higher than the number found in the database. Table 2 shows the breakdown of these data by distance between village and school for each georeferenced CAP. Some of those newly “found” schools were those that had just opened, but others were most likely schools that simply had not submitted the annual statistical report form on time. Still others may have been schools that the local education officials were not aware of. Approximately 55 percent of the “missing” cases were *medersas*, 30 percent were community schools, 11 percent were public schools, and 4 percent were private schools.

Table 2. Percentage of Settlements by Distance Between the Village and the School for Each Georeferenced CAP

| Georeferenced Zones | Category            |  |  |  |  |                                     |
|---------------------|---------------------|--|--|--|--|-------------------------------------|
|                     | Village with school | Satellite villages less than 1km from a school | Satellite villages between 1km and 2km from a school | Satellite villages between 2km and 3km from a school | Total villages less than 3km from a school | Villages outside 3km catchment area |
| Gourma Rharous      | 6%                  | 3%   | 8%   | 10%  | 26%  | 74%                                 |
| Youwarou            | 10%                 | 4%   | 5%   | 4%   | 24%  | 76%                                 |
| Nioro               | 19%                 | 2%   | 3%   | 5%   | 29%  | 71%                                 |
| Menaka              | 37%                 | 2%   | 5%   | 5%   | 48%  | 52%                                 |
| Yorosso             | 14%                 | 10%  | 25%  | 22%  | 71%  | 29%                                 |
| Niena               | 20%                 | 5%   | 18%  | 26%  | 68%  | 32%                                 |
| Nara                | 19%                 | 2%   | 6%   | 11%  | 38%  | 62%                                 |
| Dioïla              | 15%                 | 8%   | 21%  | 27%  | 70%  | 30%                                 |
| Diéma               | 15%                 | 8%   | 21%  | 27%  | 70%  | 30%                                 |
| Tombouctou          | 21%                 | 10%  | 15%  | 21%  | 67%  | 33%                                 |
| Douentza            | 14%                 | 5%   | 5%   | 11%  | 35%  | 65%                                 |
| Barouelli           | 19%                 | 12%  | 12%  | 13%  | 56%  | 44%                                 |

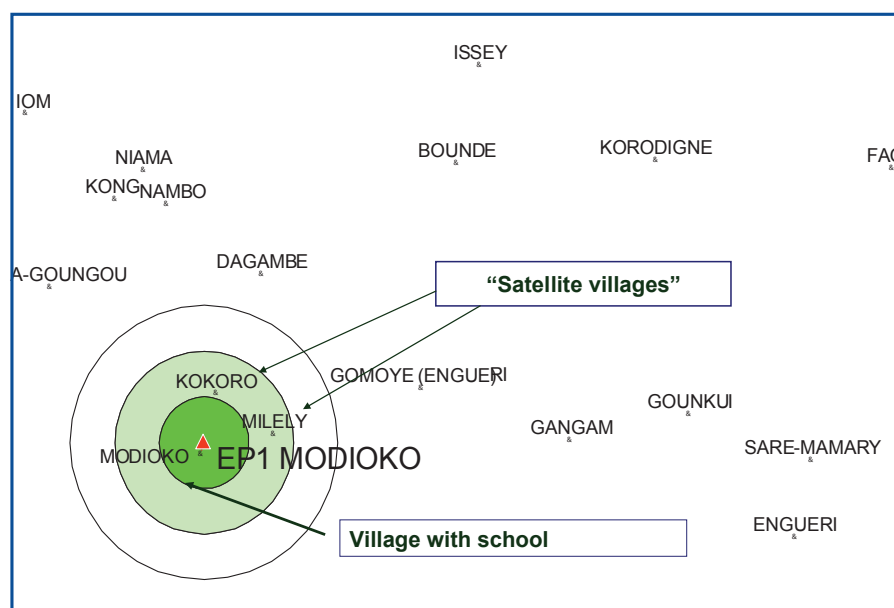
<sup>9</sup> The three-kilometer distance was used for this exercise, as it is the limit that is more commonly used in the region.

## The Effect of Distance on School Attendance

It is useful to understand where villages are located with respect to schools. It is also important to understand the effect of school location on the probability of children attending school. RAP-DM worked directly with CAP staff to implement a study to better understand the distance-to-school problem using a methodology the World Bank-funded Rural Access Initiative developed in 2002. Similar studies have been conducted in Chad, Niger, and Guinea.

To study the effect of village location on the probability of children going to school, the research team used a georeferenced database to identify all the isolated schools as potential sites for further study. For this study, a school is considered to be isolated if a theoretical three-kilometer catchment area around the school does not overlap with that of another school. Of all the potential sites, those having at least two satellite villages were retained for the sample. The satellite villages were in addition to the village where the school is located, as shown in Figure 2.

Figure 2: Map, with georeferencing data, of a portion of the Diéma CAP in western Mali.



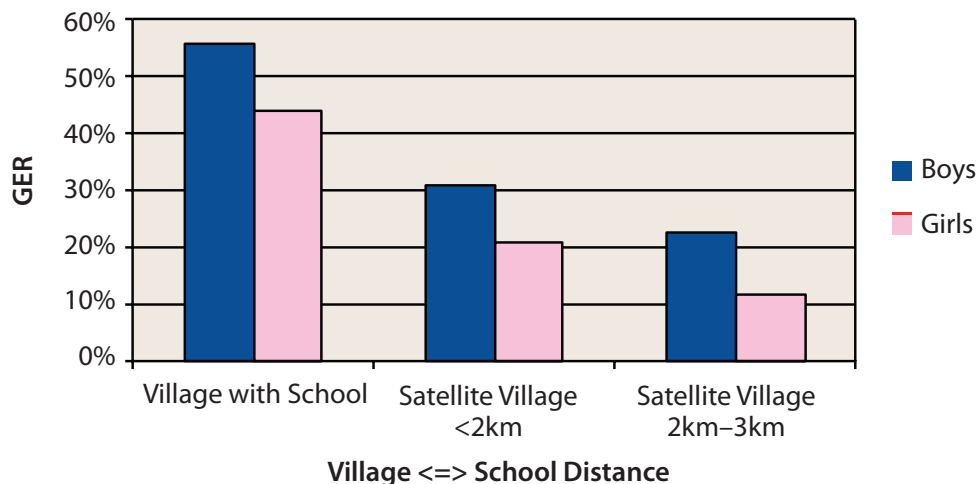
Using random selection, 40 percent of the eligible sites were selected for the study as primary sites. All of the unselected sites were designated as alternate sites if, for some reason, the primary site was not operational. A non-operational site is one where the school is closed for any reason when the data collection team arrives.

In the field data collection phase of the study, the research team arrived at a given site and met with the school director to explain its objective. Then the team visited each classroom and collected the following data for all children present: gender, grade, and village or hamlet of residence. Equipped with georeferenced maps of the area, the research team generally had little trouble linking the names of villages given by the children with those found on the map. In some instances, the team enlisted the help of a teacher or one of the students' parents to verify that the villages were correctly identified.

The data collectors then visited each locality that sent at least one child to the school. In each locality, the research team visited the village chief and explained the reason for the mission. That discussion started with where the rural communities are situated in relation to one another. Once good rapport with the village elders was established, the data collectors developed a list of all the heads of family and noted by gender the total number of children living at home for each family. Then the team disaggregated the children by age, putting them into three groups: (i) those younger than age 7, (ii) children 7 to 12, and (iii) children older than 12 years. The 7- to 12-year-old group is the denominator for the village enrollment ratio; the number of children found at the school from that village is the numerator. This ratio is an approximate GER for the village. For the context of this study, “enrollment” was determined by the physical presence of the child in class on the day of an unannounced visit, whereas official enrollment data were based on an administrative act and do not depend on whether the child is actually attending school. At the end of the village visit, the team administered a questionnaire to the village elders on the possible reasons for under-enrollment.

Between April 2006 and June 2007, the study was conducted in 26 schools and 117 villages in 11 of the 70 CAPs of Mali. Plotting the GER, by gender, against the distance of the children’s village from the village with the school revealed that even for the villages where a school was located, the number of children in school on the day of the research team visit was less than half the number of school-age children in that village (see Graph 2). The data reveal that enrollment decreases as a function of distance from school, and that the problem is quite evident even at distances of less than two kilometers. Girls seem to be slightly more sensitive to distance than boys. In villages that have schools, girls’ enrollment is 42 percent on average; but in satellite villages located between two kilometers and three kilometers from a school, girls’ enrollment is only 12 percent on average, less than one third that of villages that have schools. Granted, reasons for under-enrollment are varied. Many rural schools (62.9 percent of the total number of rural schools in 2005–2006) did not offer the full cycle of six grades of primary education in the same year; this often accounts for under-enrollment. However, the relationship between under-enrollment and distance seemed stark in this exercise.

Graph 2: Study on the Effect of Distance on Enrollment (April 2006–May 2007)



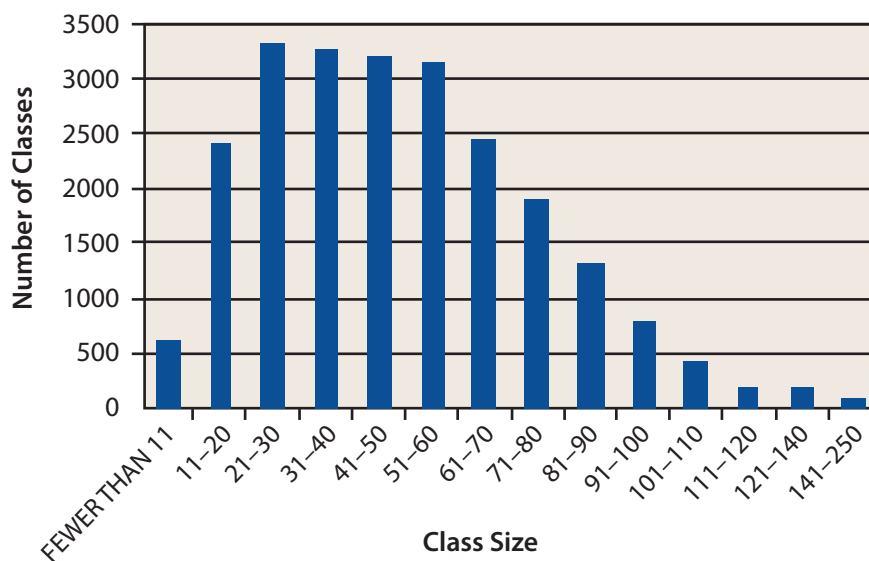
The georeferenced data indicate that in the 12 georeferenced CAPs, 47.0 percent of the villages were farther than the three-kilometer norm for a school catchment area. This implies that, according to that same norm, the remaining 53.0 percent of the villages in the Mali sample have no significant distance-to-school problem. However, the field research looked exclusively at the distance-to-school problem for those villages located less than three kilometers from a school and discovered that even within that distance, enrollment of children living two to three kilometers from the school dropped considerably in comparison to those living closer to the school. Together, these two discoveries indicate that Mali had a serious distance-to-school problem causing reduced access to school in rural areas.

## Teacher Distribution and Incomplete-Cycle Schools

The distance-to-school study demonstrated the importance of one barrier to rural access to schooling. Another challenge, that of inefficient teacher distribution, can be further elucidated by using data from the MEALN's statistical database. During the 2005–2006 school year, there were 26,854 pedagogical groups (a group of learners of a given grade level studying together in the same classroom) in the six primary grades in 8,149 schools. Of the total number of pedagogical groups, 23,281 were mono-grade in public, community, and *medersa* schools.<sup>10</sup>

Graph 3 displays the data on the number of classrooms with one pedagogical group as per the size of the pedagogical groups.<sup>11</sup> The significant numbers of classrooms with 30 or fewer students and those with 61 or more students illustrate the inefficient distribution of teachers.

Graph 3: Distribution of class sizes in mono-grade classrooms in public, community, and Franco-Arabic primary schools, 2005–2006.



<sup>10</sup> Private schools were excluded from the class-size analysis, since they can intentionally reduce class size and raise tuition to offset the increased cost; this practice is much rarer and/or forbidden by statute elsewhere.

<sup>11</sup> For this analysis, all pedagogical groups that share a classroom but at different times of the day are included. The groups are alone in the classroom with the teacher at any given time.



Using a large number of teachers in classrooms with few students exacerbates another problem, that of the incomplete-cycle school. For the 2005–2006 school year, 4,168 rural schools, or 63.1 percent of all rural schools, offered only incomplete cycles. In these schools, the grades offered each year rotate annually to follow a given cohort through the primary cycle, so if a school offers grades 1, 3, and 5 in one year, the next year it offers grades 2, 4, and 6. Removing from the sample the recently opened schools, which would not have had the time to recruit six successive waves of students, the incomplete-cycle schools were 48 percent of the total of all rural schools; they offered on average just 3.5 grades out of the planned 6 grades. The problem of incomplete-cycle schools was therefore not episodic, but chronic.

## School/Teacher Optimal Configuration Exercise

### *The Methodology*

The School/Teacher Optimal Configuration (STOC) exercise enables one to experience what happens when the STS model is added to the possible options available to education planners striving for full enrollment in sparsely populated areas. In the exercise, a facilitator divides participants into groups, and the task of each group is to get all children into school in a given rural area. A map displays villages and existing schools as well as the number of school-age children per village. Each group receives a number of chips with each chip representing a teacher. The number of chips is equal to the number of teachers that would be needed using the targeted MEALN student-to-teacher ratio if all children were in school. Requiring children to leave their village and attend school in another village (with no school transportation scheme in place) will have a negative impact on enrollment, so it is best to keep distances to a minimum.

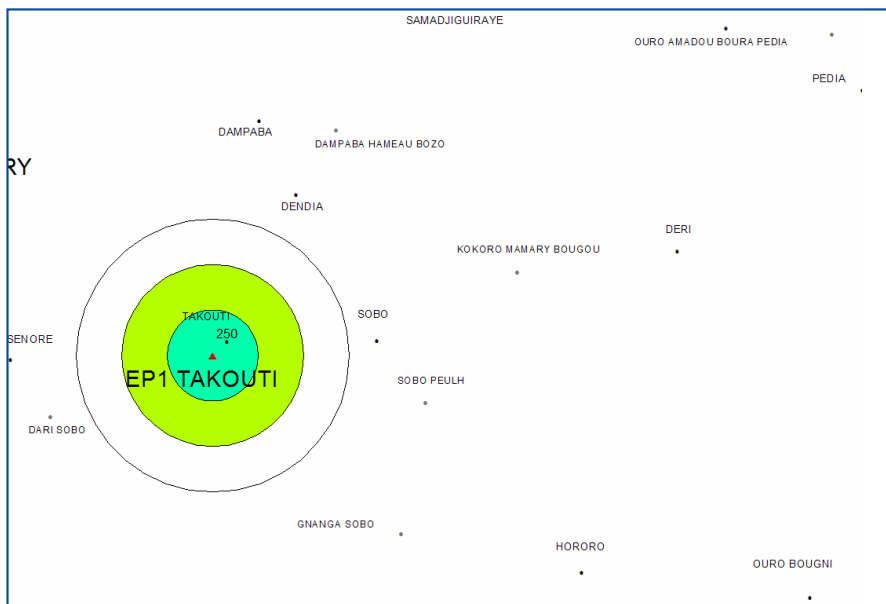
Each group works with a different school model. Group A works with the school model most well-known and widespread: one teacher for one grade in each classroom. This model requires at least six teachers for all the primary grades to be taught in a given school year. Group B is assigned the school model that uses “double grade” teaching: two grades are with one teacher in a classroom. Finally, Group C can use schools of all sizes including the STS.

As the groups debate the best locations for schools, Group A finds it can have relatively few schools, since each school needs at least six teachers. Group B’s work is more complex because, as the number of potential schools increases, the group must measure distances to find the best possible placement for them. For Group C, however, the task is much simpler, since the majority of its schools can be STSs.

The figures displayed here present a sampling of the outcomes that the STOC exercise can produce, using the village of Takouti and its environs as an example. Around the existing school in Takouti are concentric circles that are spaced at 1 km intervals with the number of school-age children in each village under the name of the village. The total school-age population for the entire zone comes to 936. Given a target student-to-teacher ratio of 40:1, and 936 children, 23 teachers would be available for the zone. The existing school in Takouti is located in the largest village in the area. The exercise is done twice, the first time using a ceiling GER of 70 percent. This less-than-EFA GER

simulates the education access and quality problems that are not related to distance from school.

Figure 3. Map of Takouti and environs used for School/Teacher Optimal Configuration exercise.



In the second iteration of the exercise, it is assumed that if a village has a school, then all the children will attend that school. This supposes that all the other quality and access issues are resolved, and that the only remaining obstacle is that of distance to school.

According to the existing school map norm, all of the villages situated less than five km from Takouti are covered by the Takouti School. Because, at three km, the enrollment ratios are about 65 percent lower than those in villages with schools, the “distance drop-off” can be projected to be even higher at four km and five km respectively. Table 3 shows the decreased enrollment related to the distance by kilometer between home, village, and school.

Table 3. Decreased Enrollment Related to Distance Between Village and School.

| Village-to-School Distance               | Percentage of Children Who Do Not Attend School Due to Distance | Source   |
|--|---|--|
| 0km (a school is located in the village) | 0%  | Study on the effect of distance on school attendance |
| 0–2km                                    | 48%   |  |
| 2–3km                                    | 69%   |  |
| 3–4km                                    | 79%   | Projection   |
| 4–5km                                    | 87%   | Projection   |

Each group is instructed to position at least six teachers in the school in Takouti, which means that a maximum of 17 teachers can be placed in new schools in the area. Often a large six-classroom school such as that in Takouti will have an additional teacher who handles the principal's job, making for a total of seven teachers there.

Group A opens two new schools in addition to the school in Takouti and positions them in the way that seems most strategic for maximizing enrollment, for example in Dampaba and Hororo, as depicted in Figure 4. With this school placement, all of the children from Takouti, Dampaba, and Hororo are enrolled. In addition, some children will come in from the satellite villages. For example, the Dampaba school will receive approximately 24 children from Dendia, 10 from Dampaba Hameau Bozo, and 6 from Samadjiguiraye, making for a total enrollment of 91 when added to the 51 children living in Dampaba. With six or seven teachers, the school would have a student-to-teacher ratio of between 15 and 17. The Takouti school, on the other hand, would have not only the 254 children from Takouti village but also 24 children from the villages of Sénoré, Dari Sobo, Sobo Peulh, and Sobo, bringing the enrollment to 278 students. The Hororo school would have just 111 students, which would produce a student-to-teacher ratio of between 16 and 18 with a staff of six or seven teachers. So if each of the three schools has a staff of seven teachers, totaling 21, the two remaining teachers would probably be added to the staff of Takouti where there is the highest enrollment. Group A would manage to enroll a total of 479 children with its 23 teachers, and gross enrollment in the area would reach 51 percent. It would be hard for this region to retain 23 teachers with such low enrollment because other areas often have overcrowded classrooms.

Group B works with a smaller school model where a minimum of three teachers are required per school, as shown in Figure 5. However, just like Group A, Group B must keep at least 6 teachers in the Takouti School, so only the remaining 17 teachers can be positioned in a maximum of five new schools in the villages of Hororo, Dampaba, Kokoro Mamary Bougou, Sénoré, and

Figure 4. School Placement, Group A

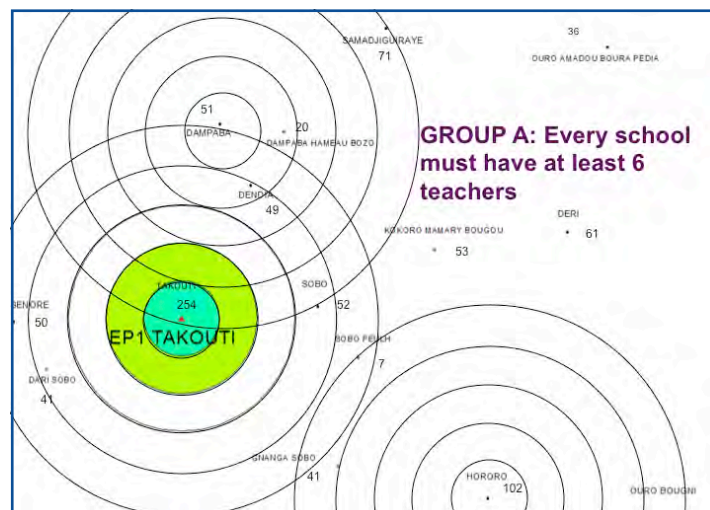
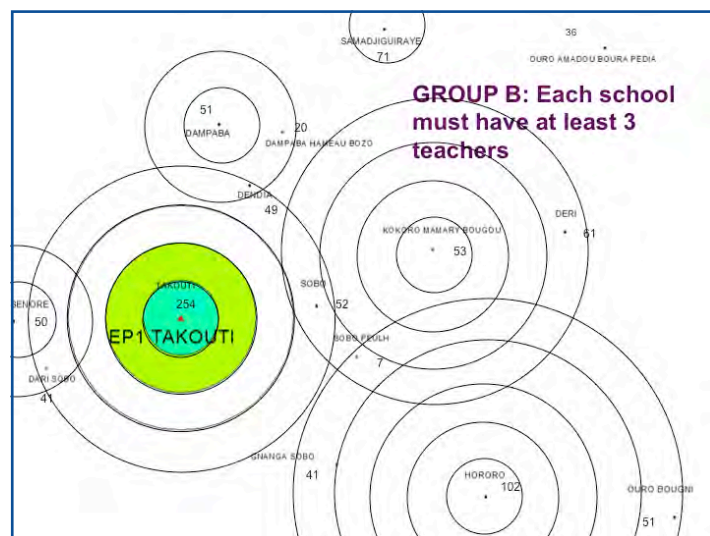


Figure 5. School Placement, Group B

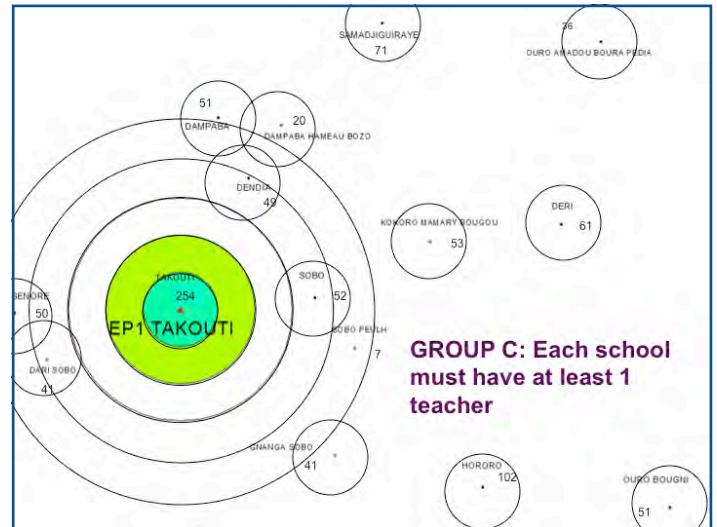


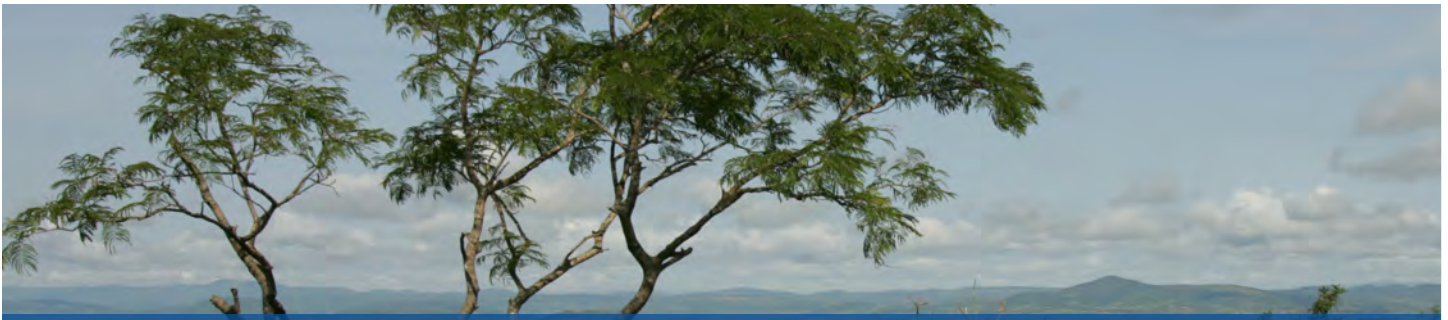
Samadjiguiraye. In addition to the 581 children living in these villages, a total of 73 children can be projected to come in from outlying villages to attend school, making for a total enrollment of 654. The student-to-teacher ratio would be 28 and the GER would be 70 percent, markedly better than that attained by Group A.

Group C maintains the school in Takouti and opens a total of 13 new schools, 4 of which have two teachers and the remainder having just one teacher (Figure 6). Only the village of Sobo Peul remains without a school. The total enrollment is 932, with a student-to-teacher ratio of 40 and a GER of 99.6 percent. Group C has used the only strategy that made it possible for today's developed countries to achieve high rural enrollment prior to the development of school transportation networks, that of the small local school.

Group C has one trump card that the other groups lack: Its teachers are trained for and competent in the facilitation of learning in classrooms where students are of several different grade levels.

Figure 6. School Placement, Group C





## Shortening the Distance to EFA: Weighing the Strategies

The examination of barriers to EFA resulted in recognition of three important factors making achievement of EFA more challenging: the negative effects of distance to school on school attendance, the inefficient distribution of teachers, and the use of incomplete-cycle schools. Strategies for reaching EFA would need to address all three phenomena.

Attempting to solve the distance-to-school problem by expanding the existing model of schools with six grades, each requiring at least one teacher, into smaller villages and hamlets would certainly result in more low-enrollment mono-grade classes and thus exacerbate the problem of inefficient teacher distribution, as well as requiring a massive increase in the number of teachers and the cost of teacher salaries.

The use of multi-grade classes, including, where necessary, STSs offering all six grades, could potentially address all three concerns, as could the development of transportation systems to take students to and from existing schools. An examination of the use of these strategies in other historical and geographic settings is instructive.

### **Distance, Transportation Systems, and Single-Teacher Schools (STSs)**

The practice of bringing children from different villages together for schooling in one central location has been used in almost all developed countries, but the bringing together, or consolidation, was not undertaken in these countries until it was possible to put into place a school transportation system. In countries such as Germany, France, and the United States, the transition from village-based schooling toward a system based on the consolidator school model began around the time that the automobile became a cost-effective mode of transport. Prior to the development of modern systems of transport, the opportunity cost of long commutes was simply prohibitive. To minimize the opportunity cost, the school system relied on numerous small schools. (The photos on the following page are of STSs in the United States in the last century.)

The value of STSs is well illustrated by the case of India. In the 1920s, the British decided to try to curtail the use of STSs in India, where they had been the norm. British colonial authorities felt that the Indian teachers were not sufficiently skilled to handle the complexity of an STS. At first, the Indians went along with the advice of the departing colonial authorities, and they began closing the small rural schools,



Morton Road Junior School. There were no fewer than 59 children in this class.

shifting teachers to larger, consolidated schools that were to draw in, without a school transportation system, children from several outlying villages. This practice led to a sharp decline in enrollment. Indian authorities had meanwhile gained sovereignty over the education system and put an end to the school consolidation measure. Today in India, there are tens of thousands of schools where children from all primary grade levels are taught in one or two classrooms.<sup>12</sup> In Mali, the distance-to-school study demonstrates that, as had happened in India, the consolidator school policy has a detrimental effect on enrollment.

With a decline in the cost of transportation and an increase in teachers' salaries, however, there comes a time when it makes economic sense to provide transportation for children to come together in larger schools so that each class can have more or less the same number of children.



In the 2006–2007 school year, there were a total of 74,974 primary schools in the United States, whereas in 1950 there were 128,306 and in 1930 there were 238,306.<sup>13</sup> So, with school consolidation in the United States, it was possible to reduce the number of schools by two-thirds over a period in which the U.S. population climbed from 123 million to 301 million.

STs have widely varying class sizes, since their size is based on the population of the community in which they are located. If, for example, a district has 16 STs with an average enrollment of 25 and a total enrollment of 400, there may be individual schools with enrollments ranging from 11 to 60 students, a range of nearly 50

<sup>12</sup> The British effort to consolidate Indian schools in the 1920s is detailed in a 1964 book by J. P. Naik, *The Single-Teacher School* (Ministry of Education, Government of India).

<sup>13</sup> The school data cited here can be found in Table 87 of the National Center for Education Statistics (NCES) and can be consulted online at the following address: [http://nces.ed.gov/programs/digest/d08/tables/dt08\\_087.asp](http://nces.ed.gov/programs/digest/d08/tables/dt08_087.asp).

students. When consolidation takes place, there can be 10 classes with 40 students each, thereby saving the equivalent of six teachers' salaries. Or there can be 13 classes with 30 or 31 students each. Larger schools also make it possible to provide specialized instruction that does not happen in an STS. There could be, for example, a teacher specializing in physical education, another who teaches a foreign language, and another who is a specialist in art or music. Thus, there are advantages to consolidator schools, but only if a transportation system can be put into place to ensure high enrollment.

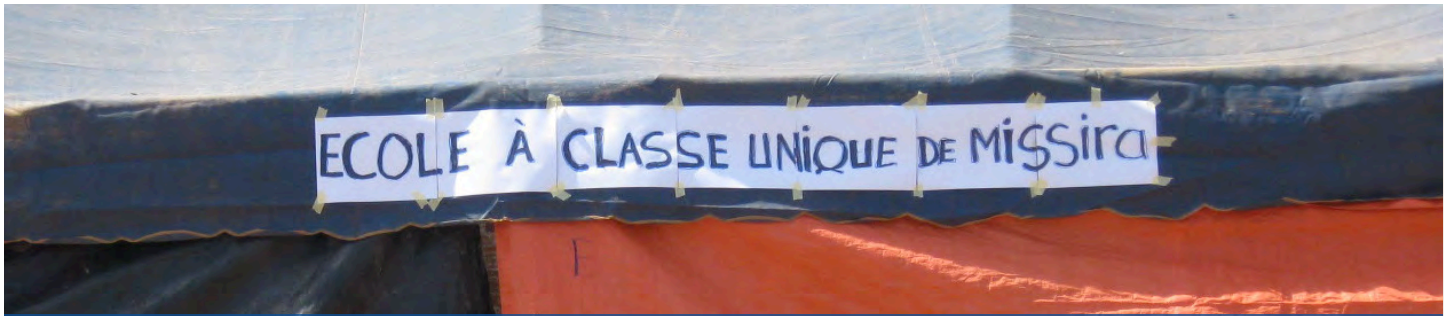
The STS model existed until the 1960s in Sahelian Africa, but, with a massive expansion of enrollment, it was eclipsed by the high demand for teachers in schools in the larger villages and towns; this led to the current reliance on consolidator schools. Using that system in today's Sahelo-Sudanian African context, it is not difficult to see how opportunity cost comes into play for rural populations. Inhabitants of outlying villages cover a considerable distance to attend weekly markets because the economic gain from that visit outweighs the cost of getting to the market. Rural farmers tend to conduct daily prayers locally in their own villages, only once a week traveling to a more formal mosque or church. For these populations the spiritual and social value of the get-together makes the trip useful. A school system, however, requires a daily trip by a child rather than a weekly trip by an adult.

We have seen the negative effect of that system on enrollment, an effect that may discriminate against those children who have less discretionary time to devote to the commute. Children from poor families, girls in particular, normally have heavier workloads than those from wealthier families, so their sensitivity to commuting time is greater. For example, a child who awakes with first light at 6:20 a.m. and must fetch water for the livestock, wash, dress, and eat breakfast will have a much better probability of being in school at 8 a.m. if the school commute takes 10 minutes instead of 80.<sup>14</sup>

Which strategy, then, would be more effective and efficient in the Malian context—to develop transportation systems or to reintroduce STSs? When the cost of a school transportation system falls below 10 percent of the school system's operating costs, it is time to explore the feasibility for transitioning toward larger, consolidated schools. In the United States, school transportation today represents about 5 percent of the school system's operating costs. These costs cover the school bus fleet, the drivers' salaries, road taxes, insurance policies, maintenance, and more. The cost of this package has not yet been calculated for the Malian context, and it would likely become feasible only after there is a good road network in place. School transportation could also be organized using local means of transport such as bicycle, donkey, horse, or canoe if and only if these options are available to all children, regardless of ability to pay. Working with EDC, the Malian MEALN chose to further examine the strategy of creating STSs.

---

<sup>14</sup> A nine-year-old child will take about 16 minutes to cover a kilometer (as the crow flies), so for a five-kilometer commute, the child will need about 80 minutes.



## The STS Strategy in Mali

### School/Teacher Optimal Configuration

To explore that strategy, from 2006–2008 EDC led Ministry representatives through an exercise called School/Teacher Optimal Configuration (STOC; for a full description, see pages 13–15, *School/Teacher Optimal Configuration Exercise: The Methodology*). The exercise was designed to answer this question: What would the Malian school system look like if its teachers were equally qualified to serve in multi-grade or mono-grade classes? The goal was to help school planners see what kind of inefficiency arises when a large-school model is used in sparsely populated rural areas, and how small schools can reduce that inefficiency. The theory was that multi-grade classes would allow schools to be placed close enough to children to ensure that many more of them could attend. Using three school models—one teacher for one grade in each classroom, one teacher for two grades in a classroom, and the third, schools of all sizes including the STS—participants in the exercise plotted school placement and school model to optimize enrollment while minimizing distance from school. Via this exercise, the MEALN experienced the logic of using small schools in sparsely populated rural areas and the satisfaction of planning for school placement that enabled almost 100 percent of children to be enrolled in schools located in their villages. Distance and transportation issues were nearly eliminated.

The exercise convinced Malian MEALN planners that the use in rural areas of larger-school models better suited to urban areas leads to inefficiencies. By the end of the exercise, they understood the role that distance plays in keeping children from school and recognized the potential of using a proven but underutilized teaching model—the STS—in conjunction with more widely used urban school models.

The planners absorbed the lessons but also had questions—important questions—about the model. These questions and the responses to them are shared in the box on page 20, *Implementing a System that Incorporates Single-Teacher Schools: Issues and Responses*.



## Implementing a System that Incorporates Single-Teacher Schools: Issues and Responses

*Isn't it presumptuous to assume that 100 percent of children will attend a school if it is located in the same village as the student? What about education quality issues?*

Education quality issues do need to be addressed. However, regardless of education quality, the reliance on larger schools in small rural communities means that children need to commute to school from their "satellite communities." When schools are closer, enrollment rises.

*Unit Cost: The number of schools will be higher, so won't the per-student cost increase?*

When thinking about cost, it is important to consider only options that are truly comparable. If EFA is the objective, then only strategies that are compatible with EFA should be compared. Obviously, any strategy that uses consolidator schools without a comprehensive school transportation system in place is not compatible with EFA. On the other hand, if the consolidator school option is used along with a comprehensive school transportation policy, then it would be fair to compare the costs between the consolidator school strategy and the local or proximity schooling approach. Today's developed countries did not attempt to consolidate their school systems until after the dramatic drop in the cost of motorized transport occurring between 1905 and 1935, depending on the country.

*Access to Schooling: Can the use of STSs resolve all access-related issues?*

No, using STSs can resolve nearly all of the problems that are linked to the challenge of home-to-school distance, but it does not deal with other accessibility issues such as children from nomadic families who move about in very small numbers, or children who cannot walk, or those children who cannot attend due to child labor.

*Teacher Training: Isn't it difficult to train a teacher on the techniques used in an STS?*

The easiest teacher to train on any particular teaching methodology is a teacher who attended a school that uses that methodology. However, many teachers learn new methodologies, and STS teaching can be learned.

*Quality: Can these small schools provide decent-quality basic education?*

STSs have functioned satisfactorily on most continents for centuries.

*Teacher Workload: How can the teacher split his or her time among children of different grades? Won't the teacher get too tired?*

Teaching in an STS is not simple, but it is workable for a teacher who knows the technique. The teacher in an STS limits time spent in frontal teaching and takes on more of a role of facilitator and monitor of the learning process. The pedagogical material is the primary source of information on course content.

*Class Size: Isn't it necessary to limit the number of children for STS teaching?*

Historically, the STS class sizes were little different from mono-grade classrooms. Today in sub-Saharan Africa many classes have between 80 and 150 students. In 2005–2006 in Mali, for example, there were 3,071 mono-grade classes with more than 80 students, representing 13 percent of the total number of mono-grade classrooms and 26 percent of the total mono-grade enrollment. No one is recommending classes of this size for mono-grade or multi-grade classrooms. STS teachers in other countries have reported teaching classes of up to between 50 and 60 students.

*Learning Outcomes: Do STS students learn as much as those in mono-grade classrooms?*

No research has found that the students in STSs learn less well than their mono-grade counterparts in those school systems where both models are widely used. And, because STS students in upper grades are often asked by the teacher to help students in lower grades, STS students do develop competencies in some areas, such as peer coaching, that are less accentuated in mono-grade classes.

*Adaptability: Could this school model work in Mali?*

The model could work in Mali, since it has already been used in Mali. The Catholic primary school in Ségou, for example, functioned as an STS for several decades until the 1950s. Many primary schools were STSs in Mali prior to 1950.

*Sustainability: Why have developed countries closed most of their STSs?*

With the decline in the cost of transportation and the increase in teachers' salaries, there comes a time when it makes economic sense to provide transportation for children to come together in larger, multi-teacher schools so that each class can have more or less the same number of children. Larger schools also offer the possibility of specialized instruction, such as physical education or foreign language teachers.

## How Many STSs?

Fully armed with the results of the field research, information on rural education strategies in other countries, and a nuanced understanding of not only the strengths of STSs but also the challenges to implementing them, the Malian MEALN decided in October 2007 to proceed formally with development of a pedagogical model compatible with an STS.<sup>15</sup>

Although the pedagogical component was the most important “missing link” in the Malian context, education planners also had to estimate the number of STSs that would be needed to ensure coverage on the national level, which in turn would allow them to prepare an appropriate number of teachers with the skills needed in an STS. The original georeferencing exercise had covered only 12 of the country’s 70 CAPs, the organizing entity for the system. Because the georeferencing did not cover the whole country, the projected need for STSs had to be estimated by extrapolating from the area that had already been georeferenced. This meant taking the georeferenced data from Niena and Yorosso, the two CAPs from the region of Sikasso, and projecting that the situation there would apply to all the CAPs of the region. The trends observed in the two georeferenced CAPs in the Kayes region, Nioro and Diéma, would form the basis for projections for Kayes’ seven non-georeferenced CAPs, and so on.

To do this, the MEALN, working with RAP-DM, grouped the localities for each georeferenced CAP according to population size. The population had been estimated by the georeferencing data collectors, who did a rough count of the number of huts as they passed through the village or hamlet. The locality database with hut-count estimates provided a total estimate of huts per CAP. The school-age population, as given in the education statistical yearbook, was then divided by the number of huts in the CAP, resulting in the mean school-age population by hut. The locality database was grouped according to the size of school-age population that corresponds to different school sizes.

In other words, a three-teacher school corresponds to a different-sized village than a two-teacher school. For georeferenced CAPs, the number of localities having a school-age population corresponding to a given school model was calculated. Each non-georeferenced CAP was associated with a CAP that is similar to it demographically; this means, for example, that a low-density population Sahelian zone is associated with another of the same type. The urban zones within the non-georeferenced CAPs were deducted from the total population. (The georeferenced CAPs were all rural.) The remaining rural population was then projected to follow the same distribution as that found in the georeferenced CAP.

The methodology for the estimation could be improved, but it provided the information necessary for decision-making with respect to the number of teachers needed. Below are the results from a 2007 national-level STOC exercise based on the georeferenced data. For this projection, the official student-to-teacher ratio at the time, 50:1, was applied. In the 11 CAPs georeferenced where the hut count was

---

<sup>15</sup> Decision # 000003/MEBALN/CAP.

considered to be reliable,<sup>16</sup> the data collectors found a total of 508,289 huts for a total population of 1,855,489 and a school-age population of 325,039, which comes to 0.64 school-age children per hut. Table 4 displays the data for the 11 CAPs that had been georeferenced. These data reveal that if the decision is made to provide schooling for children in their own communities (village or hamlet), 42.4 percent of the school-age population in the 11 georeferenced CAPs live in communities too small for a three-classroom school (those listed in the first three groups of schools in the table).

Table 4. Number of Localities by School-Age Population and Size of Corresponding School, Georeferenced Zones

| School-Age Children =>                         | 0-10                   | 11-50        | 51-100           | 101-150          | 151-more                 | Total        |
|--|------------------------|--------------|------------------|------------------|--------------------------|--------------|
| Optimal School Size =>                         | Too small for a school | STS          | 2-teacher school | 3-teacher school | 6 or more teacher school |              |
| CAP Zone                                       |                        |              |                  |                  |                          |              |
| Barouelli                                      | 2                      | 322          | 137              | 33               | 21                       | 515          |
| Diéma  | 75                     | 173          | 43               | 18               | 35                       | 344          |
| Douentza                                       | 56                     | 271          | 183              | 26               | 21                       | 557          |
| Dioila   | 778                    | 305          | 116              | 53               | 48                       | 1,300        |
| Nioro  | 158                    | 160          | 59               | 22               | 30                       | 429          |
| Nara   | 88                     | 340          | 200              | 67               | 104                      | 799          |
| Menaka   | 3                      | 73           | 32               | 11               | 12                       | 131          |
| Niena  | 228                    | 188          | 81               | 30               | 55                       | 582          |
| Tominian                                       | 183                    | 431          | 79               | 16               | 18                       | 727          |
| Youwarou                                       | 121                    | 142          | 17               | 14               | 14                       | 308          |
| Yorosso  | 476                    | 162          | 32               | 16               | 45                       | 731          |
| <b>Total</b>                                   | <b>2,168</b>           | <b>2,567</b> | <b>979</b>       | <b>306</b>       | <b>403</b>               | <b>6,423</b> |
| Percentage of total number of settlements      | 33.8%                  | 40.0%        | 15.2%            | 4.8%             | 6.3%                     | 100.0%       |
| Estimated share of total school-age population | 2.8%                   | 20.4%        | 19.2%            | 10.0%            | 47.6%                    | 100.0%       |

NOTE: Totals may not add to exactly 100% due to rounding.

16 The data from the 12th CAP, Gourma Rharous, were not sufficiently precise to be used in this analysis.

At the national level, the percentage of the school-age population living in communities that are too small for a three-teacher school comes to 35.6 percent. The data for the national-level projection are displayed in Table 5.

Table 5. Number of Localities by School-Age Population and Size of Corresponding School, Nationwide Projection

| School-Age Children = >  | 0–10                   | 11–50          | 51–100           | 101–150          | 151–more                 | Total            |
|--|------------------------|----------------|------------------|------------------|--------------------------|------------------|
| Optimal School Size = >  | Too small for a school | STS            | 2-teacher school | 3-teacher school | 6 or more teacher school |                  |
| No. of settlements in georeferenced areas  | 2,168                  | 2,567          | 979              | 306              | 403                      | 6,423            |
| No. of settlements in areas with similar population density as the georeferenced areas | 8,035                  | 12,205         | 3,492            | 1,161            | 1,424                    | 26,317           |
| <b>Total</b>   | <b>10,203</b>          | <b>14,772</b>  | <b>4,471</b>     | <b>1,467</b>     | <b>1,827</b>             | <b>32,740</b>    |
| Percentage of total number of settlements  | 31.2%                  | 45.1%          | 13.7%            | 4.5%             | 5.6%                     | 100.0%           |
| Estimated school-age population in primarily rural areas                               | 47,656                 | 420,861        | 315,350          | 171,939          | 809,543                  | 1,765,349        |
| Estimated school-age population in primarily urban areas                               | 0                      | 0              | 0                | 0                | 439,292                  | 439,292          |
| <b>Total school-age population</b>   | <b>47,656</b>          | <b>420,861</b> | <b>315,350</b>   | <b>171,939</b>   | <b>1,248,835</b>         | <b>2,204,641</b> |
| Estimated share of school-age population   | 2.2%                   | 19.1%          | 14.3%            | 7.8%             | 56.6%                    | 100.0%           |

For this population, the lack of a working small-school model coupled with the absence of a school transportation system means that the EFA effort is compromised, and two phenomena emerge: First, families of outlying villages are expected to arrange transportation to get their children to the larger consolidator schools, and at the very least, half of the children expected to attend do not attend school; and second, large consolidator schools that are opened in villages having fewer than 100 school-age children have such low student-to-teacher ratios that it is difficult to justify the presence of the relatively large teaching staff. Some villages that cannot support a large teaching staff instead maintain incomplete-cycle schools, meaning that their students often do not complete six years of basic education.

The double phenomena of low-enrollment mono-grade classes and the high incidence of incomplete-cycle schools could be addressed if teachers possessed competency in multi-grade teaching. In a rural school with low enrollment, one teacher certified for STS teaching could offer all six grades. It is possible to project the impact of such certification in multi-grade teaching on the range of class sizes observed above and the phenomenon of incomplete-cycle schools using the following seven parameters:

1. The teachers “saved” by combining classes with low enrollment will be freed to (a) help incomplete-cycle schools achieve full-cycle status, and (b) complement the teaching staff in other overcrowded schools.
2. Fifty percent of the newly available teachers will go into option (a) and 50 percent into option (b).
3. For new multi-grade classes, enrollment will be capped at 50 (as opposed to using 50 as a mean).
4. Ninety-five percent of existing classes with fewer than 11 students are located in a school where it is possible to pair them with another pedagogical group, 85 percent of the classes with between 11 and 20 students are located in a school where it is possible to pair them with another pedagogical group, 60 percent of the classes with between 21 and 30 students are in schools where they can be paired with another pedagogical group, and 5 percent of the classes with between 31 and 40 students are in a school where they can be paired with another pedagogical group, still respecting the 50-student ceiling for multi-grade classrooms.
5. Each pedagogical group that is combined will be combined with only one other pedagogical group.
6. All freed teachers who are sent to overcrowded schools will be assigned to the classes having the highest number of students.
7. Each teacher certified for multi-grade teaching who is sent to an incomplete-cycle school will begin teaching a class that has students from all of the grades that were previously not taught in that school, thereby making the school a full-cycle school. These teachers will only be sent to those incomplete-cycle schools that have been opened for more than six years.

These parameters can be modified, but the idea of this exercise is to give a glimpse into what might be the impact of a teacher redistribution operation when teachers have mastered multi-grade teaching techniques.

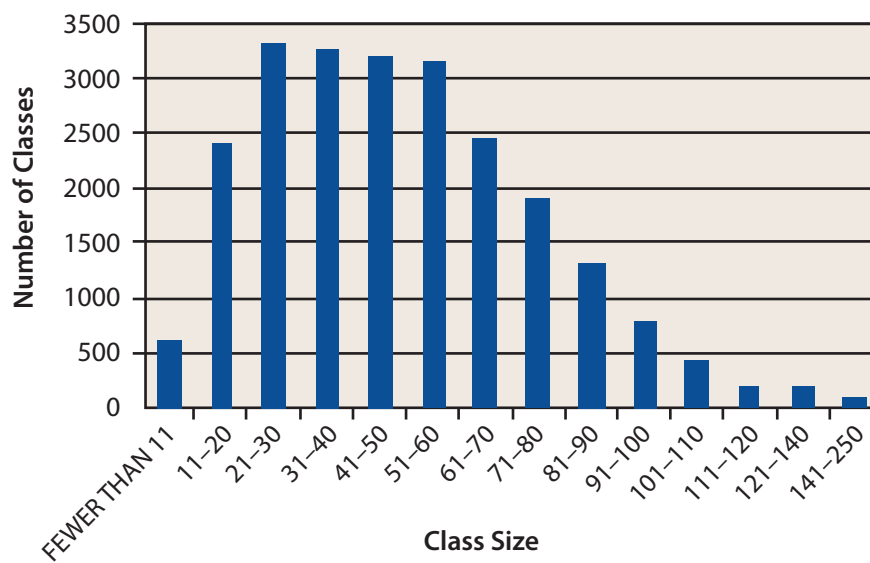
Compared with the distribution of teachers as of 2005–2006, as illustrated in Graph 4, the redistribution based on the above parameters, illustrated in Graph 5, would make it possible to have no classes with more than 100 students, and the percentage of classes with between 40 and 60 students would increase from 27 percent to 37 percent, whereas the percentage of classes with between 30 and 70 students would increase from 52 percent to 68 percent. The share of the total number of rural schools with incomplete cycles would decline from 48 percent to 19 percent and thus bring approximately 32,716 additional children into the school system.<sup>17</sup>

<sup>17</sup> Rural incomplete-cycle schools that had been open for more than six years had an enrollment of 45,803 students in 2005–2006. They offered on average 3.5 grades out of the 6 primary grades, or seven twelfths of the primary cycle. Bringing each of those schools to a full 6-grade cycle would in time help enroll twelve-sevenths the number of children currently enrolled.

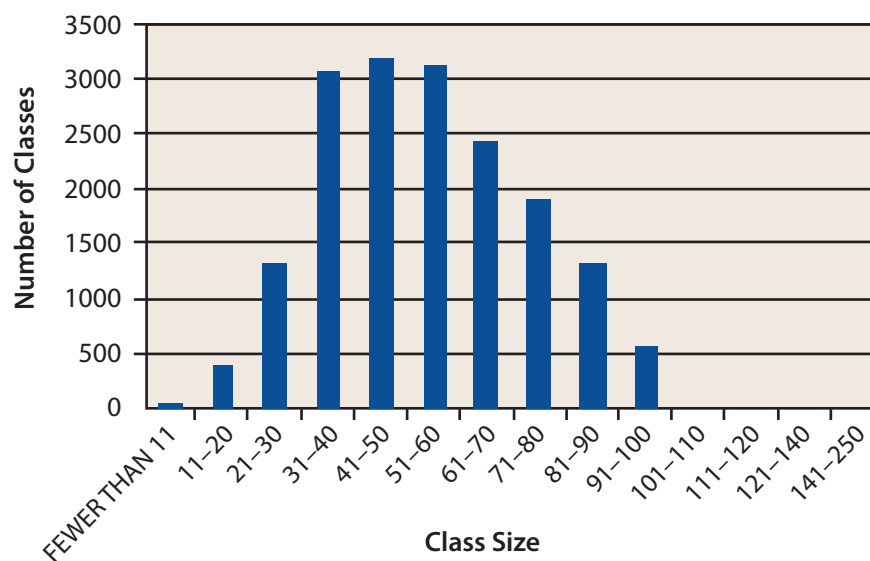
---

*The redistribution of teachers would . . . bring approximately 32,716 additional children into the school system.*

Graph 4. Class Size in Monograde Classrooms in Public, Community and Franco-Arabic Schools, Primary Level, 2005–2006



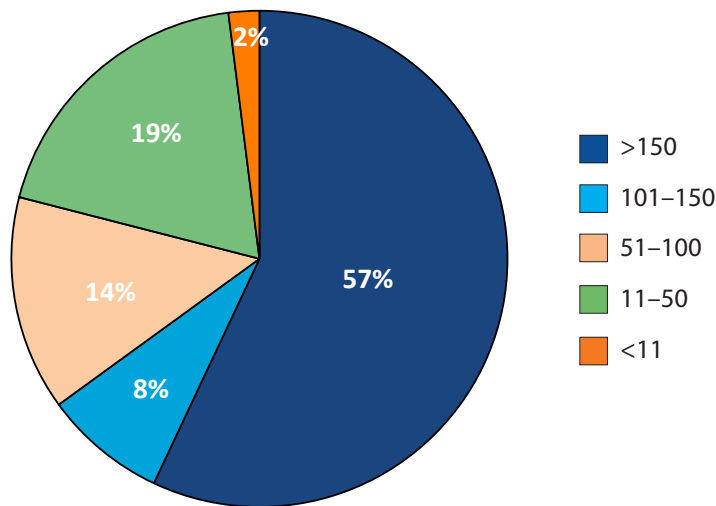
Graph 5. Projected Improved Distribution of Class Sizes According to Size, Public, Community and Franco-Arabic Schools, Primary Level, 2005–2006



## Factoring in Villages that Do Not Have Schools

The above hypotheses do not deal with the problem of those villages currently without schools, whose future is examined next. As illustrated by the exercise described above, providing teachers certified to teach multi-grade classes allows communities large enough for an STS and those large enough for a school with two teachers to open schools. A third category of small rural community, those that are too small even for an STS—those with fewer than 11 school-age children—still need coverage.

Graph 6. School-Age Population Grouped by Size of Community, 2006



For the 2.2 percent of Malian children who live in such communities (see Graph 6), history provides examples of what might work. In 19th-century France, for example, the rural population was village-based as in Africa today and children from isolated farms attended school in the nearest hamlet or village school, more often than not an STS. In the United States, however, there were vast territories where the people lived on isolated farms. In these areas, children from several neighboring farms came together in an STS that was at a central location in the countryside. The maximum walking distance was generally 2.2 kilometers. The school itself often also served as a local community and cultural center. Attending such a school was not perceived as having been expatriated to another community, and the community members elected the school board themselves. This arrangement certainly diminished the effect of cultural distance—the sense that a child is attending a school not of his or her culture—on school attendance. A similar structure might be considered in Mali.

## Estimating Numbers and Types of Teachers Needed

With an estimate in hand of how many schools of each model would be needed to achieve national coverage, it was next necessary to estimate the numbers and types of teachers required to staff those schools appropriately. In other words, how many teachers could be trained in only mono- or double-grade teaching, how many would also need to know how to teach three grades per class, and how many would need to learn to lead an STS with six grades per class? Hypothesizing that the student-to-teacher ratio will be 42 for mono-grade classrooms, 37 for classes with three grades, and 30 for those classes with all six grades, and that the use of lower student-to-teacher ratios for the smaller schools comes from the fact that small rural communities vary considerably in size, the MEALN, working with RAP-DM, developed the data displayed in Table 6.

Table 6. Estimated Need for Teachers as per the Type of Training, 2006

| Teachers by the Type of Training        | Current Situation | Need   | Difference |
|---|-------------------|--------|------------|
| Mono-Grade and/or Double-Grade Teaching | 30,515            | 38,399 | 7,884      |
| Three Grades per Class                  | -                 | 8,523  | 8,523      |
| STS (Six Grades per Class)              | -                 | 15,617 | 15,617     |
|   | 30,515            | 62,539 | 32,024     |

In 2005–2006, Mali had 30,515 teachers whose skill sets were limited to teaching in mono-grade and perhaps double-grade classrooms. According to the projections, to cover the entire country with schools located in each community, the number of teachers would need to double, and 85 percent of the new teachers would need to complete a teacher-training program that gives them a supplemental certification for STS teaching. If the same projection is done for a year in the future, then the need will likely increase. However, it is difficult to predict the demographic trends with respect to the urban areas. If the urban areas absorb all the population growth over the coming period, then the need for STS teachers will remain stable, but if rural population increases as well, more STS teachers will be needed. Developing a scenario for 2015 involved working with the hypotheses that rural exodus will drain about 40 percent of the rural population growth, reflecting the rampant growth of urban areas across the Sahel; the national population growth rate will be 2.7 percent for the 2006–2015 period; and the student-to-teacher ratio norms remain at 42, 37, and 30 depending on class size as in the previous projection (Table 7).

Table 7. Projected Need for Teachers by Type of Training, EFA Scenario in 2015–2016

| Teachers by the Type of Training        | Current Situation | Need   | Difference |
|---|-------------------|--------|------------|
| Mono-Grade and/or Double-Grade Teaching | 30,515            | 52,709 | 22,194     |
| Three Grades per Class                  | -                 | 10,084 | 10,084     |
| STS (Six Grades per Class)              | -                 | 18,478 | 18,478     |
|   | 30,515            | 81,271 | 50,756     |

There is some inefficiency in a rural school system based on STSs, and it lies in the wide range of class sizes. STSs will be found in communities of differing sizes, ranging from as few as 11 school-age children to those with as many as 50 school-age children, which results in a range of 40 children based on the assumptions of this analysis. For two-teacher schools (three grades per class), the range decreases considerably. A two-teacher school with 52 students would have a student-to-teacher ratio of 26:1, whereas one with 100 students would have a student-to-teacher ratio of 50:1, a range of just 25. The three-teacher school, found in communities with between 101 and 150 school-age children, would have a student-to-teacher ratio ranging from 34:1 to 50:1, a range of only 17. Though the wider range of class sizes associated with single-teacher and two-teacher schools introduces some inefficiency, it is far less than



that present in the current system, whose inefficiency is based on a distribution of teachers that poorly reflects population density, resulting in small class sizes in rural schools.

## The Pedagogy of STSs

When relying on STSs to help achieve greater access to schooling, the development and use of an appropriate pedagogical model are essential for several reasons. Mali began to develop such a model in 2008 and continues to refine it today, even as the model is being used in 49 schools in rural areas.

First, the role of the teacher must be adjusted. The role of the teacher in a single-teacher school is that of a facilitator who spends most of his or her time interacting with individual students or small groups. This is both a different methodology and a different culture: the teacher as coach and facilitator rather than master. Malian teachers have, for the most part, neither experienced that methodology when they were primary school students nor have they been trained in it as professionals. New teachers, who do not have years of classroom practices to relearn, are more likely to assimilate and be able to implement the new techniques. It should be noted that the teacher-as-facilitator approach is often advocated for all primary school classrooms as more effective than frontal teaching techniques such as lecturing and rote memorization. A team of MEALN officials witnessed this approach in action during a study tour to Amish schools in the United States (see page 29).

Second, the success of single-classroom schools depends upon children's ability to read because much of students' time is spent learning on their own, from books and other instructional materials. Mali's primary education system has not been successful in this regard. Thus, the new pedagogical model is designed to prepare teachers to succeed in implementing effective reading instruction, an area in which they have failed to succeed in the past. With support from another USAID-funded initiative, *Programme Harmonisé d'Appui au Renforcement de l'Éducation (USAID/PHARE)*, the MEALN has developed a program designed specifically to help Malian teachers teach students literacy in resource-lean settings.

Financing, too, is a concern: The funding for Mali's pedagogical work was not originally available in a timely manner. Nevertheless, during the 2007–2008 school year, five experimental STSs opened in Mali, and that number has increased to the 49 that are active today, now using a refined pedagogical model thanks to three years of testing and revising. Mali and Niger have shared notes to some degree on the STS pedagogical model development, since Niger has already made considerable progress in this area.

## Study Tour

In March 2008, RAP-DM led a study tour for the MEALN's Secretary-General and the head of the MEALN's Planning and Studies Division, taking them to visit three rural, parochial STSs in the state of Ohio. The schools are part of the community school system run by the Amish, a protestant Christian group that prefers keeping its children out of the public school system. The main reason for this separate schooling is to cultivate a sense of community and promote certain values that, in the opinion of the Amish, are missing in the public school system. The three schools visited provide the full basic education cycle of eight grades. In general, the children come from homes where a German dialect is spoken, whereas school is conducted in English.

The Amish community severely limits the use of technology in school, so the classrooms have limited equipment and materials. Following are some of the delegation's main observations:

- Grade One children made the transition from German to English during the first four months of the school year. By the time the Malian delegation visited in March, the Grade One pupils were using English with confidence when they asked the teacher questions.
- Children from upper grades spend part of their school day helping children from lower grades.
- There was little "dead time" in the class; students always seemed to have a project to work on if they completed their lessons early.
- The two recreation periods provided for much intense physical activity.
- Games, competition, and group activities were included in the school day.
- The older students seemed quite at ease with the content of their studies, and did not seem to have any particular difficulty in getting the work done.
- Aside from the Grade 1 students, students used their textbooks full time. These books were not expensive or sophisticated. Workbooks often accompanied the textbooks.
- Most of the teachers were 16- to 24-year-old women. Their preservice teacher training essentially happened while they were students in STSs, followed by a brief internship with an experienced teacher, and finally a one-day workshop in August prior to the start of the new school year.
- The schools' per capita operating budget was roughly one-tenth of that of the county public school system.
- According to the supervisor of the Amish schools, the STS graduates who wanted to continue their studies in a public high school had no academic difficulties making the transition.



## In Conclusion

In 2005, Mali's existing EMIS was not able to provide adequate information on how populations in small rural communities were or were not being marginalized from the school system. Enrollment in school was increasing, albeit slowly and unevenly, moving Mali closer to its goal of full enrollment in primary education by 2015. However, the MEALN lacked the tools it needed to determine which strategies were most successful and what other efforts should be made. With the technical support of RAP-DM, the MEALN conducted a study to measure the impact of a policy that requires children to leave their own community to attend school elsewhere. The study revealed that at distances of less than three kilometers, between 66 percent and 75 percent of the children are essentially "left behind" in terms of schooling. With this information, the MEALN examined how the use of smaller rural schools would impact this access-to-schooling problem, drawing from a model that was used in conditions that approximate those of rural Mali today.

As a result, the Malian MEALN made a bold choice: to pilot STSs. In August 2008, a pedagogical team set up by the Ministry began working on the development of a pedagogical model compatible with STS teaching. At the time of this writing, the work is continuing, with a complete but evolving pedagogical model and 49 rural schools using the approach.

The research conducted by the MEALN with support from RAP-DM demonstrates that expecting rural children to attend schools outside of their villages results in significantly reduced enrollment in Mali; similar research elsewhere has yielded similar results. Given the massive challenge of developing transportation systems accessible to all students, policymakers in other countries with limited access to schooling in rural areas would do well to consider the option of developing small rural schools, thus shortening the distance to EFA.



## Glossary and Abbreviations

***Centre d'Animation Pédagogique (CAP; in English, Pedagogical Support Center):***

An administrative subdivision of the Malian school system. There are 70 CAPs, of which 12 are in the District of Bamako and 58 cover the rest of the country. The CAP's zone is the geographic area covered by the CAP's pedagogical support team.

***Education for All (EFA):***

A global movement led by UNESCO, aiming to meet the education needs of all people by 2015. In Mali, EFA focuses on full primary school enrollment by 2015.

***Education Management Information System (EMIS):***

The data-gathering arm of the Malian Ministry of Education, Literacy, and National Languages.

***Education Sector Investment Program***

***(in French: Programme d'Investissement Sectoriel de l'Éducation, or PISE):***

A program designed to, among other things, achieve Education for All (EFA) in Mali by 2015.

***Education Development Center, Inc. (EDC):***

A global nonprofit organization that works to improve education, health, and economic opportunity around the world. EDC supported the work of Mali's MEALN through the Regional Action Plan/Decision-Making Program (RAP-DM).

***Georeferencing:***

Locating geographic points by using a geographic positioning system (GPS), which gives the latitude, longitude, and altitude to the nearest meter.

***Geographic positioning system (GPS):***

A technology that gives the latitude, longitude, and altitude of a geographic point to the nearest meter.

***Gross enrollment ratio (GER):***

The number of pupils enrolled in a given level of education, regardless of age, expressed as a percentage of the population in the theoretical age group for the same level of education.

**Gross intake ratio:**

Total number of new entrants in the first grade of primary education, regardless of age, expressed as a percentage of the population of theoretical entrance age to primary education.

**International Institute for Education Planning (IIEP):**

A UNESCO organization with the mission of strengthening the capacities of countries to plan and manage their education systems.

**Koranic school:**

A school that offers religious education in Islam.

**Medersa:**

A school that provides basic education in French and Arabic and may also offer a course of religious education.

**Ministry of Education, Literacy, and National Languages (MEALN; in French, Ministère de L'Éducation, de L'Alphabétisation et des Langues Nationales):**

The Malian governmental body responsible for primary education, literacy programs outside the schools, and the promotion and standardization of national languages, such as Bambara and Tamcheq, other than the official language, French.

**Pedagogical group:**

In the Malian context, pedagogical group is defined as a group of learners of a given grade level studying together in the same classroom.

**Regional Action Plan/Decision-Making Program (RAP-DM):**

A program under USAID's Educational Quality Improvement Program 2 (EQUIP2) that strengthened the Malian MEALN's capacity in education planning.

**School catchment area:**

The geographic area from which students are eligible to attend a local school.

**School/Teacher Optimal Configuration (STOC):**

An exercise that exposes participants to alternative ways to configure teachers and schools to maximize student enrollment and the efficient distribution of teachers.

**Single-teacher school (STS):**

A school, often housed in a single room, employing one teacher to deliver instruction to students in multiple grade levels.

**United States Agency for International Development (USAID):**

The lead U.S. government agency providing development and humanitarian assistance worldwide.