SERVICE DELIVERY INDICATORS

Education | Health

Education Service Delivery in MADAGASCAR

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Education Service Delivery in Madagascar

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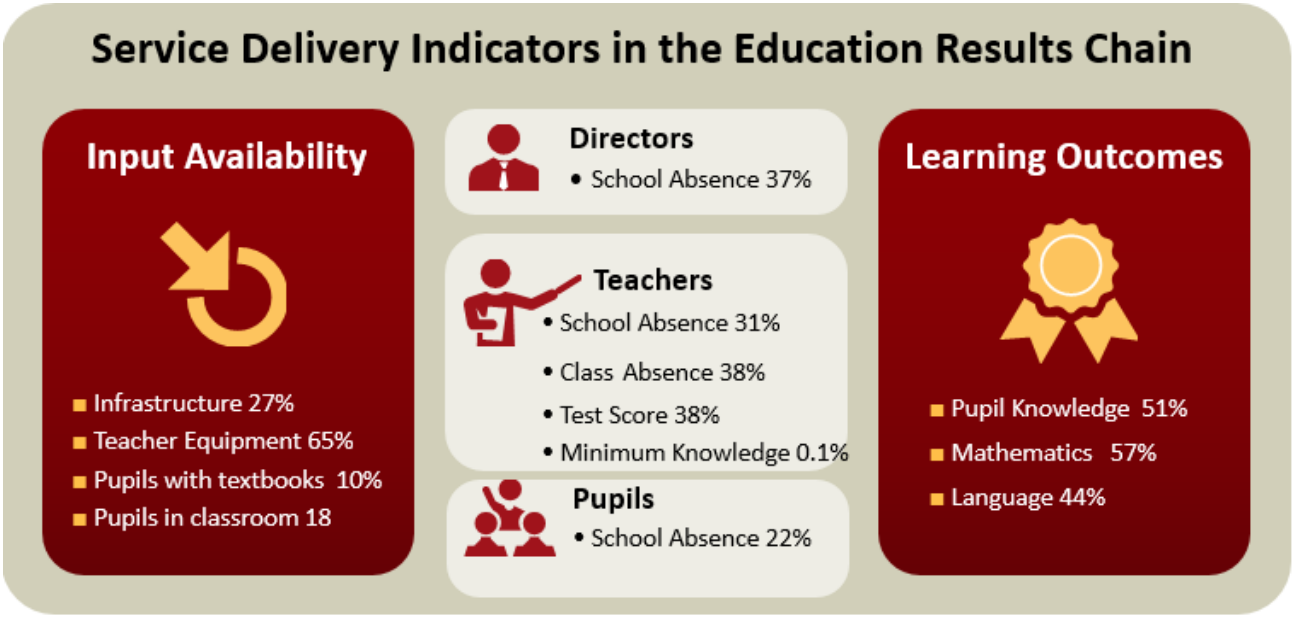
EXECUTIVE SUMMARY

The Service Delivery Indicators (SDI) provide a set of metrics for benchmarking service delivery performance in education and health. The overall objective of the indicators is to gauge the quality of service delivery in primary education and basic health services. The indicators enable the identification of gaps and tracking of progress over time and across countries. It is envisaged that the broad availability, high public awareness, and a persistent focus on the indicators will mobilize policymakers, citizens, service providers, donors, and other stakeholders for action to improve the quality of services and ultimately to improve development outcomes and social welfare.

This report presents the findings from the implementation of the SDI in the education sector in Madagascar in 2016. Survey implementation was preceeded by an extensive consultation with the Government and key stakeholders on survey design, and adaptation of survey instruments. The sampling strategy was done by INSTAT the national institute for statistics. The survey was then implemented by CAETIC Development a strong local think-tank and survey firm. The implementation period was from April 2016 (for enumerator training and pre-testing of the instruments) to May and June 2016 (for fieldwork and data collection).

Information was collected from 473 primary schools, 2,130 teachers (for skills assessment), 2,475 teachers (for absence rate), and 3,960 pupils across Madagascar. The survey also collected basic information on all the 3,049 teachers or staff that teach in the 473 primary schools visited or are non-teaching directors. The results provide a snapshot of the quality of service delivery and the physical environment within which services are delivered in public primary schools. The survey provides information on (i) teacher effort; (ii) teacher knowledge and ability; and (iii) the availability of key inputs, such as textbooks, basic teaching equipment, and infrastructure (such as sanitation or quality of lighting).



What providers do (teachers' effort)

On average, 31 percent of teachers were found to be absent from school. However, unlike many other countries, once teachers were in school, they did attend to their class as only 10 percent of teachers who were in school could not be found in the classroom, bringing the classroom absence to 38 percent. Therefore, in Madagascar, at any given point in time 2-in-5 primary school teachers were not in the classroom teaching. While in the classroom, teachers spent on average about 4 percent of time on non-teaching activities. Combining the absence from school and the classroom with the time engaged in non-teaching activities, the results indicate that pupils only had 3 hours and 09 minutes of teaching time every day out of the allocated 5 hours 12 minutes. For almost one third of the absence (29.3 percent) the reason is unknown but only 1 out of 10 (11 percent) absence was unauthorized. Directors were more likely than regular teachers to be absent from school (37 percent) and teachers were significantly more likely to be absent when the director himself was also absent. This suggests that there are accountability issues at play at the school and higher administration levels to tackle. Also, understanding and reining in director's absence could go a long way to reduce teacher's absence. However, none of the variables collected in the survey is significant in explaining head teacher's absence.

What providers know (teachers' knowledge and ability)

The vast majority of teachers lacked the necessary academic and pedagogical skills to teach. The average score on the mathematics and French assessments among teachers was 38 percent. However, only a dismal 0.1 percent i.e. 1 out of every 1,000 teachers managed to reach a combined score of at least 80 percent on these assessments. This result is explained by teacher's score in French as 0.0 percent of them reached the minimum knowledge compared to 6.3 percent in mathematics. In addition, teachers' pedagogical content knowledge was very low with an average score of 24 percent on the pedagogy test. Pupils cannot learn more from their teachers than what the teachers know, and, therefore, teachers' lack of technical competences are likely to severely constrain learning outcomes in Madagascar. Indeed, teacher's score in French and mathematics were strong predictors of pupils' learning outcomes.

What providers have (availability of key inputs)

The pupil-teacher ratio averaged 36.9 pupils per teacher, slightly below the expected norm of 45:1. In the average 4th grade class in Madagascar, the SDI found on average only 17.6 pupils also the teachers reported that 22.8 pupils were registered meaning that students' absence (non-attendance) rate was estimated at 22 percent. Although classroom sizes can be deemed reasonable, significant gaps existed in the availability of inputs at the frontline. Only 20.2 percent of schools had the minimum infrastructure. Access to clean water (44 percent), and availability of functional, improved, accessible, private, and clean toilets were major constraints. Fewer than half (41 percent) of all primary schools surveyed had toilets (such as a ventilated improved pit latrine, and so on) meeting the standard. Roughly 2 out 3 (65 percent) of the schools had the minimum teaching materials. Textbooks were a rare commodity with only 10 percent of the pupils used a mathematics or French textbook in the classroom. In the vast majority (91 percent) of the classrooms observed, none of the pupils had a textbook in hand.

Against this background, one must also note that teachers experienced salary delays with half of them (50.1 percent) claiming to have experienced such a delay at least once over the year preceding the survey. Nearly all (87.8 percent) of the subsidized FRAM teachers acknowledge a salary delay. Teachers also complained about unpaid claims with about 1 out of 5 (18.3 percent) of them reporting at least one unpaid claim.

How Madagascar compares to other countries

Madagascar has the second highest teachers' school absence rate of all SDI countries, second only to Mozambique. However, once they are in school, teachers in Madagascar usually attend to their class and classroom absence rate is only slightly higher than school absence rate. In contrast, the phenomenon of "being in school but not in class" is very prevalent in other SDI countries. As a result, only Nigeria has a significantly lower classroom absence rate than Madagascar. Togo's classroom absence rate is also lower but not significantly so. Therefore, Madagascar mainly needs to find a way to get its teachers to school, whereas other countries will still have to grapple with the issue on making sure that when teachers are at school they do go into the classroom. Time spent teaching is low in Madagascar at 3 hours and 9 minutes a day but this is higher than the SDI average of 3 hours and 2 minutes. Madagascar has by far the smallest 4th grade class size with only 17.6 pupils in attendance compared to an average of 40 pupils in the other SDI countries.

In terms of inputs and infrastructure Madagascar's schools pale compared to other countries with few exceptions. Pupils in other SDI countries are more than 3 times more likely to have a textbook in their hands while in class than the average Malagasy 4th grade pupil. Only one in five primary schools in Madagascar has the minimum infrastructure required compared to almost 2 in five in other SDI countries. As a bright spot, Malagasy pupils are more likely to have a pencil, an exercise book or a paper to write on, to be in a classroom with a blackboard and chalk.

With an average score test of 33.2 percent, Madagascar's primary school teachers performed only better than Mozambique's teachers who managed to score at 26.9 percent. Kenyan teachers performed best with an average score of 57.1 percent. More importantly, only 1 out of every 1,000 teachers in Madagascar is considered to have the minimum knowledge to teach compared to 40 percent in Kenya. Mozambique and Nigeria also had an extremely low base of teachers with minimum knowledge with 0.3 percent and 1.6 percent respectively.

Although they were taught by the lowest performing teachers, in schools with little infrastructure and barely any textbook, Malagasy pupils were resilient and performed above the average pupil in other SDI countries. In fact, only Kenyan and Tanzanian pupils outperformed Malagasy pupils in mathematics.

Table 1. Comparison of SDI results across countries (public schools only)[1]

	Madagascar 2016	Tanzania 2014	Average SDI	Kenya 2012	Mozambique 2014	Nigeria* 2013	Senegal 2011	Tanzania 2011	Togo 2013	Uganda 2013
Teacher Ability										
Minimum knowledge (At least 80% in language and mathematics)	0.0	21.5	12.7	34.8	0.3	2.4	Not Comparable	Not Comparable	0.9	19.4
Test score (language, mathematics, and pedagogy)	32.1	48.3	42.0	55.6	26.9	30.5	Not Comparable	Not Comparable	33.9	45.5
Teacher Effort										
School absence rate	35.9	14.4	20.1	15.2	44.8	16.9	18.0	23.0	22.6	29.9
Classroom absence rate	42.2	46.7	42.1	47.3	56.2	22.8	29.0	53.0	39.3	56.9
Scheduled teaching time	*5h 03min*	*5h 54min*	*5h 31min*	*5h 31min*	*4h 17min*	*4h 44min*	*4h 36min*	*5h 12min*	*5h 28min*	*7h 13min*
Time spent teaching per day	2h 56min	2h 46min	2h 53min	2h 30min	1h 41 min	3h 10min	3h 15min	2h 04min	3h 15min	2h 56min
Availability of Inputs										
Observed pupil-teacher ratio	16.9	43.5	42.1	39.3	21.4	21.5	27.2	52.0	31.4	53.9
Share of pupils with textbooks	6.8	25.3	37.2	44.5	68.1	33.7	18.0	19.7	76.0	6.0
Minimum equipment availability (90% with pencils and notebooks)	65.1	61.4	57.8	74.3	76.8	48.2	Not Comparable	Not Comparable	24.3	79.5
Minimum infrastructure availability	16.0	40.4	36.2	60.2	29.1	13.4	Not Comparable	Not Comparable	14.4	57.2
Pupil Learning										
Test Score (out of 100) (language, mathematics)	46.6	40.1+*	45.4	69.4	20.8	25.1	Not Comparable	Not Comparable	38.1	45.3
Language test score	39.7	36.5+*	44.8	72.5	18.7	23.3	Not Comparable	Not Comparable	36.9	43.4
Mathematics test score	53.5	58.2	45.2	57.4	25.1	28.2	Not Comparable	Not Comparable	41.3	41.7

Note: (*) Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger.

[1] These numbers may be different from the previously published country reports because the methodology for calculating the indicators has been updated. The numbers shown here are current. To find out more about how the indictors are calculated, go to www.SDIndicators.org.

Table 2. Comparison of SDI results across countries (All schools)[2]

	Madagascar 2016	Tanzania* 2014	Average SDI	Kenya 2012	Mozambique+ 2014	Nigeria** 2013	Senegal+ 2011	Tanzania+ 2011	Togo 2013	Uganda 2013
Teacher Ability										
Minimum knowledge (At least 80% in language and mathematics)	0.1	21.5	**14.6**	40.4	0.3	3.7	Not Comparable	Not Comparable	1.6	19.5
Test score (language, mathematics, and pedagogy)	33.2	48.3	**43.0**	57.1	26.9	32.9	Not Comparable	Not Comparable	35.6	45.3
Teacher Effort										
School absence rate	30.6	14.4	**18.6**	14.1	44.8	13.7	18.0	23.0	20.5	26.0
Classroom absence rate	37.8	46.7	**39.8**	42.1	56.2	19.1	29.0	53.0	35.8	52.8
Scheduled teaching time	*5h 12 min*	*5h 54min*	***5h 34min***	*5h 37min*	*4h 17min*	*4h 53min*	*4h 36min*	*5h 12min*	*5h 29min*	*7h 18min*
Time spent teaching per day	3h 09min	2h 46min	**3h 02min**	2h 49min	1h 41 min	3h 26min	3h 15min	2h 04min	3h 29min	3h 18min
Availability of Inputs										
Observed pupil-teacher ratio	17.6	43.5	**40.4**	35.2	21.4	21.6	27.2	52.0	29.7	47.9
Share of pupils with textbooks	10.3	25.3	**37.1**	48.0	68.1	38.2	18.0	19.7	68.5	5.0
Minimum equipment availability (90% with pencils and notebooks)	65.0	61.4	**60.5**	78.8	76.8	54.8	Not Comparable	Not Comparable	26.4	80.6
Minimum infrastructure availability	20.2	40.4	**38.1**	59.5	29.1	18.5	Not Comparable	Not Comparable	22.3	53.7
Pupil Learning										
Test Score (out of 100) (language, mathematics)	50.6	40.1+*	**49.6**	72.0	20.8	32.2	Not Comparable	Not Comparable	45.7	48.6
Language test score	44.5	36.5+*	**49.5**	75.4	18.7	31.4	Not Comparable	Not Comparable	45.5	47.1
Mathematics test score	56.8	58.2	**47.3**	59.0	25.1	31.9	Not Comparable	Not Comparable	44.6	43.4

Note: (*) Because of the very low number of private schools, only public schools are included in this second round as well. (**) Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger. (+) In Mozambique, Senegal, and Tanzania 2011 (round 1), only public schools were surveyed. (+*) These test scores are for pupils who were assessed in English. For those assessed in Kiswahili, they scored 76.2 on the combined test and 80.9 on Kiswahili.

[2] A few of these numbers may be different from the previously published country reports because the methodology for calculating the indicators has been updated. The numbers shown here are current. To find out more about how the indictors are calculated, go to www.SDIndicators.org.

I. Introduction[3]

1. **Between May and June 2016, twenty education teams travelled across Madagascar to collect data for the Service Delivery Indicators (SDI).** The SDI has been piloted in Senegal and Tanzania in 2010 and lessons learned from the pilot have led to a revised SDI being rolled out across Africa. Thus, this SDI follows a series of countries in Africa which have already implemented a full-fledged SDI (Kenya, Uganda, Nigeria, Togo, Mozambique, Tanzania, and Niger). Madagascar is implementing its first SDI to provide a snapshot of quality of service delivery in both its health and education sectors.

2. **The education SDI team visited a representative sample of 473 Malagasy primary schools across the coutry.** Following an initial consultation meeting drawing in several stakeholders, the initial SDI instruments have been customized to fit the Malagasy context and it was decided that the SDI would also provide few subnational indicators. The sampling strategy was done in a way to provide representative estimates for each of the 6 provinces, as well as for urban and rural schools. The SDI visited public and private primary schools and will also provide estimates by type of school.

3. The sampling strategy for the survey was carried out by the national statistical institute INSTAT. The survey was implemented by CAETIC Developpement in close coordination with a World Bank team. In each school, one grade 4 (8ème) French or mathematics class was observed. Up to 10 pupils were randomly chosen among 4th graders and a total of 3,960 pupils were assessed for literacy and numeracy skills. Teachers also were assessed with 2,130 of them sitting through a 1 hour 10 minute assessment on their French, mathematics, and pedagogical skills. Finally, 2,475 teachers across grades were randomly chosen during the first visit and their whereabouts assessed in a second unannounced visit for estimation of teachers' effort and the level of absence in schools and classrooms.

4. The education service delivery indicators build on a growing body of literature on measuring the performance of schools and specifically teachers who are arguably the most important actors in the sector. The indicators provide a snapshot of the learning environment and key resources which need to be in place for pupils to learn. As expenditure on teachers represents by far the largest share of education spending in developing countries, and as several recent studies convincingly demonstrate how changes in teacher behavior can improve learning achievement, a strong focus is placed on the knowledge, skills, and effort of teachers.

5. Annex B presents the Service Delivery Indicators in education and a short definition of each indicator. Below we give some more reasons for the choice of indicators, before presenting the results and a detailed discussion of the findings in the following sections.

6. A minimum requirement for learning is that the teachers are not absent from the school and spend time in the class rather than somewhere else. The first two indicators—*School absence rate* and *Classroom absence rate*—are direct measures of the extent to which this is the case. While having teachers in the class is a necessary condition, however, it is not sufficient for learning to take place. Teachers need to be involved in teaching and teachers need to have at least a minimum level of knowledge of the subjects they are teaching and skills to transform their knowledge into meaningful teaching. The indicators *share of teachers with minimum knowledge* measures to what extent these

[3] While not the focus of this report, the SDI surveys are also implemented in the health sector.

skills exist across schools and the indicator *time spent teaching in the class* the extent to which teachers are exerting effort to enable learning.

7. Four of the indicators deal with the environment, that is, the school. The indicator *availability of teaching resources* assesses if necessary materials such as blackboard, chalk, pencils, paper are in place to support the teaching activities. The indicator *school infrastructure* measures whether functioning sanitation facilities exist and if there is at least minimum light in the classroom so that pupils can read and study. Finally, the indicators *pupil-teacher ratio* and *share of pupils with textbooks* measure the ***observed*** average number of pupils per teacher in grade four classrooms and the proportion of pupils in the classroom who are using the relevant (mathematics or language) textbook while the teacher dispenses learning.

Table 3. 2016 Madagascar Service Delivery Indicators At-A-Glance

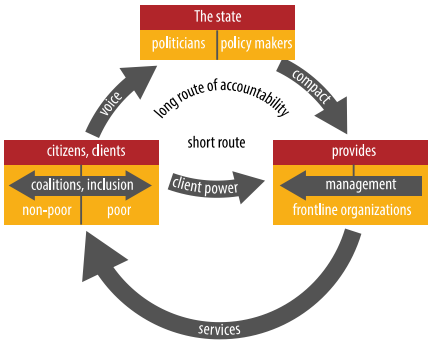
	Madagascar	Public	Private	Urban	Rural	Urban Public	Rural Public
School absence rate (% of teachers)	30.6	35.9	14.4	24.3	31.9	41.8	35.1
Classroom absence rate (% of teachers)	37.8	42.2	24.4	30.9	39.3	47.7	41.5
Classroom teaching time (ToT)	3h 09min	2h 56min	3h 50min	3h 46min	3h 05min	2h 37min	2h 57min
Scheduled teaching time	*5h 12min*	*5h 03min*	*5h 38min*	*5h 21min*	*5h 11min*	*4h 58min*	*5h 03min*
Teachers' minimum knowledge	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Observed pupil-teacher ratio	17.6	16.9	19.9	22.9	17.0	27.2	16.3
Share of pupils with textbooks	10.3	6.8	21.1	20.1	9.1	7.0	6.8
Minimum equipment availability	65.0	65.1	64.6	66.6	64.8	52.3	65.9
Minimum infrastructure availability	20.2	16.0	32.9	37.1	18.1	21.9	15.7

Source: Madagascar SDI 2016 and author's calculations.

Box 1. Analytical Underpinnings

Service delivery outcomes are determined by the relationships of accountability between policymakers, service providers, and citizens (Figure 1, World Bank 2004). Human development outcomes are the result of the interaction between various actors in the multi-step service delivery system, and depend on the characteristics and behavior of individuals and households. While delivery of quality education is contingent foremost on what happens in classrooms, a combination of several basic elements have to be present in order for quality services to be accessible and produced by teachers at the frontline, which depend on the overall service delivery system and supply chain. Adequate financing, infrastructure, human resources, material, and equipment need to be made available, while the institutions and governance structure provide incentives for the service providers to perform.

Figure 1. Relationships of accountability between citizens, service providers, and policymakers



Service Delivery Production Function

Consider a service delivery production function, f, which maps physical inputs, x, the effort put in by the service provider, e, as well as his/her type (or knowledge), θ, to deliver quality services into individual level outcomes, y. The effort variable e could be thought of as multidimensional and thus include effort (broadly defined) of other actors in the service delivery system. We can think of type as the characteristic (knowledge) of the individuals who are selected for a specific task. Of course, as noted above, outcomes of this production process are not just affected by the service delivery unit, but also by the actions and behaviors of households, which we denote by ε. We can therefore write

$$y = f(x,e,\theta) + \varepsilon.$$

To assess the quality of services provided, one should ideally measure $f(x,e,\theta)$. Of course, it is notoriously difficult to measure all the arguments that enter the production, and would involve a huge data collection effort. A more feasible approach is therefore to focus instead on proxies of the arguments which, to a first-order approximation, have the largest effects.

Indicator Categories and the Selection Criteria

There are a host of data sets available in education. To a large extent, these data sets measure inputs and outcomes/outputs in the service delivery process, mostly from a household perspective. While providing a wealth of information, existing data sources (such as Living Standards Measurement Survey (LSMS), Welfare Monitoring Surveys (WMS), and Core Welfare Indicators Questionnaire Survey (CWIQ)) cover only a sub-sample of countries and are, in many cases, outdated.

Box 1. Analytical Underpinnings (cont'd)

The proposed choice of indicators takes its starting point from the recent literature on the economics of education and service delivery, more generally. Overall, this literature stresses the importance of provider behavior and competence in the delivery of education services (as opposed to water and sanitation services and housing that rely on very different service delivery models). Conditional on service providers exerting effort, there is also some evidence that the provision of physical resources and infrastructure has important effects on the quality of service delivery.

The somewhat weak relationship between resources and outcomes documented in the literature has been associated with deficiencies in the incentive structure of school and education systems. Indeed, most service delivery systems in developing countries present frontline providers with a set of incentives that negate the impact of purely resource-based policies. Therefore, while resources alone appear to have a limited impact on the quality of education in developing countries, it is possible inputs are complementary to changes in incentives, so coupling improvements in both may have large and significant impacts (see Hanushek, 2006). As noted by Duflo, Dupas, and Kremer (2011), the fact that budgets have not kept pace with enrollment, leading to large pupil-teacher ratios, overstretched physical infrastructure, and insufficient number of textbooks, and so on, is problematic. However, simply increasing the level of resources might not address the quality deficit in education without also taking providers' incentives into account.

SDI proposes three sets of indicators: (i) provider effort; (ii) knowledge of service providers and (iii) availability of key infrastructure and inputs at the frontline service provider level. Providing countries with detailed and comparable data on these important dimensions of service delivery is one of the main innovations of the Service Delivery Indicators.

Additional considerations in the selection of indicators are (i) quantitative (to avoid problems of perception biases that limit both cross-country and longitudinal comparisons), (ii) ordinal in nature (to allow within and cross-country comparisons); (iii) robust (in the sense that the methodology used to construct the indicators can be verified and replicated); (iv) actionable; and (v) cost effective to collect.

Table 4. Education Indicators

Teacher Effort
School absence rate
Classroom absence rate
Time spent teaching per day
Teacher Knowledge and Ability
Minimum knowledge in mathematics
Minimum knowledge in English
Minimum knowledge in pedagogy
Availability of Inputs
Minimum infrastructure availability
Minimum equipment availability
Share of pupils with textbooks
Observed pupil-teacher ratio

Box 2. The Service Delivery Indicators (SDI) Program

A significant share of public spending on education is transformed to produce good outcomes at schools. Understanding what takes place at these frontline service provision centers is the starting point in establishing where the relationship between public expenditure and outcomes is weak within the service delivery chain. Knowing whether spending is translating into inputs that teachers have to work with (e.g. textbooks in schools), or how much work effort is exerted by teachers (e.g. how likely are they to come to work), and their competency would reveal the weak links in the service delivery chain. Reliable and complete information on these measures is lacking, in general.

To date, there is no robust, standardized set of indicators to measure the quality of services as experienced by the citizen in Africa. Existing indicators tend to be fragmented and focus either on final outcomes or inputs, rather than on the underlying systems that help generate the outcomes or make use of the inputs. In fact, no set of indicators is available for measuring constraints associated with service delivery and the behavior of frontline providers, both of which have a direct impact on the quality of services that citizens are able to access. Without consistent and accurate information on the quality of services, it is difficult for citizens or politicians (the principal) to assess how service providers (the agent) are performing and to take corrective action.

The SDI provides a set of metrics to benchmark the performance of schools in Africa. The Indicators can be used to track progress within and across countries over time, and aim to enhance active monitoring of service delivery to increase public accountability and good governance. Ultimately, the goal of this effort is to help policymakers, citizens, service providers, donors, and other stakeholders enhance the quality of services and improve development outcomes.

The perspective adopted by the Indicators is that of citizens accessing a service. The Indicators can thus be viewed as a service delivery report card on education. However, instead of using citizens' perceptions to assess performance, the Indicators assemble objective and quantitative information from a survey of frontline service delivery units, using modules from the Public Expenditure Tracking Survey (PETS), Quantitative Service Delivery Survey (QSDS), and Staff Absence Survey (SAS).

The literature points to the importance of the functioning of schools and more generally, the quality of service delivery. The service delivery literature is, however, clear that, conditional on providers being appropriately skilled and exerting the necessary effort, increased resource flows for health can indeed have beneficial education outcomes.

The SDI initiative is a partnership of the World Bank, the African Economic Research Consortium (AERC), and the African Development Bank to develop and institutionalize the collection of a set of indicators that would gauge the quality of service delivery within and across countries and over time. The ultimate goal is to sharply increase accountability for service delivery across Africa, by offering important advocacy tools for citizens, governments, and donors alike; to work toward the end goal of achieving rapid improvements in the responsiveness and effectiveness of service delivery.

More information on the SDI survey instruments and data, and more generally on the SDI initiative can be found at: www.SDIndicators.org and www.worldbank.org/sdi, or by contacting sdi@worldbank.org.

II. Methodology and Implementation

8. The sample of the Madagascar SDI is given in Table 5. Overall, 473 primary schools were visited, 2,130 standard three, four, and five teachers were assessed on French, mathematics, and pedagogy, teachers of all grades have been followed for absence rate (not shown in Table 5). Also, although learning outcomes are not part of the indicators, 3,960 standard four pupils have been assessed on language (French), mathematics, and non-verbal reasoning (NVR).[4] It is crucial that the indicators correlate with pupil learning outcomes SDI's objective is to identify the drivers of learning outcomes at the school level.

Table 5. Madagascar's Education SDI Sample

	Schools				Teachers			Grade 4 Pupils		
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(1)	(2)	(3)
Total Sample	**473**				**2,130**			**3,960**		
Stratum										
Antananarivo	130	27.5	28.4	2.3	640	30.0	27.4	1,171	29.6	34.2
Antsirana	47	9.9	9.0	13.5	180	8.4	6.5	403	10.2	7.2
Fianarantsoa	98	20.7	22.3	63.9	434	20.4	23.6	740	18.7	17.9
Toamasina	70	14.8	14.9	20.3	303	14.2	15.7	639	16.1	16.2
Mahajanga	63	13.3	13.9	20.3	289	13.6	14.9	527	13.3	16.6
Toliary	65	13.8	11.5	20.3	285	13.4	11.9	480	12.1	7.9
Location										
All Rural	319	67.4	89.2	79.2	1,263h	59.3	83.0	2,623	66.2	85.9
All Urban	154	32.6	10.8	20.8	868	40.7	17.0	1,337	33.8	14.1

Note: Each unit of analysis i.e. schools, teachers, or pupils has its own specific weights which are where relevant. Column definitions are as follows: (1) is sample size; (2) is share of sample; (3) is the weighted share; (4) is the distribution in the actual sample frame or universe.

9. The Madagascar SDI is representative of primary schools at the national level. It is also representative of the former 6 provinces (Antananarivo, Antsirana, Fianarantsoa, Toamasina, Mahajanga, and Toliary). The SDI can also report statistics on public and private schools as well as urban vs rural schools. The sampling strategy has been done by INSTAT, the national statistics institute, and is fully explained in the annex of this report. It is noteworthy that each entity has its own weight. Weights for schools are therefore different from weights for pupils or teachers. For the latter weights even differ for the analysis of absenteeism or the knowledge content analysis. The difference in weights comes from the fact that for each unit of analysis a sample needs to be drawn.

10. The education service indicators build on a growing body of literature on measuring the performance of schools and, specifically, of teachers. The Indicators provide a snapshot of the learning environment and key resources which need to be in place for pupils to learn. As the expenditure on teachers represents, by far, the largest share of education spending in developing countries, and, as several recent studies convincingly demonstrate how changes in teacher behavior can improve learning achievement, a strong focus is placed on the knowledge, skills, and effort of

[4] Following the Tanzania 2010 SDI results, it was decided for this round to add a Kiswahili test for the pupils. In each school roughly three pupils were tested in Kiswahili and seven in English (to maintain comparability with other countries and Tanzania's previous round). Overall 1,200 standard four pupils were tested in Kiswahili and 2,841 sat for the English test.

teachers. Annex B presents the Service Delivery Indicators in education and a short definition of each indicator. The survey instrument consists of the six modules as shown in Table 6.

11. A minimum requirement for learning is that the teachers are not absent from the school and spend time in the class rather than somewhere else. As shown in the definitions table in Annex B, the first two indicators, *School absence rate* and *Classroom absence rate*, are direct measures of the extent to which this is the case. While having teachers in the class is a necessary condition, however, it is not sufficient for learning to take place. Teachers need to be involved in teaching and need to have at least a minimum level of knowledge of the subjects they are teaching and skills to transform their knowledge into meaningful teaching. The indicator *Minimum knowledge* measures to what extent these skills exist across schools and the indicator *Time spent teaching per day* measures the extent to which teachers are exerting effort to enable learning.

12. Four of the indicators deal with the environment; i.e., the school. The indicator *Minimum equipment availability* assesses if necessary materials such as blackboard, chalk, pencils, and paper are in place to support the teaching activities. The indicator *Minimum infrastructure availability* measures whether functioning sanitation facilities exist and if there is at least minimum light in the classroom so that pupils can read and study. Finally, the indicators *Observed pupil-teacher ratio* and *Share of pupils with textbooks* measure the average number of pupils per teacher in grade four classrooms and the number of mathematics and language books at their disposal. Below we discuss each indicator in more depth and provide additional information on how they are derived, how they should be interpreted, and what they imply.

Table 6. Education SDI survey instrument

Module	Description
Module 1: School Information	Administered to the head of the school to collect information about school type, facilities, school governance, pupil numbers, and school hours. Includes direct observations of school infrastructure by enumerators.
Module 2a: Teacher Absence and Information	Administered to head teacher and individual teachers to obtain a list of all school teachers, to measure teacher absence and to collect information about teacher characteristics.
Module 2b: Teacher Absence and Information	Unannounced visit to the school to assess absence rate.
Module 3: School Finances	Administered to the head teacher to collect information about school finances.
Module 4: Classroom Observation	An observation module to assess teaching activities and classroom conditions.
Module 5: Pupil Assessment	A test of pupils to have a measure of pupil learning outcomes in mathematics and language in grade four.
Module 6: Teacher Assessment	A test of teachers covering mathematics and language subject knowledge and teaching skills.

III. Results

13. The indicators *Minimum equipment availability*, *Minimum infrastructure availability*, *Observed pupil-teacher ratio*, and *Share of pupils with textbook*[5] are all constructed using data

[5] This indicator is used in lieu of *Pupils per textbook* which is the traditional indicator. The primary reason for this change is that this indicator is not defined in a classroom without textbook which proved to be a regular occurrence in previous SDI countries.

collected through visual inspections of a standard four classroom and the school premises in each primary school. Below we discuss each indicator in some more detail. Table 7 summarizes the findings.

A. Availability of inputs at the school

Minimum equipment availability

Methodological Note

Minimum equipment availability is a binary indicator capturing the availability of: (i) functioning blackboard and chalk and (ii) pens, pencils and exercise books in 4th grade classrooms. In one randomly selected 4th grade classroom in the school the enumerator assessed if there was a functioning blackboard by looking at whether text written on the blackboard could be read at the front and back of the classroom, and whether there was chalk available to write on the blackboard. We considered that the classroom met the minimum requirement of pens, pencils, and exercise books if both the share of pupils with pen or pencils and the share of pupils with exercise books were above 90 percent.

14. **In terms of minimum resources, the availability of teaching resources, almost 2 in 3 (65.0 percent) Malagasy primary schools seem to possess the minimum required**. As shown in Table 7, all sub-indicators are close to 100 percent except 'sufficient contrast to read board'. In more than one out of five schools, enumerators found that there was not enough contrast to allow proper reading from a distance. This was most problematic in Antsiranana, where in over half the classrooms (57.1 percent) the enumerators reported that it is difficult for them to read the blackboard from a distance. This needs to be addressed since it has been show that lighting quality in the classroom may significantly impact learning process and outcomes.[6]

Minimum infrastructure availability

Methodological Note

Minimum infrastructure availability is a binary indicator capturing the availability of: (i) functioning toilets and (ii) classroom visibility. Functioning toilets is defined as whether toilets were functioning, accessible, clean and private (enclosed and with gender separation) as verified by an enumerator. To verify classroom visibility we randomly selected one 4th grade classroom in which the enumerator placed a printout on the board and checked whether it was possible to read the printout from the back of the classroom.

Share of pupils with textbooks reflects the typical ratio in pupil to textbooks in a 4th grade classroom. It is measured as the number of pupils with the relevant textbooks (language or mathematics conditional on which randomly selected class is observed) in one randomly selected 4th grade class and divided by the number of pupils in that classroom.

Observed pupil-teacher ratio reflects the typical ratio of pupils to teachers in a 4th grade classroom. It is measured as the number of pupils in one randomly selected 4th grade class at the school.

15. Table 7 reports the means for each sub-indicator for *Minimum infrastructure availability*. For a fuller breakdown of these results, see Table C 1. Overall, schools score poorly on ***minimum infrastructure availability*** **with only one in five schools (20.2 percent) meeting standards**. Slightly more than two thirds of primary schools (69.8 percent) have access to toilets or have privacy (61.6 percent) in the bathroom. In addition, only half the toilets were considered clean

[6] Mott et al. (2012),

(49.4 percent). Access to toilets is especially limited in rural areas (67.4 percent) and in public schools (62.6 percent). Enumerators found issues with toilet cleanliness, privacy and accessibility in over half the bathrooms in Fianarantsoa, Mahajana, Toliary and Antsiranana. Finally similar to lighting concerns above, visibility was also an issue in one in four classrooms (27.3 percent).

Table 7. At the School, auxiliary information

(Percent)	Madagascar	Antananarivo	Fianarantsoa	Toamasina	Mahajanga	Toliary	Antsiranana	All Rural	All Urban	Private	Public	Public Urban	Public Rural
Minimum resource availability	**65.0**	**75.4**	**45.2**	**85.6**	**56.8**	**68.4**	**56.1**	**64.8**	**66.6**	**64.6**	**65.2**	**52.3**	**65.9**
Share of pupils with pencil	92.6	96.2	83.8	97.6	91.1	90.2	99.7	92.5	93.1	94.4	92.0	86.8	92.3
Share of pupils with paper	97.4	97.1	95.7	99.7	99.9	94.3	99.1	97.4	98.0	97.8	97.3	97.6	97.3
Have a board	100	100	100	100	100	100	100	100	100	100	100	100	100
Have chalk	99.8	100	100	99.5	100	100	99.1	100	98.5	99.3	100	100	100
Sufficient contrast to read board	78.5	84.0	68.3	92.9	76.1	85.6	57.1	77.7	85.1	76.8	79.0	88.7	78.5
Minimum infrastructure availability	**20.2**	**42.0**	**2.9**	**26.0**	**18.4**	**3.9**	**6.5**	**18.1**	**37.0**	**32.9**	**16.0**	**21.5**	**15.7**
Visibility (by enumerator)	72.7	74.4	64.5	87.7	71.4	82.0	53.4	72.1	77.9	63.0	75.8	87.0	75.2
Toilet clean	49.4	79.6	38.5	57.6	43.5	10.5	25.8	47.2	67.3	69.1	43.0	49.5	42.7
Toilet private	61.6	93.4	51.8	78.0	37.3	34.8	30.7	59.5	79.7	86.8	53.5	69.7	52.6
Toilet accessible	63.5	95.1	45.2	82.3	44.1	42.5	34.9	61.0	84.1	90.7	54.7	65.1	54.2
Pupil-teacher ratio	36.6	29.5	38.0	39.1	34.7	44.1	36.7	36.7	29.0	28.4	38.3	36.5	38.4
Observed pupils in classroom	17.6	21.1	14.0	19.0	20.9	12.6	14.0	16.9	22.9	19.9	16.7	27.2	16.2
Share of pupils with textbooks	10.3	26.8	4.1	2.8	1.7	9.4	0.3	9.1	20.1	21.1	6.8	7.0	6.8

16. **Only one out ten pupils had access to a French or mathematics textbook in a typical grade four classroom.** Table 7 provides the statistics on the share of pupils who had or were sharing a textbook. First, it is important to state that in 90 percent of the schools none of the pupils had a textbook during the lesson. In the schools in which textbooks are available roughly two pupils would have to share a textbook. There seems also to be little variation across strata with maybe the exception of Antananarivo where 27 percent of pupils were using a textbook in the classroom almost three times the national average. This is probably driven by the prevalence of private schools in Antananarivo. Pupils in private school had a 21.1 percent chance to have a textbook in their hands compared to 7 percent for pupils attending public schools. The lack of books in the classrooms does not always mean that there are no textbooks in the school. Indeed, as shown recently in a recent study in Sierra Leone, (Sabarwal, Evans, and Marshak 2014) schools that have high uncertainty with respect to future transfers are more likely to store a proportion of current transfers (textbooks) with a view towards smoothing 'consumption'. It is not clear whether this is what happens in Madagascar schools but the phenomenon is worth further investigation to make sure books are fully and efficiently used by schools and pupils.

17. The *pupil-teacher ratio* stands at 36.6 when dividing the number of students registered in the school by the total number of teachers. However, in the grade 4 classrooms observed across the country there were on average 17.6 pupils. According to the teachers of the observed classrooms, an average of 22.8 pupils are registered to attend the class meaning that pupils absence rate hovered around 22 percent. The ratio is almost half of Madagascar's recommended benchmark of 40:1. Looking at the provinces, it is interesting to note that Toliary which has the highest PTR also has the lowest number of observed students in grade 4 suggesting a very high dropout rate or a very significant students' absence rate compared to the other provinces. There is not much some variation across the provinces. The same comparison holds between rural and urban schools.

B. Teachers' effort

18. There are three indicators designed to capture the effort teachers put into their job. These indicators are (a) *School absence rate*, (b) *Classroom absence rate*, and (c) *Time spent teaching per day.* The rationale behind these indicators is that the low levels of accountability and weakened incentives observed in many countries especially in Sub-Saharan Africa have led to an upsurge of no-show for teachers. A classroom with no teacher is an environment where no learning is taking place. The indicators are computed across strata to capture the variations in these important dimensions in the country.

Methodological Note

School absence rate is measured as the share of teachers who are absent from school at the time of an unannounced visit. It is measured in the following way: During the first announced visit, a maximum of ten teachers are randomly selected from the list of all teachers (excludes volunteer and part time teachers) who are on the school roster. The whereabouts of these ten teachers are then verified in the second, unannounced, visit. Teachers found anywhere on the school premises are marked as present.

School absence rate

19. **As shown in Table 8, the school absence rate is relatively high with close to one out of three (30.7 percent) not present at school at the time of the surprise visit**.[7] This is particularly high in Fianarantsoa where half (50.6 percent) the teachers are absent from school. It is also high in Mahajanga (39.3 percent) and Toliary (41.2 percent). Public schools have a much greater school absence rate than private schools especially in urban public schools where the absence rate is 41.9 percent.

[7] The majority of the surprise visits took place during the morning with roughly 70 percent of the enumerators arriving before 12 a.m. (the mode of arrival is between 9–10 a.m.). The surprise visit lasted 45 minutes on average.

Table 8. School absence rate and Classroom absence rate

	School absence rate				Classroom absence rate			
	Percent	Robust Std. Err.	[95% Conf. Interval]		Percent	Robust Std. Err.	[95% Conf. Interval]	
Madagascar	30.7	2.7	25.3	36.0	37.9	2.8	32.4	43.3
Antananarivo	15.5	2.1	11.4	19.6	22.9	3.0	17.1	28.8
Fianarantsoa	50.6	5.8	39.2	62.0	59.5	5.3	49.0	70.0
Toamasina	12.3	3.2	6.1	18.6	18.3	4.3	9.8	26.8
Mahajanga	39.3	9.0	21.7	56.9	42.2	8.5	25.6	58.8
Toliary	41.2	7.1	27.4	55.1	51.3	8.8	34.0	68.6
Antsiranana	35.3	7.0	21.6	49.1	43.3	6.9	29.7	56.9
Private	14.4	2.1	10.3	18.5	24.4	3.6	17.2	31.5
Public	35.9	3.4	29.2	42.5	42.2	3.4	35.4	48.9
All urban	24.3	6.3	11.9	36.8	30.9	6.5	18.0	43.7
All rural	31.9	3.0	26.0	37.9	39.3	3.1	33.2	45.4
Public/Urban	41.9	10.1	22.1	61.6	47.7	10.6	26.8	68.6
Public/Rural	35.2	3.6	28.1	42.2	41.5	3.6	34.4	48.6

Methodological Note

Classroom absence rate is measured as the share of teachers not in the classroom at the time of an unannounced visit. The indicator is constructed in the same way as the school absence rate indicator, with the exception that the numerator now is the number of teachers who are either absent from school, or present at school but absent from the classroom.

Classroom absence rate

20. **Even when in school, teachers may not necessarily be in the classroom teaching**. To capture this new dimension, the indicator *Absence from class* is used. A teacher is considered absent from classroom if she is either not on the school premises or when in school, she cannot be located inside a classroom.[8]

21. **Nearly two out of five (37.9 percent) teachers are absent from classrooms.** This would mean that close to 2 fifths of all primary school teachers are not in the classroom teaching at any given time. As expenditure on teachers represents by far the largest share of education spending in developing countries including Madagascar, this very high absence from classroom clearly constitutes an important waste of time and resources with close to 40 percent of the time of teachers not utilized interacting with their pupils. Absence from classroom is especially high in two provinces. More than fifty percent of teachers are absent from the classroom in Fianrantsoa (59.5 percent) and Toliary (51.3 percent). Teachers in public schools are almost twice as likely absent from classrooms (42.2 percent) compared to their colleagues teaching in the private sector (24.4 percent). This is a challenge in both rural and urban public schools, where over forty percent of teachers are absent.

[8] A small number of teachers are found teaching outside, and these are marked as present for the purposes of the indicator.

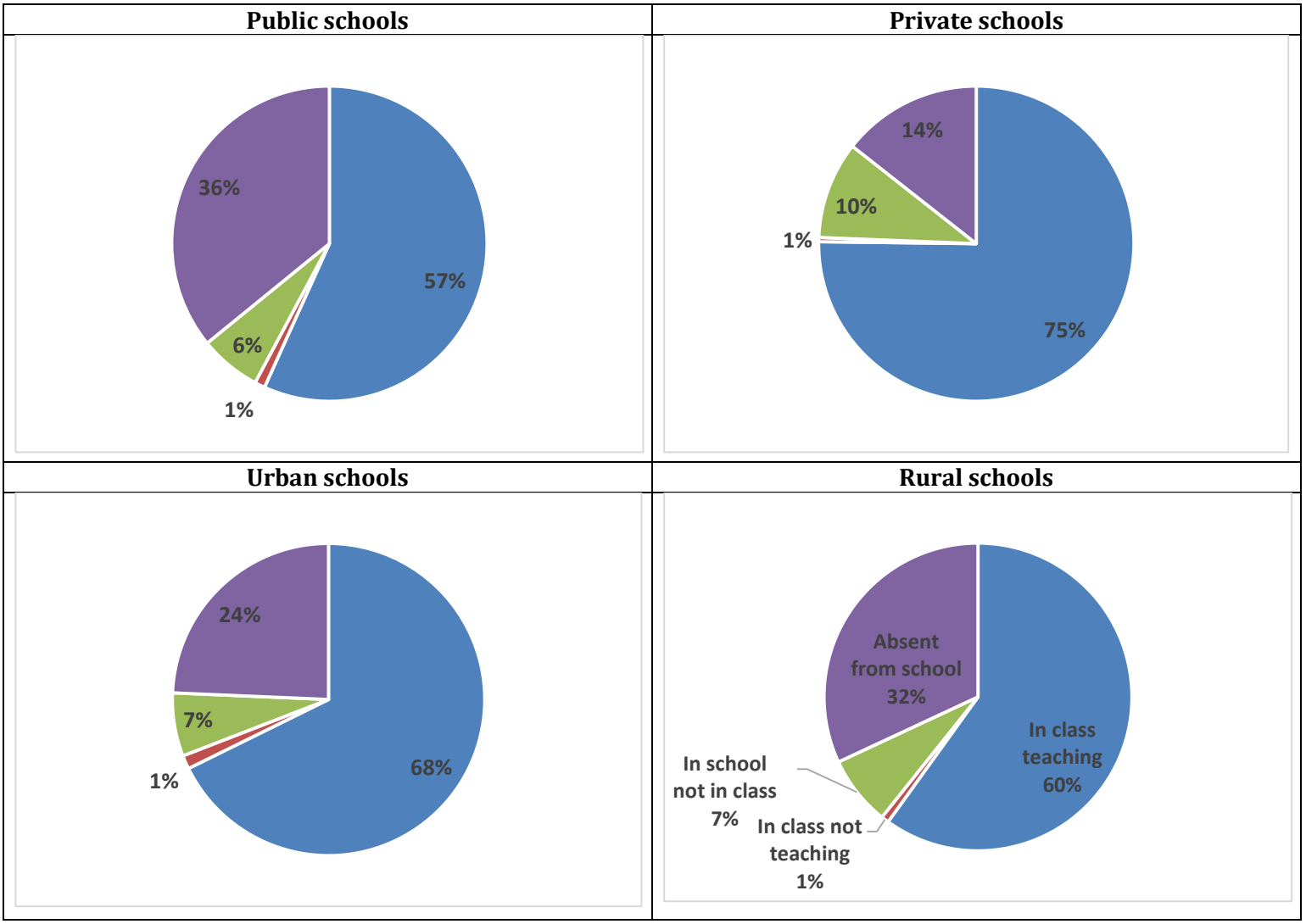
Table 9. 'Quartiles' of absence rates

	"Quartiles" of School Absence rate				Quartiles of Classroom absence rate			
	20% or less	*20 to 40%*	*40 to 60%*	*60+% absent*	*20% or less*	*20 to 40%*	*40 to 60%*	*60+% absent*
Madagascar	50.3	18.7	10.1	20.9	41.9	19.2	9.6	29.3
Antananarivo	62.8	22.6	5.8	8.9	49.3	29.8	6.5	14.4
Fianarantsoa	26.8	20.7	21.7	30.9	18.9	17.7	14.9	48.5
Toamasina	79.7	4.8	3.2	12.3	73.1	4.9	3.2	18.8
Mahajanga	50.8	16.1	10.3	22.8	44.6	18.5	14.1	22.8
Toliary	30.0	18.3	12.6	39.0	27.9	6.8	11.6	53.7
Antsiranana	42.3	29.1	4.7	23.9	35.3	29.8	8.0	26.9
Private	63.2	21.0	4.6	11.2	52.4	22.3	5.3	20.0
Public	46.0	17.9	12.0	24.1	38.5	18.2	11.0	32.4
Urban	61.7	15.4	11.1	11.8	50.1	22.3	11.7	15.9
Rural	48.9	19.1	10.0	22.0	40.9	18.8	9.3	30.9

Source: Madagascar SDI 2015 and Author's calculations

22. **Table 9 provides information on the distribution of absence by looking at the 'quartiles'.** About a third of schools in Madagascar record school absence rate above forty percent. These school absences rates are consistent across both public schools and rural schools. Classroom absence rates are also equally striking. In half of Finarantsoa and Toliary's schools, over *sixty percent* of teachers were **not** in the classroom. Again, these rates are identical in both public and rural schools across the country. In Madagascar, the major issue remains absence from school since when teachers came to school they were mostly in their classroom. It is therefore critical to understand why teachers were not showing up in the first place and put in place measures/incentives to curb absenteeism.

Figure 2. Teachers' whereabouts during unannounced visit



23. **Where were the teachers at the time of the unannounced visit?** Figure 2 provides the answer to that question contrasting public and private schools on the top panel and urban vs rural schools in the bottom panel. This offers another perspective on absence rates by showing teachers' whereabouts during the surprise visit. In private schools, out of every 100 teachers, 75 would be found teaching in the classroom, 1 would be in the classroom but doing something unrelated to teaching, 10 will be in the school but not in the classroom , whereas the remaining 14 will not be in the school at all. In contrast, 36 teachers in public schools will not be in the school's premises and 57 will be teaching in their classroom. The contrast is less stark between urban and rural schools but clearly more teaching (not necessarily learning!) seemed to be taking place in urban schools.

24. **Teacher's absence might be related to teachers' characteristics and Table 10 shows how it correlates with few such characteristics as gender, place of birth, and position in school**. School and classroom absence rate is a challenge across both genders as well as level of school personnel. Nearly one third of male and female teachers are absent in the school and nearly forty percent of both male and female teachers are absent from the classroom at any given time. Higher level of personnel were more likely to be absent in both schools and classrooms. Nearly forty percent

of headmasters are absent from schools and over 47 percent are absent from classroom. Whereas, 30 percent of regular teachers are absent from school and close to 35 percent of teachers are absent from the classroom. Being from the same district neither deters nor encourages absenteeism. Indeed, teachers born in the district they teach are equally absent as those who came to the district. Absence from classroom for those not born in the district seems higher but the difference is not statistically significant.

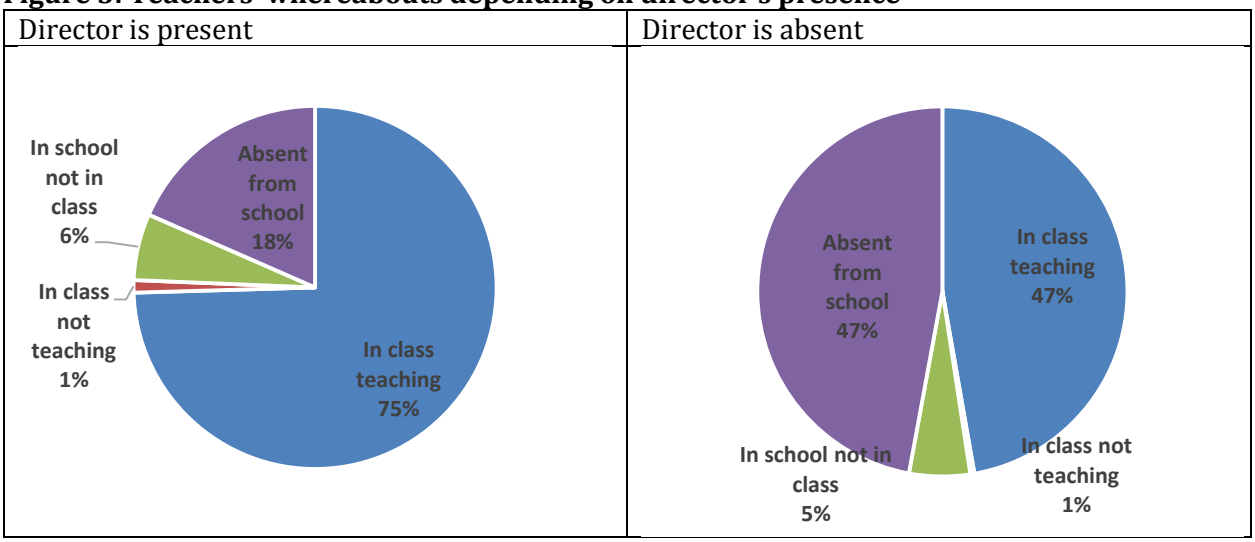
Table 10. School absence rate and Classroom absence rate by gender and birth place

	School absence rate				Classroom absence rate			
	Percent	Robust Std. Err.	[95% Conf. Interval]		Percent	Robust Std. Err.	[95% Conf. Interval]	
Madagascar	30.7	2.7	25.3	36.0	37.9	2.8	32.4	43.3
Male	31.3	2.6	26.2	36.3	39.0	2.8	33.6	44.5
Female	30.3	3.4	23.6	37.1	37.3	3.4	30.6	43.9
Head teacher[a]	37.4	3.4	30.7	44.1	47.1	3.9	39.5	54.7
Regular teacher	28.9	3.1	22.9	34.9	34.6	3.1	28.5	40.7
Born in district	28.2	4.1	20.1	36.4	34.0	4.5	25.2	42.7
Not born in district	31.5	2.9	25.8	37.3	39.2	3.0	33.4	45.0

Source: Madagascar SDI 2016 and author's calculations.
Note: (a) Classroom absence for head teachers is restricted to head teachers that effectively teach

25. As none of the teachers' characteristics seems to strongly explain absence, we turn now to the status of the head teacher (who are absent more often than regular teachers) to find out whether head teacher's absence has an effect on regular teachers showing up at school and going to the classroom. Head teachers are supposed to manage the school and make sure than it runs properly including ensuring that teachers do come. Figure 3 shows the prevalence of regular teachers' absence depending on whether the head teacher is at school or not. The result is striking. In schools where the director is absent 47 percent of the teachers are not in school either, compared to "only" 18 percent when the head teacher is at school.

Figure 3: Teachers' whereabouts depending on director's presence



26. This phenomenon is also likely to vary between public and private schools and Table 11 shows how teachers in public and private schools respond differently to their director's absence. Regular teachers' school absence rate in public schools where the director is absent is more than twice higher than in school where the director is present (55.2 percent vs. 22.1 percent). In private schools, teachers' absence rate is only slighter higher and not significantly so when the director is absent (12.3 percent vs 9.1 percent). Interestingly, for private schools when the director is not in school regular teachers are more likely to be out of the classroom. Director's absence seems to make a huge difference in teacher's absence and this is confirmed in the multivariate analysis further in this report.

Table 11: Teacher's whereabouts by director's status and school ownership

	School Ownership / Head Teacher Status								
	All Schools			*Public Schools*			*Private Schools*		
	In School	Not in School	All	In School	Not in School	All	In School	Not in School	All
In class teaching	74.5	47.2	64.6	70.8	40.6	58.9	84.0	76.0	81.8
In class not teaching	1.1	0.4	0.8	1.4	0.2	0.9	0.4	1.0	0.5
In school not in class	5.9	5.3	5.7	5.7	4.1	5.1	**6.5**	**10.7**	7.7
Absent from school	18.4	47.1	28.9	**22.1**	**55.2**	35.2	9.1	12.3	10.0

Source: Madagascar SDI 2016 and author's calculations

Time spent teaching per day

Methodological Note

Time spent teaching per day reflects the typical time that teachers spend teaching on an average day. This indicator combines data from the staff roster module (used to measure absence rate), the classroom observation module, and reported teaching hours. The teaching time is adjusted for the time teachers are absent from the classroom, on average, and for the time the teacher teaches while in classroom based on classroom observations. While inside the classroom distinction is made between teaching and non-teaching activities.

Teaching is defined very broadly, including actively interacting with pupils, correcting or grading pupil's work, asking questions, testing, using the blackboard or having pupils working on a specific task, drilling or memorization. Non-teaching activities include working on private matters, maintaining discipline in class, or doing nothing and thus leaving pupils not paying attention.

27. This indicator measures the amount of time a teacher spends teaching in a school during a normal day, which on average was 3 hours and 09 minutes in Madagascar for the 2015/2016 school year (Table C 2). That is, teachers taught only about 60 percent of the scheduled time (which is 5 hours and 12 minutes accounting for break times). Several intermediate inputs feed into the calculation of this indicator and are reported in Figure 4.

28. The first step was to begin by recording the scheduled time of a teaching day from school records, which was 5 hours and 12 minutes on average. Then we multiplied this number by the proportion of teachers absent from school. The idea was that if 10 teachers were supposed to each teach 5 hours and 12 minutes per day, but three of them was nowhere to be found in school, then scheduled teaching time was reduced to 3 hours and 37 minutes (5 hours and 12 minutes x 0.694). The second step was to adjust with classroom absence (that is, teachers may have been at the school, but they were not in the classroom teaching). The scheduled teaching time was reduced further to 3 hours and 14 minutes (5 hours and 12 minutes x 0.622).[9]

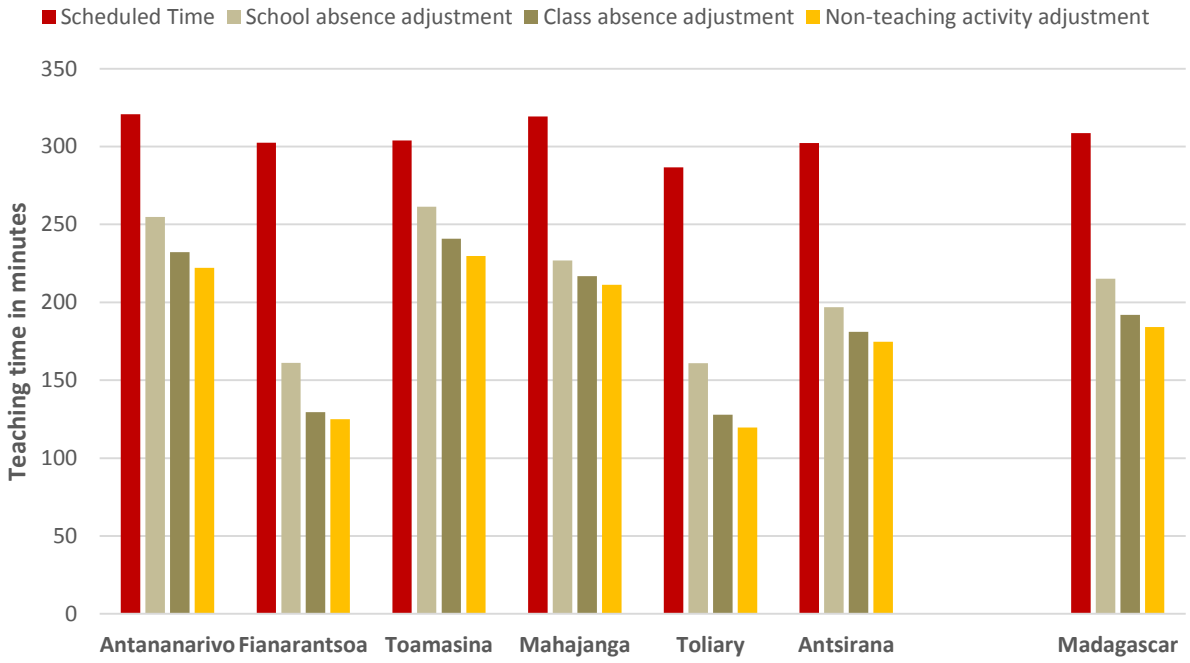
29. The last step consisted of taking into account and removing the time lost by teachers on non-teaching activities while in the classroom. Indeed, even when in the class, teachers may not necessarily be teaching. The percentage of the lesson lost to non-teaching activities was measured through observation of a standard four lesson.[10] As reported in Table C 2, roughly 4 percent of a typical lesson was lost due to non-teaching activities.[11] To take this into account, we multiplied our measure by the proportion of a typical lesson that was spent on teaching. In the example, the teaching time of 3 hours and 14 minutes fell again to 3 hours and 09 minutes (3 hours and 14 minutes x 0.959).

[9] The numbers 0.694 = (1 - 0.306) and 0.622 = (1 - 0.378) represent the share of teachers in school and the classroom, respectively.

[10] This is most likely an upper bound on the time devoted to teaching during a lesson, since presumably a teacher is more likely to teach when under direct observation (that is, Hawthorne effects will bias the estimate upward).

[11] During the observation, enumerators first had to judge whether the teacher was teaching or not. If they judged the teacher to be teaching, they were supposed to indicate how much time the teacher spent on any of the following teaching activities: teacher interacts with all children as a group; teacher interacts with small group of children; teacher interacts with children one on one; teacher reads or lectures to the pupils; teacher supervises pupil(s) writing on the board; teacher leads kinesthetic group learning activity; teacher writing on blackboard; teacher listens to pupils recite/read; teacher waits for pupils to complete task; teacher tests pupils in class; teacher maintains discipline in class; teacher does paperwork.

Figure 4. From official scheduled time to effective teaching time



30. With 2 hours and 56 minutes of contact time with their teacher per day, pupils in public school lost one minute of teaching every four minutes when compared to their peers in private schools who received 3 hours and 50 minutes of teaching time per day. Urban public schools provided the lowest teaching time to their students with an average of 2 hours and 37 minutes teaching per day or roughly half the schedule teaching time.

Table 12. Orphaned classrooms (no teacher but pupils were present)

	Total # of classrooms	# Classrooms with pupils	# Orphan classrooms	Percent	Std. Err.	[95% Conf. Interval]	
Madagascar	4.3	3.3	0.5	16	0.0	0.1	0.2
Antananarivo	4.7	4.1	0.6	16	0.0	0.1	0.2
Fianarantsoa	4.5	2.7	0.7	24	0.0	0.1	0.3
Toamasina	4.5	4.3	0.3	7	0.0	0.0	0.1
Mahajanga	4.7	3.0	0.3	9	0.0	0.0	0.1
Toliary	3.0	1.9	0.6	32	0.1	0.1	0.6
Antsiranana	3.3	2.5	0.5	21	0.0	0.1	0.3
Private	4.4	4.0	0.4	9	0.0	0.0	0.2
Public	4.3	3.1	0.6	19	0.0	0.1	0.2
Urban	6.3	5.1	0.4	8	0.0	0.0	0.1
Rural	4.1	3.1	0.5	18	0.0	0.1	0.2
Public/Urban	7.2	4.4	0.4	10	0.0	0.0	0.2
Public/Rural	4.1	3.0	0.6	20	0.0	0.1	0.3

Source: Madagascar SDI 2015 and author's calculations

31. Finally, Table 12 (and Figure C 1) provides information on a complementary measure of effort - the share of classrooms with pupils but no teacher, i.e. orphaned classrooms. This was measured by inspecting the school premises, counting the number of classrooms with pupils, and recording whether a teacher was present in the classroom or not. The share of orphaned classrooms was then calculated by dividing the number of classrooms with pupils but no teacher by the total number of classrooms that contained pupils. In total, about 16 percent were orphaned in Madagascar with some variation across the provinces. Almost one third of classrooms in Toliary and a quarter of classrooms in Fianarantsoa were orphaned. Public schools had a higher share of orphaned classrooms especially in rural areas.

Correlations between teacher effort and school inputs

32. One might expect that better infrastructure would be associated with more teacher effort- at least poor quality infrastructure is often named by teachers as a reason for low motivation. Looking at the SDI data in Madagascar there is some evidence (simple correlations) to support the claim that school resources may be correlated with teacher's effort. Examining the correlations between *School absence rate* and *Classroom absence rate* and the various infrastructure indicators a fairly consistent picture emerges. Almost all of the indicators are strongly correlated with absence with the right sign. Better infrastructure reduces by 16 percent school and classroom absence. Availability of textbooks also reduces absence and is positively related to teaching time. Only the class size has a counterintuitive (negative) sign meaning that bigger class sizes reduce absence from school and classroom whereas one would tend to think that larger classes exhaust teachers and are likely to increase absence. However, given the fairly low class sizes observed in Madagascar's grade 4, it may well be that teachers have not reached the point where classes are not manageable.

Table 13. Correlates of teachers' effort

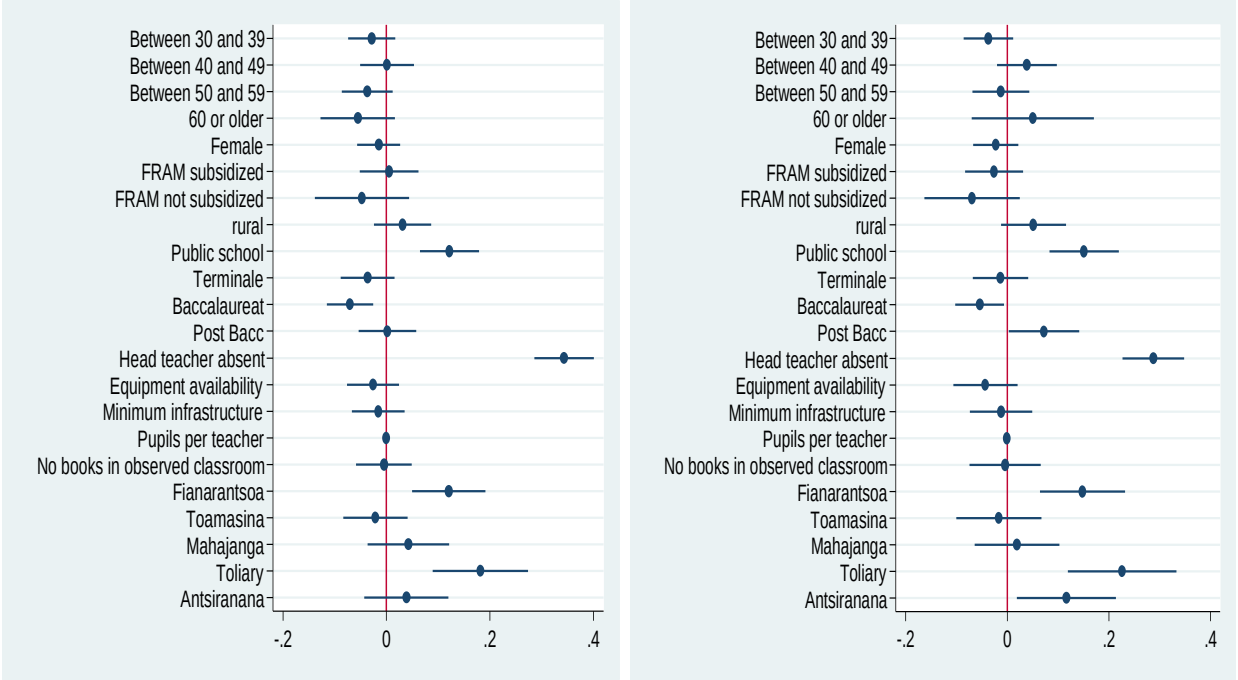
	School absence			Classroom absence			Time spent teaching		
	Coef	R2	N	Coef	R2	N	Coef	R2	N
Infrastructure	-0.160***	0.042	465	-0.166***	0.041	465	64.49***	0.054	459
	(0.0354)			(0.0374)			(12.66)		
Teaching Equipment	-0.05	0.005	465	-0.0755**	0.01	465	27.64**	0.011	459
	(0.0335)			(0.0353)			(12.11)		
Pupils with pencils (%)	-0.220***	0.005	465	-0.243***	0.02	464	78.52***	0.018	459
	(0.0748)			(0.079)			(26.98)		
Pupils with notebooks (%)	-0.0131	0.018	464	-0.144	0.002	464	73.67	0.004	459
	(0.143)			(0.151)			(54.06)		
Pupils with textbooks (%)	-0.120**	0.013	464	-0.129**	0.013	464	55.28***	0.02	459
	(0.0493)			(0.0522)			(17.89)		
Pupils in class	-0.0042***	0.036	465	-0.0039***	0.028	465	1.259***	0.025	459
	(0.001)			(0.0011)			(0.368)		

Source: Madagascar SDI 2016 and author's calculations.
Note: Standard errors in parentheses. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

33. To explore further teacher's absence, Figure 5 shows the coefficients from a multivariate analysis of absence on a whole set of variables (the regression tables are in the annex). Apart from the regional variation and the absence rates in Toliary and Fianarantsoa two major

variables explain teachers absence and these are head teacher's absence and whether the school is public. FRAM teachers, whether subsidized or not, are not more likely to be absent than other teachers once we control for other factors. Education level does not explain absence either. *The simple correlations shown in Table 13 do not hold anymore and infrastructure is not a significant predictor of absence any more.* However, public schools seem to be fertile ground for absenteeism as teachers there are 13.6 percent more likely to be absent that a similar teacher in a similar school except that it is private. The absence of the head teacher is by far the most powerful single explanatory variable for teacher's absence. In the regression, the variation of absence explained when introducing director's absence jumps form 8.8 percent to 20.5 percent.

Figure 5: Correlates of teacher's absence from school and from classroom

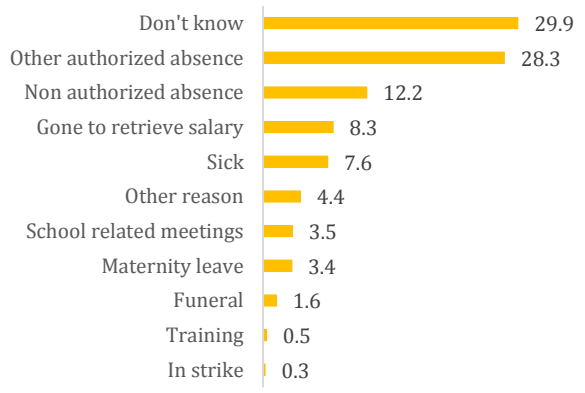


34. As director's absence is critical understanding why head teachers are absent may go a long way to try and address it and thereby reduce regular teachers absence. First, Figure 6 shows the reasons that were provided to explain the absence for both regular teachers and their directors. Clearly the major reason for both is that the respondent does not know the reason for absence (around 30 percent of the time). Then comes all other possible reasons for absence apart form the ones listed in the figure 6 and they concern 22.7 percent of the head teachers. Finally the third main reason for absence for the head teachers are school-related meetings outside of the school premises. These reasons unfortunately do not provide a clear picture for head teachers' absence. Reverting to a multivariate model similar to the one used for teachers' absence, none of the variables available in the dataset was significant. There is a need to study further director's absence.

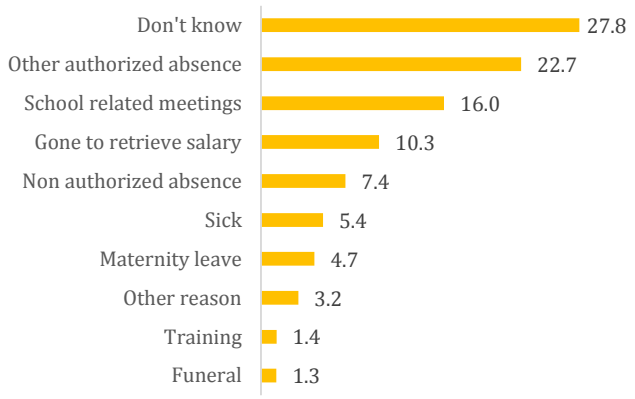
35. We can however note that 90 percent of head teachers in public schools are also active teachers compared to 48 percent of head teachers in the private sector. Therefore, head teachers in public schools have to carve out time to manage the school and its staff. In terms of education also 34 percent of private schools' head teacher have a post-secondary education compared to only 5 percent of public schools' head teachers.

Figure 6: Reasons for absence: Teachers and directors

Reasons for teachers' absence



Reasons for directors' absence



C. Teachers' competence

36. Even if teachers show up to school and spend the allocated time in the classroom engaging in teaching activities with their pupils as expected, they need to have a fairly good command of the subject they teach as well as the required pedagogical skills to effectively pass that knowledge to their pupils. This section discusses the indicator used to capture teachers' knowledge and capacity to teach which is dubbed *Minimum knowledge*.

Minimum knowledge

Methodological Note

Minimum knowledge is measured as the percentage of teachers who can master the curriculum they taught. It is based on mathematics and language tests covering the primary curriculum administered at the school level and is calculated as the percentage of teachers who score 80 percent or more on the language and mathematics portion of the test. The test is given to all mathematics or language teachers that taught third grade last year or fourth grade in the year the survey was conducted.

37. The share of teachers with minimum subject content knowledge is calculated on the basis of a custom-designed teacher test administered to the standard four mathematics and English teachers of the 2013 and 2014 pupil cohorts. The objective of the teacher test is to examine whether teachers have the basic reading, writing, and arithmetic skills that lower primary pupils need to have to progress further with their education. Teachers are considered capable of teaching if they score at least 80 percent on the tests, which is interpreted as the *minimum* knowledge required for the teacher to be effective.

38. In addition, the test also examines the extent to which teachers demonstrate mastery of subject content skills that are above the level they are teaching at and mastery of pedagogic skills. Out of courtesy to teachers the test was designed as a marking exercise, in which teachers had to mark and correct a hypothetical pupil's exam. This is expected to be a seamless exercise for teachers

who routinely grade their students' tests. The test was validated against the Malagasy primary curriculum as well as 12 other Sub-Saharan curricula.[12]

39. The minimum knowledge indicator is calculated as the percentage of teachers who score 80 percent or more on the French and mathematics test. The test also contains more advanced questions in both subjects as well as a pedagogy section.

Table 14. Teachers' tests performance (French and Mathematics combined)

Minimum knowledge French & mathematics (% of teachers)	Madagascar	Antananarivo	Fianarantsoa	Toamasina	Mahajanga	Toliary	Antsiranana	All Urban	All Rural	Private	Public	Public Urban	Public Rural
Cut-off point*: 80%	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.6	0.0	0.1	0.1	0.9	0.0
French: 80%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Math: 80%	6.3	10.2	7.9	5.1	0.1	5.7	2.5	8.0	6.0	9.1	5.5	7.9	5.2
Average Scores (%)													
French & mathematics	38.0	44.1	38.5	38.4	29.4	35.8	33.8	43.2	36.9	42.3	36.8	41.5	36.2
French	23.4	28.5	21.5	24.7	19.7	19.7	21.3	32.5	21.6	27.8	22.2	30.9	21.1
Mathematics	45.0	53.3	48.0	44.5	29.4	44.1	37.9	46.9	44.6	49.7	43.7	45.0	43.5
Pedagogy	23.6	34.0	21.1	26.3	16.1	15.5	14.9	26.3	23.1	27.1	22.6	26.8	22.1

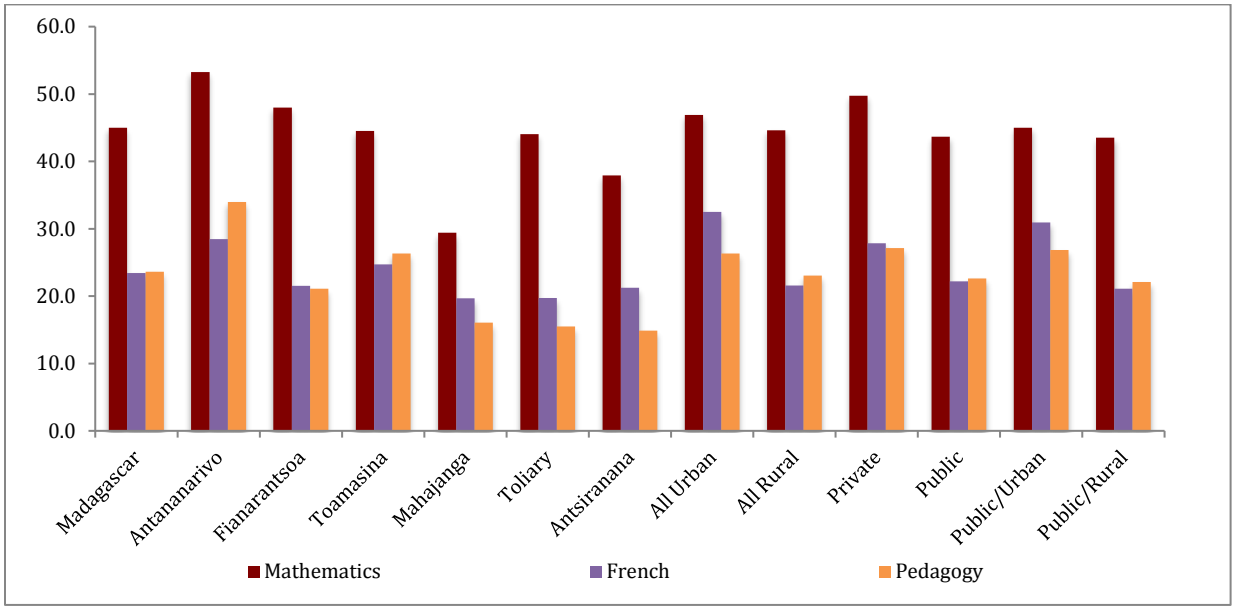
Note: (*) is the agreed cut-off point to estimate minimum knowledge for the SDI. Weighted means using sampling weight. Results based on observations from 2,130 teachers in 465 schools for both French and mathematics.

40. **Content knowledge among Malagasy teachers seems extremely low**. Only 0.1 percent of teachers score more than 80 percent on the combined mathematics and French test (Table 14). Most likely the teachers that met the minimum scores are based in Antananarivo (0.3 percent) and Fianarantsoa (0.1 percent). No teachers met the minimum knowledge cut off for French and only 6.3 percent met the cut off in mathematics. More teachers across the provinces met this 80 percent cutoff for mathematics as compared to French. However, for the most part average scores were less than fifty percent across Madagascar for French, Mathematics and Pedagogy.

41. Table 14 and Figure 4 also show the scores in the tests. Unlike the *Minimum knowledge* indicator, which captures the share of teachers who score above a threshold, the scores simply capture the proportion of questions teachers—taken as a whole—were able to answer as a share of the total number of questions. Taking mathematics and French together, teachers correctly found two out of five (38 percent) questions on the whole test. Across the board, teachers scored higher in mathematics compared to French or pedagogy with an average score of 45.0 percent. However, teachers scored poorly in both French (23.4 percent) and in pedagogy (23.6 percent). As teachers are likely to speak and read Malagasy better than French, that the pedagogy test was written in Malagasy to make sure that one captures teacher's pedagogical skills rather than French skills.

[12] See "Teaching Standards and Curriculum Review", prepared as background document for the SDI by David Johnson, Andrew Cunningham and Rachel Dowling. The countries included for the review were: Botswana, Ethiopia, Gambia, Kenya, Madagascar, Mauritius, Namibia, Nigeria, Rwanda, Seychelles, South Africa, Tanzania and Uganda.

Figure 7. Teachers' average score on English, mathematics, and pedagogy tests



42. Results indicate that Malagasy teachers have limited pedagogical knowledge, which is critical for effective teaching. As a matter of fact, even when teachers have a deep knowledge of their subject matter, only a decent level of pedagogical knowledge content ensures that they can pass that knowledge onto their pupils. In Madagascar, there is clearly a lot of room for progress for teachers to reach and stay at a reasonable level for both subject matter knowledge and pedagogical content knowledge.

43. Teachers in Antananarivo performed slightly but significantly better on all three tests as compared to teachers in other provinces. Scores for all three tests were lowest in Toliary and Mahajanga. Teachers in private schools outperformed their counterparts in public schools although not by much. Similarly, urban teachers performed better on tests than rural teachers. The next sections carry out a more in-depth investigation of teachers' performance on each of the three tests.

D. Test scores

44. **Table 15 presents the average score on the French test, as well as a detailed analysis of particular questions**. The average score is 23.4 percent correct answers indicating that teachers do not have a good grasp of the fourth grade (8ème) curriculum. This is line with the results of the *minimum knowledge* indicator, where no teachers scored more than 80 percent on the test. We need to lower the bar to 50 percent mastery of the curriculum to find 4 percent of the teachers who would manage to cross this extremely low standard.

45. **Teachers scored on average 53.0 percent on the grammar assessment**, which asked them to complete sentences with the correct conjunction, verb (active or passive voice and different tenses) or preposition. Four alternatives, including the correct one, were given for each sentence. Despite the good grammar scores, there were some serious gaps. For example, only 3 percent of the teachers were able to correct the sentence *"L'accident **avait vu** par trois personnes"* even though the correct alternative ("***a eté vu***") was given (recall that teachers were asked to mark a hypothetical pupil's exam).

Table 15. Teachers' performance on French test by sub-section

(Percent)	Madagascar	Antananarivo	Fianarantsoa	Toamasina	Mahajanga	Toliary	Antsiranana	All Urban	All Rural	Private	Public	Public/ Urban	Public /Rural
Minimum Knowledge													
Cut-off point: 80%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average scores													
French (full test)	23.4	28.5	21.6	24.8	19.8	19.7	21.3	32.5	21.6	27.9	22.2	30.9	21.1
Grammar task	53.0	59.4	50.0	55.1	48.9	47.1	52.3	61.0	51.4	57.8	51.7	59.8	50.6
Cloze task	26.3	30.8	23.4	30.6	21.2	24.4	23.2	36.4	24.2	30.1	25.2	36.6	23.8
Composition task	7.8	12.5	7.2	7.3	5.2	4.2	5.5	16.9	6.0	12.4	6.6	14.1	5.7

Source: Madagascar SDI 2016 based on author's calculations.

46. **Scores on the Cloze exercise which assesses vocabulary and text comprehension were much lower (26.3 percent)**. The exercise consisted of a short story with certain words removed, and the teachers had to fill the gaps in a meaningful way. Again, some weaknesses emerged. While teachers were more or less able to confirm that pupils had answered correctly, they struggled to correct wrong answers or complete sentences that the pupil had left blank. For example, 85 percent of teachers could not correct the sentence *"Les joueurs veulent **me** battre."*

47. **The average score (7.8 percent) was lowest on the composition task.** They were tasked to correct a letter for grammar, punctuation, spelling, syntax, and salutation. Sentences such as *"je veu te dire que me nouvelle école est meilleure la vielle"* were set for correction. Overall, the text to be corrected contained 22 errors and the teachers, on average, caught 1.7 mistakes. More than half (56 percent) of the teachers didn't correct any mistake and only 7 percent of the teachers found and corrected seven or more mistakes in the grade four level six-line French paragraph.

48. **Teachers in Antananarivo performed better on the overall test.** The least performers were in Toliary although they are not far from teachers in the other provinces and score better than Mahanjanga teachers in the Cloze test.

Mathematics

49. **Table 16 presents the performance of teachers on the mathematics test, as well as a detailed analysis of particular questions**. (For a full breakdown of the mathematics results, see Table C 3.) First, it is interesting to note that nationally about 1 in 200 teachers had a perfect score and 2.5 percent found and corrected 90 percent of the mathematics questions. Nationally, very few teachers (6.3 percent) met the *Minimum knowledge* standard of 80 percent. This is better than the results from the minimum knowledge standard for French however this is still very low and there is much room for improvement.

50. The average score on the mathematics section was 45 percent correct answers and we observed a large and significant difference (21.9 percentage points) between scores on the lower and upper parts of the primary curriculum. This means that teachers were much more at ease with simple operations, such as adding two- or three-digit numbers, than with slightly more complex computations such as comparing fractions. This pattern holds true across all the provinces, and public/private schools and urban/rural areas.

51. **Looking at the details of the test (Table 16), nearly 20 percent of teachers could not subtract two-digit numbers or multiply two-digit numbers**; over half the teachers could not add or subtract numbers with decimals. Close to seventy percent of teachers could not read a clock or interpret a Venn diagram. Most teachers, eight out of ten, could not compare fractions, interpret data on a graph or solve one variable algebraic equations.

Table 16. Teachers' performance on mathematics assessment (and selected examples)

	Madagascar	Antananarivo	Fianarantsoa	Toamasina	Mahajanga	Toliary	Antsiranana	All Urban	All Rural	Private	Public	Public Urban	Public Rural
Minimum Knowledge Cutoff point: 80%	6.3	10.2	7.9	5.1	0.1	5.7	2.5	8.0	6.0	9.1	5.5	7.9	5.2
Average scores													
Mathematics (complete test)	45.0	53.3	48.0	44.5	29.4	44.1	37.9	46.9	44.6	49.7	43.7	45.0	43.5
Lower primary	52.6	59.7	55.4	52.1	39.1	51.8	46.3	54.0	52.3	56.7	51.5	52.0	51.4
Upper primary	30.7	41.3	34.1	30.3	11.3	29.5	22.1	33.7	30.1	36.6	29.1	31.8	28.8
Adding two-digit numbers	95.1	97.8	97.0	91.5	91.9	94.7	93.9	92.5	95.7	96.9	94.6	88.9	95.4
Subtracting two-digit #	80.6	81.6	86.3	75.0	74.7	82.7	78.4	79.1	80.9	81.8	80.2	74.9	80.9
Adding three-digit numbers	86.0	87.4	91.0	83.1	81.9	82.3	84.4	84.8	86.2	87.8	85.5	82.2	85.9
Multiplying two-digit numbers	79.0	81.2	85.4	79.4	71.6	70.9	77.6	79.7	78.9	79.7	78.8	77.4	79.0
Adding decimals	44.7	50.3	49.3	47.2	32.8	40.8	32.1	50.9	43.4	48.3	43.7	50.4	42.8
Comparing fractions	19.6	26.2	19.8	19.9	8.8	20.9	13.4	23.4	18.9	24.4	18.3	23.9	17.6
Time (reading a clock)	29.0	41.8	19.9	34.1	13.4	36.7	16.8	38.2	27.1	37.5	26.6	33.1	25.7
Interpreting a Venn diagram	35.2	49.5	37.6	34.7	12.3	35.8	19.3	40.2	34.2	40.5	33.8	39.0	33.1
Interpreting data on a graph	18.4	27.8	19.2	18.3	3.8	19.6	6.9	22.5	17.5	23.8	16.9	21.0	16.3
Square root (no remainder)	41.6	53.4	47.3	37.1	13.4	47.4	36.0	40.0	41.9	50.5	39.1	38.9	39.1
Subtraction of decimal #	44.2	54.6	49.5	40.2	19.0	51.4	35.9	39.2	45.3	50.2	42.6	40.3	42.9
Division of fractions	21.1	30.8	27.2	16.1	5.3	14.8	18.1	18.2	21.7	24.3	20.2	17.1	20.6
One-variable algebra	13.3	20.5	16.2	10.6	2.8	11.2	6.9	12.0	13.6	19.1	11.7	7.3	12.3

Source: Madagascar SDI 2015 based on author's calculations.

Pedagogy

52. The overall score on the pedagogy section was 23.6 percent with little difference between basic and more advanced questions (Table 17). Overall, teachers seem to lack pedagogical skills across the country. . This is clearly illustrated by the *Minimum knowledge* indicator whereby only seven out of 1000 (0.1 percent) teachers scored more than 80 percent on the pedagogy test. Even lowering the standard to 50 percent, only one out of ten (11.6 percent) teachers (Figure 8) would reach the bar.

53. The pedagogy test consisted of three sections designed to capture all the skills teachers would routinely be asked to apply when teaching.[13] The first section asked teachers to prepare a lesson plan about road accidents in Tanzania[14] based on a simple information-giving text they had read. The average score on this task was 34.4 percent. The second task asked teachers to assess and compare children's writing on the basis of two sample letters. The average score on this task was 17.9 percent. The final task asked teachers to inspect test scores of 10 children, aggregate them, and make some statements about patterns of learning. This task received the lowest score at 9.1 percent.

54. The low scores on the pedagogy section combined with the performance on the curriculum content imply that teachers know little more than their pupils and that the little they know, they cannot teach adequately.

Table 17. Teachers' performance on pedagogy assessment (selected examples)

	Madagascar	Antananarivo	Fianarantsoa	Toamasina	Mahajanga	Toliary	Antsiranana	All Urban	All Rural	Private	Public	Public Urban	Public Rural
Minimum Knowledge cut-off point: 80%	0.7	1.3	0.8	0.9	0.0	0.1	0.0	0.8	0.7	0.8	0.6	0.9	0.6
Average scores													
Pedagogy	23.6	34.0	21.1	26.3	16.1	15.5	14.9	26.3	23.1	27.1	22.6	26.8	22.1
Basic pedagogy	25.9	36.8	22.4	28.9	19.1	17.5	16.3	28.8	25.3	28.9	25.1	29.6	24.5
Advanced pedagogy	21.9	31.8	20.1	24.3	13.7	13.9	13.8	24.4	21.3	25.8	20.8	24.7	20.3
Prepare a lesson plan	34.4	44.0	32.1	39.8	26.9	27.1	21.7	37.3	33.9	36.3	34.0	39.0	33.3
Compare/Assess pupils' abilities	17.9	31.0	14.1	19.4	9.1	7.1	12.4	20.5	17.3	23.6	16.3	20.2	15.8
Evaluate pupils' progress	9.1	15.1	9.4	7.9	4.7	5.4	3.1	11.9	8.6	11.7	8.4	11.0	8.1

Source: Madagascar SDI 2016 based on author's calculations.

Sensitivity of Minimum knowledge to the cut-off point

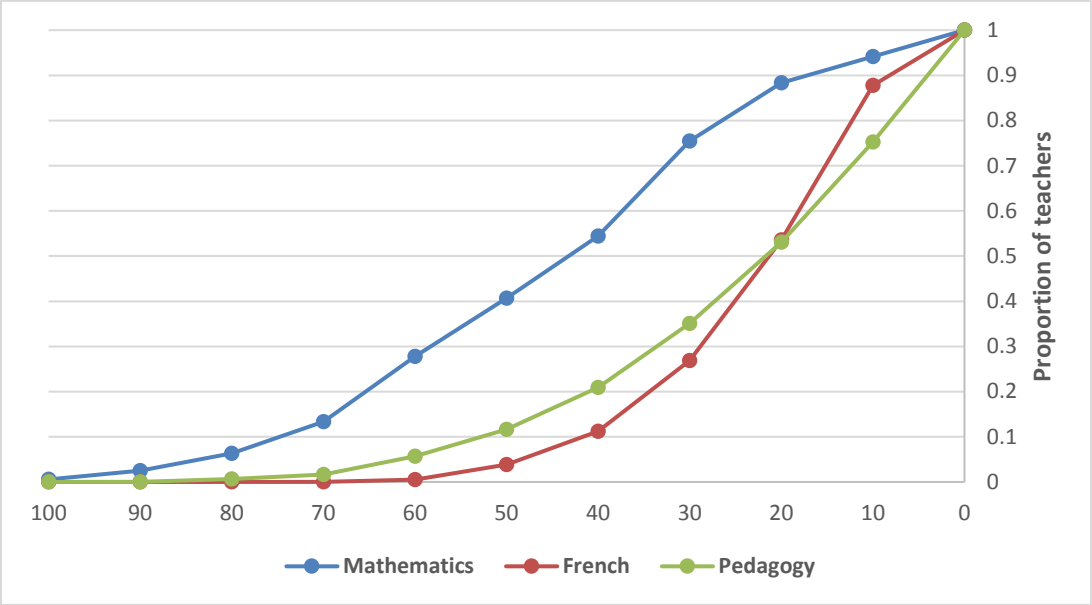
55. Figure 8 shows the sensitivity of the *Minimum knowledge* indicator to different cut-offs (that is, requiring a score of 100 percent, 90 percent, and so on). First, note that teachers performed better in mathematics compared to French or pedagogy, no matter the threshold used. Overall, the results appear fairly sensitive to the choice of threshold, especially for French and pedagogy. For mathematics, the share of teachers who met the standard smoothly and steadily increases across the spectrum the lower the threshold. For French and pedagogy, however, almost no teacher met the standard until the threshold is set at 50 percent of mastery of the curriculum. At this point, 3.8 percent and 11.6 percent of the teachers scored enough to meet the standard in French and pedagogy, respectively. There is a very sharp increase in the proportion of teachers that met the standard when it is lowered from 40 percent to 30 percent and then 20 percent of the curriculum. There is a jump of 42 percentage points for French and 32 percentage points for pedagogy when the standard moves from 40 to 20 percent, a failing grade for any student. As noted before, however, it seems

[13] Because the aim is to measure pedagogical skills, not English, the text was written in Kiswahili, except in places where English was part of the exercise.

[14] During the adapatation of the instrument, in the text for the pedagogy related to preparing a lesson the word "Tanzanie" was not replaced with "Madagascar". However, this did not change the nature of the exercise which remained valid.

reasonable—if not too low a bar—to request teachers to master at least 80 percent of the curriculum they teach for them to be able to stand in front of a classroom.

Figure 8. Sensitivity of *Minimum knowledge* to the cut-off point



IV. Assessment of pupil learning

56. Even though Malagasy is considered to be the language which is used most of the time in Madagascar's primary schools it was decided during the technical consultation meetings in Anatananarivo that the pupil's test would be delivered in French. This is consistent with the previous PASEC tests implemented in Madagascar. Secondly, this will also ensure that Madagascar 4th graders performance can be compared to that of their peers in other SDI countries.

57. **Students score higher in mathematics and in non-verbal reasoning as compared to French.** The average score in mathematics was 56.8 percent and 55.9 percent in non-verbal reasoning (NVR), whereas the average score in French was 44.5 percent. There is no significant gender gap in learning. There is, however, a lot of variation to be explained across provinces, school ownership, and school location. It is surprising to note that in Antananarivo where most of the private schools are, and where the wealthiest households live the scores are significantly lower compared to Toamasina, Antsiranana and Fianarantsoa and similar to scores in other provinces. There is a striking difference between urban and rural students. Rural students had lower scores across all three assessments especially in French.

58. While the average total score provides interesting information, looking into the details of the test can give even more insights. Table C 4 and Table C 5 break down the results for English and mathematics, respectively.

Box 4. Background on the SDI Pupil Assessment

It is instructive to think of the Service Delivery Indicators as measuring key inputs, with a focus on what teachers do and know, in an education production function. These inputs are actionable and they are collected using objective and observational methods at the school level. The outcome in such an education production function is pupil learning achievement. While learning outcomes capture both school-specific inputs (e.g., the quality and effort exerted by the teachers) and various child-specific factors (e.g., innate ability) and household-specific factors (e.g., the demand for education), and thus provide, at best, reduced form evidence on service provision, it is a still an important measure to identify gaps and to track progress in the sector. Moreover, while the Service Delivery Indicators measure inputs -- and learning outcomes are not part of the Indicators -- in the final instance we should be interested in inputs not in and of themselves, but only in as far as they deliver the outcomes we care about. Therefore, as part of the collection of the Service Delivery Indicators in each country, learning outcomes are measured for grade four pupils.

The objective of the pupil assessment was to measure basic reading, writing, and arithmetic skills. The test was designed by experts in international pedagogy and based on a review of primary curriculum materials from 13 African countries (For details on the design of the test, see Johnson, Cunningham and Dowling (2012) "Draft Final Report, Teaching Standards and Curriculum Review"). The pupil assessment also measured nonverbal reasoning skills on the basis of Raven's matrices, a standard IQ measure that is designed to be valid across different cultures. This measure complements the pupil test scores in language and mathematics and can be used as a rough measure to control for innate pupil ability when comparing outcomes across different schools. Thus, the pupil assessment consisted of three parts: language, mathematics and non-verbal reasoning (NVR).

The test, using material up to the grade three level was administered to grade four pupils. The reason for choosing pupils in grade four is threefold. First, there is scant information on achievement in lower grades. SACMEQ, for example, tests pupils in grade six. Uwezo is a recent initiative that aims to provide information on pupils' learning irrespective of whether they are enrolled in school or not and tests all children under the age of 16 on grade two material. While this initiative has provided very interesting results, it is not possible to link pupil achievement to school level data, since the survey is done at the household level. Second, the sample of children in school becomes more and more self-selective as one goes higher up due to high drop-out rates. Finally, there is growing evidence that cognitive ability is most malleable at younger ages. It is therefore especially important to get a snapshot of pupil learning and the quality of teaching provided at younger ages.

The test was designed as a one-on-one test with enumerators reading out instructions to pupils in their mother tongue. This was done to build up a differentiated picture of pupils' cognitive skills; i.e. oral one-to-one testing allows us to evaluate whether a child can solve a mathematics problem even when her reading ability is so low that she would not be able to attempt the problem independently. The language test consisted of a number of different tasks ranging from testing knowledge of the alphabet, to word recognition, to a more challenging reading comprehension test. Altogether, the test included six tasks. The mathematics test also consisted of a number of different tasks ranging from identifying and sequencing numbers, to addition of one- to three-digit numbers, to one- and two-digit subtraction, to single digit multiplication and divisions. The mathematics test included six tasks and a total of 17 questions. The non-verbal reasoning section consisted of four questions.

Table 18. Madagascar 4th grade pupils performance

(Average scores in percent)	French & mathematics	[95%	IC]	French	Mathematics	NVR	Number of pupils
Madagascar	50.6	48.1	53.1	44.5	56.8	55.9	3,960
Antananarivo	46.3	40.9	51.7	35.8	56.9	53.0	1,171
Fianarantsoa	55.1	51.3	59.0	52.3	58.0	56.9	740
Toamasina	58.2	53.3	63.1	57.4	59.1	64.1	639
Mahajanga	44.6	41.2	48.1	37.3	52.0	51.5	527
Toliary	51.3	45.3	56.7	48.2	54.5	57.3	480
Antsiranana	55.8	51.3	60.3	50.1	61.5	57.7	403
All Urban	68.1	64.5	71.5	71.2	64.9	65.6	1,337
All Rural	47.8	45.1	50.4	40.1	55.4	54.3	2,623
Public	46.6	44.0	49.2	39.7	53.5	54.0	2,540
Private	61.1	50.9	65.6	57.0	65.2	60.8	1,420
Boy	49.1	46.2	52.1	42.5	55.8	56.6	1,902
Girl	52.1	49.5	54.5	46.4	57.7	55.3	2,058
No Breakfast	48.3	43.5	53.1	41.8	54.8	54.6	237
Had Breakfast	50.7	48.1	53.3	44.6	56.8	56.0	3,723

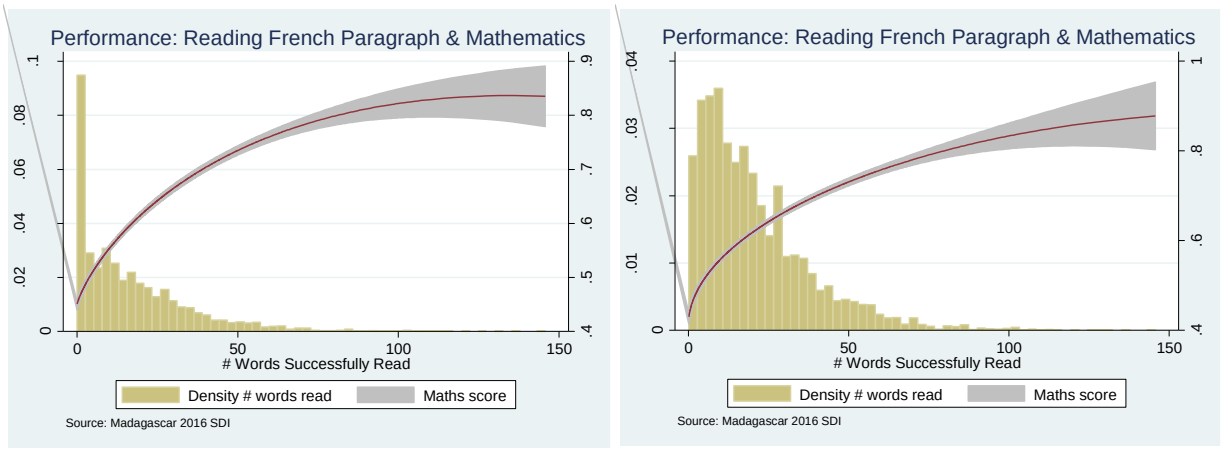
Source: Madagascar SDI 2016 and author's calculations.

59. **Mathematics scores were much better than the French scores.** There were still some significant knowledge gaps. With regard to operations, the pupils performed better when handling tasks involving only one-digit numbers, except for addition where 72.7 percent of the pupils could add two three-digit numbers. In order of performance, mastery of addition was followed by subtraction, then division as a distant third and, finally, multiplication followed. For operations involving two-digit numbers, 36.8 percent of the pupils could do subtraction but this performance dropped down to 23.9 percent for division, and 17.1 percent for multiplication. Very few pupils could perform on questions that required higher analytical skills, such as completing a sequencing of numbers with a specific pattern (9.8 percent) or problem-solving task (11.2 percent).

60. **Although the pupils correctly answered half of the mathematics questions, the test revealed that the majority of grade four pupils did not perform well at the grade three level.** For example, the complete 9x9 multiplication table should be taught by year three; simple division is also clearly in the curriculum. However, only 52 percent of the grade four pupils could perform ***6÷3*** and just a dismal 30 percent found the simple ***7x8*** operation. Pupils in private schools and urban areas performed significantly better across the board.

61. **Interestingly, socioeconomic status and gender seemed to have no impact on pupils' performance.** Indeed, quite surprisingly pupils who had breakfast before coming to school, who, on average, probably live in better-off households, performed at par with children who were not fortunate enough to have breakfast and showed up at school with an empty stomach. There was also no noticeable difference between boys and girls either across all tests.

Figure 9. Performance correlation reading a paragraph and mathematics by language



62. **Figure 9 shows how performance in reading a language paragraph relates to performance in mathematics.** The histograms show the distribution of pupils by the number of words per minute they could read in the paragraph. The lines show the average mathematics score (on the right-hand side, vertical axis) against the number of words successfully read in a minute by the pupils. The distribution of number of words read some pupils bunching on zero, then the share of pupils steadily decreases as the number of words read per minute increases. The figure on the right-hand side does not include pupils who did not read a single word (19.7 percent of them) on the paragraph they were presented.

63. **The graphs clearly show that mathematics and language are strongly positively correlated.** This means the more words the pupils read correctly in a minute the better they performed in mathematics. The grey area depicts the 95 percent confidence interval around the mathematics score. The scores are fairly precisely estimated for the majority of the test takers but clearly as the reading performance increases and fewer pupils are at the top of the reading distribution the less precise the mathematics score and the wider the confidence interval.

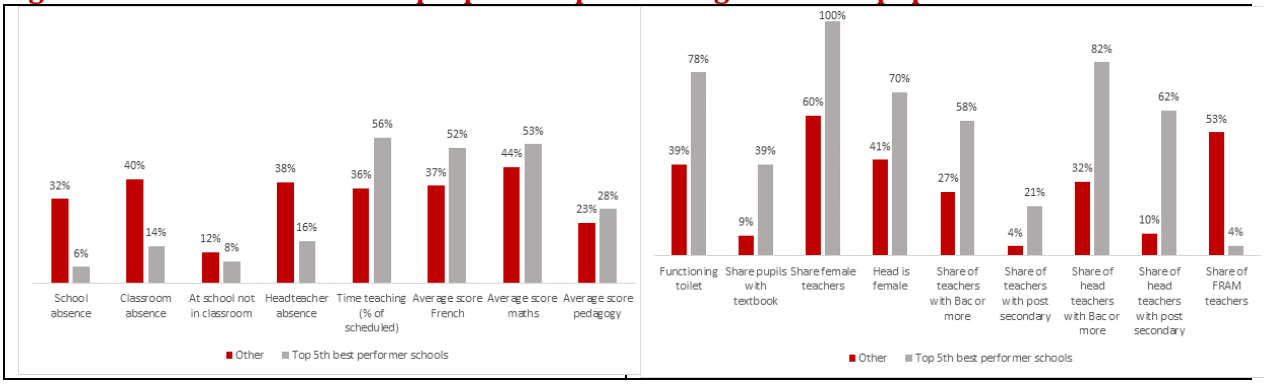
A. Correlations between service delivery indicators and learning outcomes

64. As stated earlier, the service delivery indicators are, by no means, an end in and of themselves. In fact, they matter if, and only if, they explain and are somehow related to pupils' learning, which is what the population and the policymakers care most about. Table C 6 to Table C 8 show a series of simple regressions of pupils' test scores for various subjects on individual service delivery indicators. The scores, as well as the indicators, are averaged at the school level and standardized.

65. The top panel (Panel A) shows the regression results for all the schools, whereas the sample is split into urban and rural schools for the middle panel (Panel B) and bottom panel (Panel C), respectively. All the indicators are significant in one regression or another and they always have the expected sign. The coefficients also suggest that the indicators have relatively large effects, for example, pupils' overall scores increased by 26 percent (respectively 14 percent) of a standard deviation, if teachers' scores in French (respectively pedagogy) increased by one standard deviation. Reducing school absence rate by one standard deviation is associated with an increasing in pupils' overall score of 0.13SD (see Table C 8). Infrastructure, textbooks, and time spent teaching also come out with strong effects on learning.

66. Figure 10 shows the characteristics of the top five percent performing schools in terms of average pupil assessment score compared to other schools in the country. The average pupil score in the top 5 percent schools is 84 percent compared to 48 percent for the bottom 95 percent schools. There is also less variability within those schools with a standard deviation of 10 percent (compared to 20 percent for the other schools) and 3 quarters of the students scored 78 percent or more. Teachers in the top schools are five times less likely to be absent from school (6 percent vs. 32 percent) and performed significantly better in French, mathematics, and pedagogy. Head teachers also were less likely to be absent (16 percent vs. 38 percent). The schools had better infrastructure and more pupils had access to a textbook during the class (39 percent vs. 9 percent). Teachers in the top performing schools were also better educated and much fewer FRAM teachers in the teachers corps (4 percent vs. 53 percent). It is interesting to note that almost all the teachers in the top five percent performing schools are female.

Figure 10: Characteristics of top 5 percent performing schools in pupil assessment



V. SDI Special Topic: Gender and Teachers

67. Gender equality is a leading Sustainable Development Goal (SDG 5). The fourth SDG also is about gender equality because it advocates for universal primary education. There is evidence that gender equality is a strong driver for economic growth and, as put in simple terms by the 2012 World Development Report, gender equality is smart economics. Gender equality in education is most probably the strongest route to full gender equality. This goal has been embraced by most countries including Madagascar. Unfortunately, though, equality in education is generally equated to having equal numbers of boys and girls in school. Although ensuring that girls have as much access to education as boys is a worthy goal, it may not be enough. One needs also to make sure that girls are treated in the same way as boys in schools and classrooms and that they have equal access to inputs, be it books, stationery, toilets, or teachers' time and attention.

68. Following the lead of the Tanzania 2014 SDI, the Madagascar SDI survey collected also gender-disaggregated school and classroom observation data.[15] The SDI survey collected the complete teacher roster in each and every visited school. Questions were asked of all teachers, but subsequently a number of teachers have been sampled for investigating absence rates, knowledge, and classroom practices. In its classroom observation module, the 2016 Madagascar Education SDI

[15] The SACMEQ data actually includes a variable on using a book in the classroom, but this is self-reported as it is asked directly to the pupil instead of direct observation as is the case with SDI.

survey collected detailed gender-disaggregated data. This section uses the collected information to analyze and shed new light on gender issues in Malagasy primary schools and classrooms.

A. Teachers' characteristics by gender of head teacher

69. **In Madagascar's grade four classrooms, girls slightly outnumbered boys with 50.8 percent of them in the average classroom**. Madagascar has thus succeeded to enroll more girls than boys in the primary education system. More interesting, the primary education's teaching workforce was dominated by women. Table 19 indeed shows that 2-in-3 (67.5 percent) of teachers were women. There was quite a lot of regional variation hidden in this average. For instance, in Antananarivo 76.8 percent of the teachers were female against only 46 percent in Antsiranana.

Table 19. Share of female teachers in school

	By Position		By Sex of Head Teacher	
(Percent)	All Teachers	Head teachers	Male	Female
Antananarivo	76.8	55.3	86.1	79.4
Fianarantsoa	60.6	37.5	63.4	69.5
Toamasina	73.2	48.7	75.9	80.7
Mahajanga	63.5	37.1	60.4	78.6
Toliary	64.7	31.7	64.3	79.3
Antsiranana	46.3	25.2	50.2	61.9
Madagascar	67.5	42.4	68.5	77.1

Source: Author's calculations using 2015 Madagascar SDI data.

70. **In school management, however, females were grossly underrepresented with less than half (42 percent) of the head teachers a woman**. Indeed men represent 22.5 percent of the teaching workforce but 57.6 percent of the school managers.

71. **Female-headed schools had on average 8.6 percent more female teachers a significant difference**. It is also interesting to note that with regard to teacher staff size, female-headed schools were significantly larger than those headed by men. This held true across all strata (Figure 11) and the average female head of school had to manage 2.3 more teachers than her male counterpart or a staff which is 30 percent larger in size.

Figure 11. Female-headed schools have more teachers

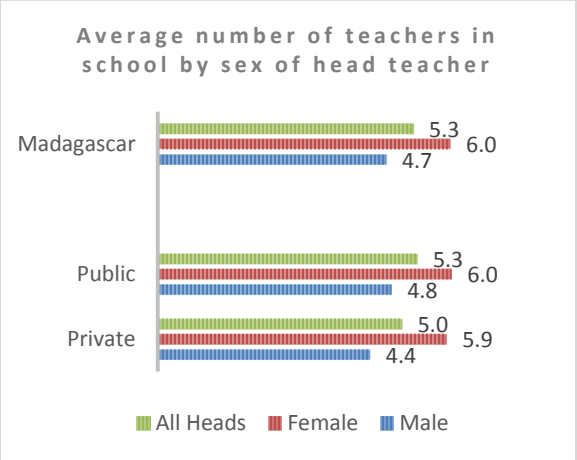


Table 20. Teachers' completed level of education

	Male head			Female head		
	M	F	All	M	F	A
1ere or less	47.9	48.7	48.3	46.7	47.9	47.7
Terminale	28.6	23.9	26.0	21.7	18.7	19.7
Bac	19.1	21.2	20.3	25.7	28.2	27.7
Post-Bac	4.4	**6.2**	5.4	5.9	**5.2**	5.4

	All head teachers		
	M	F	All
1ere or less	47.5	48.2	48.0
Terminale	26.5	20.9	22.7
Bac	21.1	25.2	23.9
Post-Bac	4.9	5.7	5.4

Source: Author's calculations using 2016 Madagascar SDI data

72. **Overall, the education profile of male and female primary school teachers was fairly similar, as shown in Table 20.** The vast majority of primary school teachers (70.7 percent) have not obtained their baccalauréat i.e. the high school diploma, 23,9 percent did have the baccalauréat, and the remaining 5.4 percent pursued their general education beyond high school. The sex of the head of school doesn't seem to impact the sex-education composition of the school's teaching crew.

73. **Does the sex of the head teacher also influence teachers' behavior?** We already learned in an earlier section of this report that male and female teachers were equally likely to be absent (from school and the classroom). Table 21 confirms that fact and it also shows that female teachers behaved differently in school depending on the sex of the head teacher. Female teachers were more likely to be absent when the head teacher was a woman compared to a man. Male teachers also were more absent from school when the head teacher was a man. Table C 9 offers more results on teachers' practices in the classroom broken down by gender.

Table 21. Female teachers more likely in classroom teaching when head teacher is male

	Male head teacher			*Female head teacher*			*All head teacher*		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
In class - teaching	56.2	70.0	60.1	61.8	61.8	61.8	59.2	63.4	61.2
In class - not teaching	0.6	1.3	0.8	0.6	1.2	0.9	0.6	1.2	0.9
In school - not in class	9.5	3.5	7.8	8.8	5.6	6.9	9.1	5.2	7.2
Absent from school	33.7	25.2	31.3	28.8	31.4	30.3	31.1	30.2	30.7

Source: Author's calculations using 2016 Madagascar SDI data. To avoid double counting, only regular teachers are included.

74. Let us now look into the intensity of classroom supervision (Figure 13) and the incidence of salary delays and unpaid claims by the sex of teachers and head teachers. It is noteworthy that most teachers reported that the head teacher comes to observe their classroom at least once a week. Male head teachers observe more often the class on a weekly basis than female head-teachers. However, they observe their teachers equally often irrespective of their sex.

B. Teachers in Madagascar

75. **It is often argued and now widely accepted that teachers are the single most important "input" for children's learning outcomes**. This section examines the main characteristics of Madagascar's primary school teachers. Are they mostly women, how young is the teachers workforce, what their education and training, how much are they paid? All these are important questions that determine the behavior of teacher and their effectiveness in the classroom.

76. **Teachers in public schools are either civil servants or community teachers, known as FRAM teachers, and hired by the local community.** Civil servant teachers are paid by the government and typically received some pre-service training (anywhere between six months and two years) in a government institution. FRAM or community teachers on the other hand are hired locally when a school has a shortage of teachers and few of them have received any formal training. FRAM teachers are almost all paid by the community through fees paid by parents and some of them also receive payment from the government. They are known as subsidized FRAM teachers whereas those whose sole payment emanates from parents are unsubsidized FRAM teachers.

77. **According to SDI data, 23.3 percent of the teaching workforce operates in the private sector.** Within the public sector, the distribution of teacher is as follows: 39.7 percent are civil servant or have some type of contract with government, 50.7 percent are subsidized FRAM and the remaining 9.6 percent are not subsidized FRAM.

78. **How different are FRAM teachers from the other public school teachers?** If 45 percent of the non-FRAM teachers reported to have received some form of training, only 5 percent of the FRAM teachers reported the same. FRAM teachers are more likely to be men (40 percent) compared to other public school teachers (33 percent), they are also younger as the average FRAM is 33 compared to 41-year old for other teachers. Within the FRAM group, the non-subsidized are even younger with an average age of 26 and more likely to be women. Table 22 shows that FRAM teachers have much less experience in the education sector, 3 out of 4 not subsidized FRAM teachers have been hired in 2014 or later compared to 1996 for the non-FRAM teachers and 2000 for private school teachers.

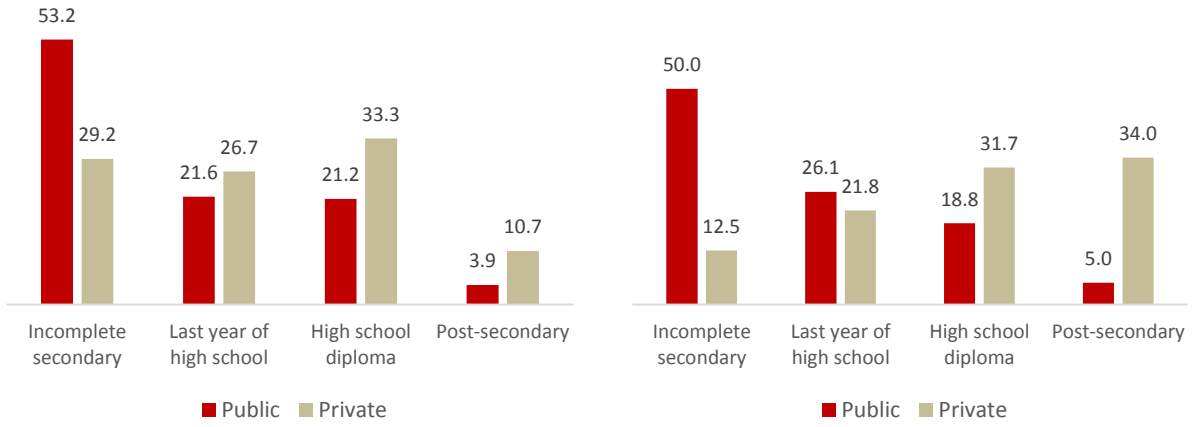
Table 22: Length of teaching experience in education sector and in the current school

	When did you start teaching				***When did you start teaching at this school***		
	Average	p.25	Median		Average	p.25	Median
Public school teachers	**2005**	**2003**	**2008**		**2009**	**2007**	**2011**
Non FRAM	2000	1996	2004		2008	2005	2010
FRAM subsidized	2008	2006	2009		2010	2008	2011
FRAM not subsidized	2013	2014	2015		2014	2014	2015
Private school teachers	**2005**	**2000**	**2007**		**2009**	**2006**	**2011**
All teachers	***2005***	***2003***	***2008***		***2009***	***2007***	***2011***

79. **Teachers in private school had many more years of schooling compare to their colleagues in the public sector.** Figure 12 shows that 44 percent of teachers in private sector had a least their high school diploma compared to 25 percent in the public sector. The majority (53.2 percent) of public schools' teachers have not reach the last year of high school let alone have the diploma. Head teachers in public schools have a similar education profile than the teachers they

supervise and are much less educated than their peers in the private sector. One out of three (34 percent) of private schools' director reach post-secondary level compared to 5 percent of head-teacher in the public sector. Although not shown in the figure, subsidized FRAM teachers are slightly less educated than non-FRAM teachers but non-subsidized FRAM teachers are better educated with "only" 38.7 percent of them who didn't reach the last year of high school and 35 percent have at least the baccalauréat compared to 54.3 percent and 25.6 percent respectively for non-FRAM teachers.

Figure 12: Madagascar's primary teachers and head-teachers education profile



80. As already shown, teachers in the public sector were much more likely to be absent from school (36 percent vs. 14 percent) and classroom (42 percent vs. 24 percent) even though head teachers in private school were equally likely not to be at school compared to the public schools' head-teachers (33.2 percent vs. 38.6 percent). Head teachers in private school seems much better able to manage their staff and this may be partly due to their highest education level.

81. **Only 20 percent of teachers received a training any kind** (CAE/EB, CAP, CFEP, CFEN, etc.). Interestingly teachers in public sector are more likely to have been trained compared to those in the private sector (21 percent vs 16 percent). With 21.1 percent of female teachers who reported they have received a training are more likely to have done so than their male counterparts (16 percent). Actually only 45 percent of non-FRAM teachers in the public sector have received some training.

82. Teachers' salary is considered as the prime incentive for teachers. Oftentimes, it is argued that teachers in public schools are absent or do not perform because they are not well paid. Table 23 shows the results of a series of regressions explaining teacher's monthly salary. Column (1) shows that provincial variation explains roughly 4 percent of the variation in teacher's salary

83. Surprisingly, salary seems to be unrelated to teacher's education level but once we control for more teacher's and school's characteristics teacher who have the baccalauréat have an 11 percent higher salary compared to a teacher with the same characteristics who didn't complete high school. Post-secondary schooling is not significant but this may have to do with the few number of teachers at that level. However, a teacher with no any education training had a 17 percent lower salary. This gap can be closed with experience as one additional year of teaching experience was associated with a 1.4 percent increase, and head-teachers had a 10.2 percent higher salary. There is no gender gap in teacher's salary, female teachers were as well paid as their male counterparts and teaching in a female-headed school did not come with a salary disadvantage.

Table 23: Determinants of teacher's (log of) salary

	(1)	(2)	(3)	(4)	(5)	(6)
Teacher's characteristics						
Education level: 1ère or less is reference						
Terminale		-0.149	-0.0964	-0.0950	-0.0341	-0.0104
		(0.0900)	(0.0660)	(0.0508)	(0.0545)	(0.0429)
Baccalaureate		-0.0833	0.0628	0.0537	0.0811**	0.116**
		(0.0514)	(0.0525)	(0.0359)	(0.0286)	(0.0353)
Post Bac		-0.0442	-0.000927	-0.00239	0.0273	0.146
		(0.0883)	(0.0702)	(0.0553)	(0.0657)	(0.0742)
Age			0.0209***	0.0179***	-0.000648	0.00176
			(0.00330)	(0.00289)	(0.00262)	(0.00172)
Female teacher			-0.0329	-0.0432	0.0147	0.0433
			(0.0342)	(0.0271)	(0.0324)	(0.0216)
Subsidized FRAM				-0.000229	0.142	-0.373***
				(0.105)	(0.0877)	(0.0782)
Not subsidized FRAM				-0.957**	-0.882**	-1.416***
				(0.281)	(0.262)	(0.242)
Teacher is head teacher					0.184***	0.102**
					(0.0309)	(0.0352)
Experience					0.0192***	0.0143***
					(0.00267)	(0.00101)
Teacher w/o training					-0.438***	-0.166**
					(0.0660)	(0.0524)
School characteristics						
Public						0.869***
						(0.0447)
Rural						-0.109
						(0.0639)
Headteacher is female						-0.0280
						(0.0272)
Antananarivo is reference						
Fianarantsoa	0.149***	0.133***	0.162***	0.170***	0.209***	0.0397
	(0)	(0.0152)	(0.0231)	(0.0420)	(0.0409)	(0.0324)
Toamasina	0.327***	0.292***	0.272***	0.278***	0.287***	0.0584*
	(0)	(0.0229)	(0.0172)	(0.0287)	(0.0236)	(0.0262)
Mahajanga	0.154***	0.142***	0.188***	0.250***	0.301***	0.169***
	(0)	(0.0131)	(0.0235)	(0.0423)	(0.0446)	(0.0352)
Toliary	0.369***	0.328***	0.431***	0.409***	0.457***	0.328***
	(0)	(0.0302)	(0.0366)	(0.0505)	(0.0472)	(0.0366)
Antsiranana	-0.0336***	-0.0464***	-0.00949	0.00121	0.0945**	-0.0318
	(0)	(0.0101)	(0.0190)	(0.0260)	(0.0312)	(0.0285)
Constant	4.973***	5.047***	4.203***	4.358***	5.001***	4.594***
	(0)	(0.0514)	(0.173)	(0.102)	(0.0941)	(0.0764)
Observations	2,127	2,127	2,127	2,127	2,096	2,096
R-squared	0.042	0.048	0.168	0.237	0.350	0.518

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

84. As expected FRAM teachers had a much lower salary especially those who do not receive a subsidy. However, teachers in the public sector had an astounding 86.9 percent higher salary compared to the similar teacher in the private school yet their level of effort as captured by their school absence rate is much lower.

Figure 13. Supervision of head teacher

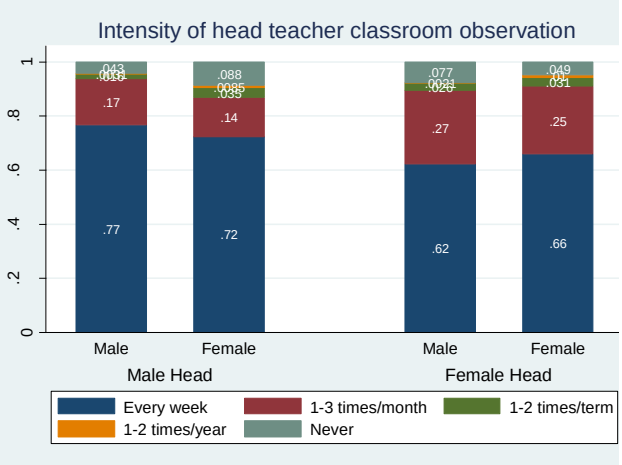


Table 24: Unpaid claims and salary delays

	HMTM	HMTF	HFTM	HFTF
	Reported Unpaid Claims (%)			
FRAM w/o sub.	16.8	0.0	3.6	3.7
FRAM w/ sub.	25.0	22.3	36.1	21.0
Not FRAM	24.6	10.8	17.6	13.4
All teachers	24.2	14.8	25.7	15.1
	Reported Salary Delays (%)			
FRAM w/o sub.	42.2	33.9	51.5	33.0
FRAM w/ sub.	95.6	93.7	77.8	87.8
Not FRAM	29.7	21.6	28.7	19.5
All teachers	61.2	53.5	54.9	39.9

Source: Author's using Madagascar SDI 2016 data.

85. Half of the teachers reported receiving their salary with delay and 18.3 percent said they still had pending unpaid claims. Nearly all (90.4 percent) of the subsidized FRAM teachers reported a delay in salary receipt. It seems though that the subsidized FRAM teachers were more likely to have experienced a salary delay when the head teacher was a man. About 36.1 percent of the subsidized FRAM teachers working in a school managed by a woman reported an unpaid claim, the largest share of all groups which is also twice the national average.

C. Gender effects of classroom environment and teaching practices

86. In each school, one grade four classroom was observed during a French or mathematics lesson. The objective of the classroom observation was to have a better understanding of the dynamics in a typical grade four class. Information was collected on the classroom environment and how the teacher carried out her teaching activity (that is, how she behaved with pupils, whether she asked questions, provided feedback, went individually to the pupils, called them by name, and so on). Most of the questions were gender-disaggregated (for instance, the enumerator was asked to note the pupil's gender when recording the number of pupils who went to the blackboard).

87. **Teachers led and maintained gender-balanced classrooms with regard to access to and use of inputs (Table 25)**. Female teachers had larger classes with a difference of almost eight pupils. The gender composition of the classes was, however, similar with roughly half of girls in the classroom irrespective of the teacher's gender. With regard to access to inputs such as textbooks, pens or pencils, or exercise books, girls and boys had access in the same proportion as they were in the class (that is, of the pupils who had access to the inputs roughly half are girls). Even for textbooks which were a rare commodity, pupils used textbooks in a similar share than the composition of the classroom irrespective of the teacher's sex. To illustrate, in the average male teacher's classroom, only 7.7 percent of the pupils used a textbook and among those, 48 percent were girls. Girls represent also 49.5 percent of the classroom population so a similar proportion. There was no difference either for pens or exercise books, but this could be a reflection of the near universal access to those inputs with 96 percent of pupils having them.

Table 25. Class size and use of inputs by pupils in classroom

	Male Teachers				Female Teachers			
	Mean	Std. Err.	[95% Conf. Interval]		Mean	Std. Err.	[95% Conf. Interval]	
Total number of pupils	**14.0**	**1.2**	**11.0**	**16.9**	**21.9**	**1.7**	**17.4**	**26.4**
Of which % girls	49.5	1.8	44.8	54.2	52.6	3.3	44.1	61.1
Share of pupils with textbook	**6.9**	**4.6**	**-5.0**	**18.9**	**14.0**	**6.6**	**-3.0**	**31.0**
Of which % girls	46.3	3.4	37.4	55.1	55.5	6.1	39.8	71.1
Share of pupils that used textbook	**7.7**	**4.2**	**-3.2**	**18.6**	**9.8**	**3.5**	**0.9**	**18.8**
Of which % girls	47.7	2.3	41.7	53.7	57.3	2.0	52.3	62.4
Share of pupils with pens	**93.2**	**1.5**	**89.2**	**97.2**	**91.9**	**4.3**	**80.8**	**103.0**
Of which % girls	49.1	1.5	45.4	52.9	52.7	3.2	44.3	61.0
Share of pupils with exercise books	**96.6**	**1.2**	**93.6**	**99.7**	**98.3**	**0.8**	**96.4**	**100.3**
Of which % girls	49.3	1.6	45.2	53.4	52.6	3.4	43.9	61.3
Teacher goes to see pupils	**42.7**	**7.6**	**23.3**	**62.2**	**59.6**	**2.3**	**53.8**	**65.5**
Of which % girls	48.2	5.1	35.0	61.4	51.1	3.4	42.2	60.0

Source: Author's calculations using 2016 Madagascar SDI data.

88. Table 26 shows regression results for many teaching practices as observed in the classroom. (For a fuller breakdown of teaching practices, see Table C 10.) Each row represents a regression. The first three columns show combinations of head teacher/teacher by sex. The reference group is HM-TM, whereby both the head teacher and the teacher are male. The fourth column is the share of female teachers in the school. The teachers' interaction with their classroom seemed quite gender-balanced.

Table 26. Regression results of teaching practices

	HF-TM	HM-TF	HF-TF	% female teachers	# Obs.	R-squared
Number pupils in classroom	**6.556*** **	2.5	-0.631	11.36**	473	0.131
% of girls in classroom	-0.0311	0.0222	0.00164	0.0939*	473	0.074
Share of pupils with textbooks	-0.0175	-0.0269	0.00304	0.115*	473	0.173
% of girls with textbooks	**0.134***	0.104	**0.242****	-0.239**	70	0.139
Share of pupils who used textbooks	0.0347	0.0459	0.0203	0.0433	473	0.055
% of girls using textbook	0.0438	0.105*	0.216	-0.0798	52	0.195
Teacher wrote on board	-0.0152	0.0089	-0.0157	-0.0183	473	0.032
Pupils wrote on board	0.0459	0.0505	0.052	-0.147	472	0.009
% of girls wrote on board	-0.0986	-0.036	0.0258	0.0878	324	0.053
Teacher kept attendance	0.0634	**0.148***	-0.0187	0.135*	473	0.061
Teacher had scheme of work	0.0451	0.0726	-0.0356	0.254***	473	0.091
Teacher had lesson plan	0.0218	**0.0820****	0.128	0.0359	473	0.08
Teacher introduced lesson	-0.686	-0.699	0.573	-0.522	473	0.013
Teacher summarized lesson	-0.174	0.007	0.434	0.612	467	0.025
Teacher assigned homework	-0.812	-0.837	0.0914	-1.698	470	0.025
Teacher tested creativity	-0.00441	**0.0606***	0.00118	-0.0856	473	0.161
Teacher gave positive feedback	-0.00062	0.0436	-0.0344	0.134	473	0.016
Teacher gave corrective feedback	0.00451	-0.0344	0.0552	0.0816	473	0.036

Note: Significance levels *** p < 0.01, ** p < 0.05, * p < 0.1.

89. There is no discernable gender effect in having a scheme of work, introducing or summarizing the lesson, or providing feedback (positive or negative) to pupils. Teachers also visited pupils or sent them to write on the blackboard with no differences in gender from the teachers' or the pupils' side. There are, however, a few interesting exceptions. A textbook-gender imbalance effect is now emerging in this analysis. Girls are significantly more likely to have access to a textbook when their head teacher is female. Within that female-headed school, girls are even more likely to have access to a textbook when their teacher is a woman. A girl with a female teacher in a female-headed school had 24.2 percent higher chance to have a book than her similar peer with a male teacher in a male-headed school.

Determinants of teachers' performance

90. **Are there key determinants or correlates of teachers' performance that one can identify?** It is widely recognized now that what teachers know is the most important driver of what pupils learn (see Metzler and Woessmann 2012, among others). In turn, teachers' knowledge and performance can have long-lasting impact on their pupils through labor market outcomes and productivity as shown by Hanushek (2011).

91. As expected, gender, education level, training, and teaching experience prominently figure among the usual suspects for teachers' quality determinants. There are clearly more variables that influence teachers' quality but the regression results in Table 27 focus on those few important aspects and check how strongly they are correlated with teachers' standardized scores in mathematics, French, pedagogy, and combination scores of those three.

92. Controlling for a large number of variables, female teachers are on par with their male colleagues on all subjects. Interestingly, teachers in public school performed significantly better in pedagogy compared to teachers in a private school with similar characteristics. Public and private schools teachers' performance on French and mathematics were not significantly different. Education level plays an important role as teachers with post-secondary education scored 0.71 SD better in French compared to those who did not reach the last year of high school. Experienced teachers scored significantly better in all three subjects. Looking into teachers' classroom practices it is counterintuitive that introducing the lesson has a negative sign on performance. The strongest indicator though is whether the teacher uses local language which was observed in nearly all classrooms.

93. **FRAM teachers performed significantly worse than non-FRAM teachers in French, mathematics, and pedagogy**. The non-subsidized FRAM performed particularly badly even compared to the subsidized FRAMs. This may seem counterintuitive as not-subsidized FRAM are younger and better educated than subsidized FRAM teachers and one would therefore expect that they would perform better. However, as shown by Table 23 not subsidized FRAM teachers have a significantly lower salary whereas Table 24 shows that many of them claimed unpaid benefits and suffered salary delays. The combination of these factors might have a detrimental impact on the performance of not subsidized FRAM teachers despite their relative better education level. In any event, the fact that FRAM teachers performed so badly does not bode well for public schools as FRAM teachers represented 60 percent of the public teaching force in 2016 according to the SDI data.

94. Even education level and teacher training may be correlated both variable have been included in the regression analysis of Table 27. Teachers with no teacher training performed at 0.2SD and 0.13SD in mathematics and French respectively when compared to teachers with otherwise similar characteristics.

Table 27. Regression results of teachers' standardized test scores

	Mathematics	French	Pedagogy	Mathematics and French	Mathematics, French, and Pedagogy
Female	0.0575	-0.0821	-0.0378	0.00739	-0.0120
	(0.0435)	(0.0514)	(0.0463)	(0.0466)	(0.0436)
School basic characteristics					
Public school	-0.0287	0.0552	0.156**	0.0199	0.0855
	(0.0678)	(0.0910)	(0.0688)	(0.0781)	(0.0709)
Rural school	-0.446***	-0.0205	0.0281	-0.209***	-0.136**
	(0.0661)	(0.0839)	(0.0626)	(0.0756)	(0.0672)
Reference group is Première or less (next to last high school year)					
Terminale	0.130***	0.289***	0.165***	0.276***	0.272***
	(0.0477)	(0.0585)	(0.0520)	(0.0558)	(0.0524)
Baccalauréat	0.415***	0.504***	0.435***	0.537***	0.582***
	(0.0544)	(0.0618)	(0.0583)	(0.0568)	(0.0552)
Post-Bac	0.711***	0.473***	0.494***	0.697***	0.723***
	(0.0882)	(0.0982)	(0.0867)	(0.0961)	(0.0900)
Teacher w/o training	-0.198***	0.134*	-0.0417	-0.00596	-0.0233
	(0.0693)	(0.0719)	(0.0610)	(0.0701)	(0.0654)
Experience in years	0.00790*	0.0120***	0.00681*	0.0123***	0.0119***
	(0.00411)	(0.00399)	(0.00373)	(0.00401)	(0.00373)
FRAM w/ subsidy	-0.115**	-0.175**	-0.0919*	-0.171***	-0.164***
	(0.0511)	(0.0713)	(0.0542)	(0.0606)	(0.0556)
FRAM w/o subsidy	-0.183**	-0.391***	-0.346***	-0.398***	-0.442***
	(0.0859)	(0.0996)	(0.0789)	(0.0932)	(0.0812)
Teacher's teaching practice					
Introduced lesson	-0.00253**	-0.00616***	-0.00536***	-0.00501***	-0.00602***
	(0.00126)	(0.00238)	(0.00196)	(0.00104)	(0.00120)
Summarized lesson	0.00291	0.00900**	0.000279	0.00809***	0.00590**
	(0.00259)	(0.00378)	(0.00259)	(0.00254)	(0.00253)
Assigned homework	-0.000239	-0.00331	-0.00315	-0.00120	-0.00229
	(0.00155)	(0.00297)	(0.00208)	(0.00176)	(0.00199)
Reviewed homework	-0.000269	0.00859***	0.00369**	0.00596***	0.00594***
	(0.00179)	(0.00303)	(0.00163)	(0.00141)	(0.00137)
Used local language	-0.260**	-0.0845	-0.276**	-0.162	-0.242**
	(0.114)	(0.123)	(0.126)	(0.111)	(0.115)
Observations	2,039	2,039	2,039	2,039	2,039
R-squared	0.349	0.206	0.226	0.291	0.343

Note: Robust standard errors in parentheses. Standard errors clustered at the school level. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.1.
The regressions contain a number of other control variables such a province, age of teacher, infrastructure, equipment, etc.

D. Pupils' performance and teacher's gender

95. **Does teacher's gender matter for pupil's learning outcomes**? **Do girls perform better when they are taught by a woman?** There is a large literature on this topic (see Dickerson, McIntosh, and Valente 2015; Holmlund and Sund 2008, and references therein). If teachers treat pupils differently according to both the teacher's and the pupil's gender or pupils themselves behave

according to their teacher's gender, this may impact pupils' learning achievement. The impact may also be cumulative along the life of the pupils through their primary cycle. A clear-cut answer to this question may have deep policy implications, but our data can only offer suggestive evidence for Madagascar.

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99. Table 28 shows the results of a regression of pupils' French and mathematics performances on a series of variables of interest. It shows the effects of having a female teacher on all pupils' test performance, as well as on boys and girls taken separately. The teachers' tests scores are also of special interest. A number of school-level variables such as the share of female teachers or whether the school is headed by a woman are also examined.

100. The first three columns show achievement in French, whereas the last three are concerned with the mathematics test scores. The first regression was pooled for all pupils. The sample was then split between boys and girls and the same model was run on each single-sex sample. The teacher is the pupil's teacher for the specific subject. Also we consider teacher's scores on both subject.

101. Looking into French scores, column 1 shows that pupils' French score are higher by a significant 0.23 standard deviation when their teacher is female. The effect is even large for girls 0.26SD than for boys 0.2SD. The teacher's performance on both French and mathematics had a strong positive effect on pupils' French scores. Teacher's French score had the highest impact on pupils' score with a 0.17SD effect. Teacher's mathematics score had a small but positive effect on pupils' French score although the single-sex regressions show that this impact appeared only for girls, meaning the better the teacher performed, the better the girls' French score but not boys'.

102. The results for pupils' performances in mathematics are fairly similar to those in French. However, there are a few noticeable differences. For instance, a teacher's mathematics performance had no impact on boys' French or mathematics scores. Female teachers did not impact pupils' performance in mathematics irrespective of their gender. It is surprising to note that FRAM teachers had a positive impact on pupils' mathematics score especially boys. Finally pupils in public schools, rural schools performed worse across the board. Older children, probably repeaters, also performed less well on the French test.

Table 28. Determinants of pupils' performance (standard deviations)

	French			*Mathematics*		
	All	**Boys**	**Girls**	**All**	**Boys**	**Girls**
	(1)	(2)	(3)	(4)	(5)	(6)
Pupil's characteristics						
Pupil is girl	0.0478			0.0461		
	(0.0620)			(0.0557)		
Pupil's age	-0.0505***	-0.0535**	-0.0515***	-0.00270	-0.00927	0.00181
	(0.0112)	(0.0156)	(0.00911)	(0.0260)	(0.0288)	(0.0271)
Pupil had breakfast	0.0108	0.108	-0.0690	-0.0601	0.0331	-0.129
	(0.150)	(0.145)	(0.163)	(0.130)	(0.157)	(0.131)
Subject Teacher's characteristics						
Female	0.235**	0.201**	0.265**	0.0688	0.104	0.0290
	(0.0675)	(0.0744)	(0.0837)	(0.0674)	(0.0838)	(0.0882)
Age	0.00288	0.00160	0.00351	0.00312**	0.00185	0.00411
	(0.00214)	(0.00333)	(0.00209)	(0.00117)	(0.00156)	(0.00226)
FRAM teacher	-0.0167	0.0807	-0.100	0.199**	0.250**	0.165
	(0.0822)	(0.0802)	(0.0854)	(0.0644)	(0.0963)	(0.101)
French score	0.168***	0.165***	0.175***	0.122***	0.110***	0.132**
	(0.0266)	(0.0311)	(0.0308)	(0.0277)	(0.0152)	(0.0400)
Mathematics score	0.0442***	0.0247	0.0586***	0.0870*	0.0822	0.0890**
	(0.00893)	(0.0163)	(0.0117)	(0.0388)	(0.0535)	(0.0299)
School characteristics						
Head is female	-0.0100	0.0197	-0.0426	-0.0795	-0.0882	-0.0771
	(0.0745)	(0.0741)	(0.0786)	(0.0652)	(0.0524)	(0.0957)
% Female teachers	-0.000705	-0.0590	0.0837	0.114	-0.00293	0.258
	(0.173)	(0.138)	(0.223)	(0.121)	(0.126)	(0.163)
Public	-0.523***	-0.543***	-0.489***	-0.598***	-0.562***	-0.628***
	(0.0555)	(0.0421)	(0.0841)	(0.0450)	(0.0754)	(0.0341)
Rural	-0.505**	-0.504**	-0.491**	-0.194*	-0.265*	-0.111
	(0.137)	(0.144)	(0.130)	(0.0863)	(0.131)	(0.0848)
Fianarantsoa	0.554***	0.655***	0.458***	0.119**	0.212**	0.0261
	(0.0625)	(0.0523)	(0.0733)	(0.0386)	(0.0589)	(0.0333)
Toamasina	0.493***	0.469***	0.521***	0.170***	0.167***	0.174***
	(0.0328)	(0.0134)	(0.0506)	(0.0228)	(0.0217)	(0.0222)
Mahajanga	0.0509	0.0316	0.0585	-0.103**	-0.154**	-0.0707**
	(0.0461)	(0.0253)	(0.0643)	(0.0291)	(0.0454)	(0.0272)
Toliary	0.439***	0.647***	0.307**	0.0608	0.294***	-0.104
	(0.0576)	(0.0407)	(0.0772)	(0.0554)	(0.0640)	(0.0516)
Antsiranana	0.301***	0.254***	0.343***	0.199***	0.175***	0.212***
	(0.0303)	(0.0244)	(0.0511)	(0.0185)	(0.0303)	(0.0321)
Constant	0.688**	0.639**	0.801**	0.309	0.386	0.266

	French			*Mathematics*		
	All	**Boys**	**Girls**	**All**	**Boys**	**Girls**
	(1)	(2)	(3)	(4)	(5)	(6)
	(0.212)	(0.216)	(0.212)	(0.179)	(0.293)	(0.145)
Observations	3,769	1,825	1,944	3,769	1,825	1,944
R-squared	0.370	0.338	0.417	0.166	0.151	0.194

Note: Robust standard errors in parentheses. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.1. Regressions control for other pupil's and teacher's characteristics, as well.

VI. SDI Comparative Analysis

103. After the SDI pilot in Senegal and Tanzania was carried out in 2010, the SDI was revised and rolled out in a number of countries such as Kenya and Uganda (2013), Nigeria, Togo, Mozambique, and Tanzania (2014). In 2016 Niger and Madagascar carried out their first SDI. Apart from the pilot surveys, all the SDI surveys are fully comparable despite the local customization of the instruments. After 6 years of implementation and having gone through multiple local technical consultations the SDI instruments appear to be fairly stabilized. Teachers and pupils were assessed with the exact same questions apart from minor changes, especially for names to "localize" the survey instruments. The same questions were also asked to heads of schools. Finally, during the analysis, the indicators were computed with the same program maximizing the comparability of all SDI countries.

104. Table 29 shows the national averages of the indicators for several SDI countries. Bearing in mind that overall performance is low, Madagascar still fares not very well among the SDI countries in terms of inputs, effort, and knowledge. For traditional quality indicators, such as infrastructure, Madagascar had the second to worst score with only 20 percent of its schools meeting the minimum infrastructure requirement compared to 59 percent for Kenya, 53 percent for Uganda. Only Nigeria schools seem more dilapidated with 18 percent of them having minimum infrastructure. In terms of minimum equipment such as pencils and blackboards, Madagascar is faring better than Tanzania, Nigeria, and Togo, but worse than Kenya, Mozambique, and Ugandan. It is in Madagascar that pupils are the least likely to have a textbook in their hands while in the classroom after Uganda. Only 10 percent of the pupils had a textbook in the observed classrooms compared to 25 percent in Tanzania, 68 percent in Mozambique or Togo, and 38 percent in Nigeria.

105. When it comes to teachers' effort, Madagascar is fairly different to most of the SDI countries. In Madagascar, 1 in 3 teacher is absent from school at any point in time, the second highest school absence rate after Mozambique (45 percent). However, unlike most of the SDI countries, once teachers are at school they go to their classroom. As a result classroom absence rate in Madagascar is at 38 percent and lower than for the average SDI country.

106. Malagasy primary school teachers' performed at the bottom along with their colleagues in Mozambique, Nigeria, and Togo. Madagascar has however the lowest share of teachers who scored above the 80 percent threshold for minimum knowledge. If only 0.1 percent of teachers in Madagascar were assessed as having the minimum knowledge, this number stood at 40 percent, 21 percent, and 20 percent for teachers in Kenya, Tanzania, and Uganda respectively. Despite facing all these challenges i.e. dilapidated schools and non-performing teachers, pupils in Madagascar managed to outperformed most of their peers.

Table 29. Comparison of SDI results across countries (public schools only)[16]

	Madagascar 2016	Tanzania 2014	Kenya 2012	Mozambique 2014	Nigeria* 2013	Senegal 2011	Tanzania 2011	Togo 2013	Uganda 2013
Teacher Ability									
Minimum knowledge (At least 80% in language and mathematics)	0.0	21.5	34.8	0.3	2.4	Not Comparable	Not Comparable	0.9	10.1
Test score (language, mathematics, and pedagogy)	32.1	48.3	55.6	26.9	30.5	Not Comparable	Not Comparable	33.9	43.3
Teacher Effort									
School absence rate	35.9	14.4	15.2	44.8	16.9	18.0	23.0	22.6	29.9
Classroom absence rate	42.2	46.7	47.3	56.2	22.8	29.0	53.0	39.3	56.9
Scheduled teaching time	*5h 03min*	*5h 56min*	*5h 31min*	*4h 17min*	*4h 44min*	*4h 36min*	*5h 12min*	*5h 28min*	*7h 13min*
Time spent teaching per day	2h 56min	2h 46min	2h 30min	1h 41 min	3h 10min	3h 15min	2h 04min	3h 15min	2h 56min
Availability of Inputs									
Observed pupil-teacher ratio	16.9	43.5	39.3	21.4	21.5	27.2	52.0	31.4	53.9
Share of pupils with textbooks	6.8	25.3	44.5	68.1	33.7	18.0	19.7	76.0	6.0
Minimum equipment availability (90% with pencils and notebooks)	65.1	61.4	74.3	76.8	48.2	Not Comparable	Not Comparable	24.3	79.5
Minimum infrastructure availability	16.0	36.0	60.2	29.1	13.4	Not Comparable	Not Comparable	14.4	57.2
Pupil Learning									
Test Score (out of 100) (language, mathematics)	46.6	40.1	69.4	20.8	25.1	Not Comparable	Not Comparable	38.1	45.3
Language test score	39.7	36.5	72.5	18.7	23.3	Not Comparable	Not Comparable	36.9	43.4
Mathematics test score	53.5	58.2	57.4	25.1	28.2	Not Comparable	Not Comparable	41.3	41.7

Note: (*) Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger.

[16] The information in Table 28 is a duplicate of Table 1 in the Executive Summary. It is shown here for ease of reference.

107. Table 30 provides information on the average scores of the different parts of the test, as well as more details. Among the six countries in the table, Madagascar has the lowest overall performance with teachers' overall score of 33 percent slightly below Togo at 35 percent. Madagascar's teachers ranked a distant last on language as shown in Table 30. The composition task proved to be the hardest for all teachers, but this was also the area where the gap between Madagascar's teachers and their peers was the largest in language test.

108. In mathematics, Malagasy teachers only outperformed Togolese and Nigerian teachers. They display striking weakness in the upper primary part of the test as interpreting data on a graph or comparing fractions. Only 20 percent of Malagasy primary school teachers could compare fractions vs. 81 percent and 91 percent in Tanzania and Kenya respectively. In pedagogy again Malagasy teachers managed to slightly outperformed teachers in Togo and Nigeria, and they performed at par with Ugandans. It is in the section of "evaluating pupils' progress" that Malagasy teachers struggled the most. However, they also had difficulties when required to prepare a lesson plan based on a basic text provided to them as well as in assessing the abilities of different pupils.

Table 30. Average teachers' knowledge scores across SDI countries

(Percent)	Madagascar	Tanzania	Kenya	Nigeria	Togo	Uganda
Overall score (language, mathematics, and pedagogy)	**33**	**48**	**58**	**38**	**35**	**45**
Language (average score)	***23***	***42***	***65***	***49***	***50***	***58***
Grammar task	53	73	93	64	74	90
Cloze task	26	53	69	38	30	62
Composition task	8	21	51	24	26	43
Mathematic (average score)	***45***	***63***	***81***	***42***	***33***	***65***
Adding double digit numbers	95	97	97	89	79	97
Subtracting double digits	81	86	88	70	65	83
Adding triple digit numbers	86	85	88	78	60	87
Multiplying two digit numbers	79	85	87	61	51	76
Adding decimals	45	64	77	34	36	61
Comparing fractions	20	81	91	58	15	77
Interpreting a Venn Diagram	35	49	73	36	22	72
Interpreting data on a graph	18	27	67	20	14	32
Subtraction of decimal numbers	44	66	82	45	18	68
One-variable algebra	13	50	72	15	9	55
Pedagogy (average score)	***24***	***36***	***35***	***18***	***19***	***25***
Preparing a lesson plan	34	58	39	20	27	31
Assessing pupil's abilities	18	18	33	23	33	25
Evaluating pupils' progress	9	22	29	6	6	11

Source: Various SDI reports and author's calculations.

Table 31. Comparison of Pupil Achievement in SDI Countries*

(Average score in percent)	Madagascar	Mozambique	Average SDI	Tanzania	Uganda	Togo	Nigeria**	Kenya
Pupil overall score	**51**	**21**	**50**	**50**	**49**	**46**	**32**	**72**
Language	**44**	**19**	**50**	**48**	**47**	**46**	**31**	**75**
Identify letters	72	38	79	76	86	78	58	96
Identify basic words	71	21	57	46	66	65	30	80
Read a sentence	41	13	47	45	53	26	26	82
Read a paragraph	10	7	19	24	10	17	12	33
Reading comprehension	18	5	16	0.8	0.8	18	16	45
Mathematics	**57**	**25**	**47**	**58**	**43**	**45**	**32**	**59**
Addition (1- digits)	89	48	77	78	83	77	57	92
Addition (2- digits)	71	18	60	60	56	65	36	84
Subtraction (1- digits)	81	28	70	73	76	65	50	87
Subtraction (2- digits)	37	5	34	38	27	22	22	62
Multiplication (1- digits)	30	4	29	37	24	11	22	51
Multiplication (2- digits)	17	0.1	6	12	2	6	4	8
Division (1- digits)	52	9	38	38	37	36	21	60
Division (2- digits)	24	3	19	21	13	12	12	36
Non-verbal reasoning	**56**	**44**	**55**	**54**	**57**	**54**	**50**	**58**
Number of Observations	3,960	1731	n/a	4041	3831	1518	6644	2953

Note: * Data was collected from all schools in the country, public and private; except in the cases of Mozambique and Tanzania where only public schools were surveyed. ** Results for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger. Weighted means using sampling weight and the sample design. Results for pupil performance based on observations from 1,731 sampled pupils from 200 schools.

VII. Conclusion: What does this mean for Madagascar?

109. To break out of the high and consistent poverty rates equilibrium it has been in for many years, Madagascar needs to set itself on a path of high, sustained, and shared economic growth. Building a well-educated labor force is critically important in that respect. The SDI showed that Malagasy teachers functioned in working environment, which was not conducive in terms of availability of infrastructure or learning material, even though they had small class sizes. There are however, a number of more serious challenges that need to be urgently addressed. No teacher performed at the level in French where they could be considered as having the minimum knowledge to be in a classroom and teach. High absenteeism with almost 40 percent of teachers not in the classroom. High absence of the management also with 38 percent of school directors absent from the school which also spurred teachers' absence. A teacher workforce with low level of training and a training that seems only slightly correlated with teacher's performance and therefore needs to be updated and strengthened.

110. The high absence rate and sub-optimal ability of teachers suggest room for improvement in the efficiency of spending on human development and reflect systemic problems. If not addressed, these service delivery failures uncovered by the SDI will hamper Madagascar's effort to build an educated workforce. The SDI also showed serious provincial inequalities, which will likely feed into greater income and welfare inequality in the future. This can hamper any shared growth agenda and undermine the effort to build a cohesive and prosperous Madagascar.

111. Improvements in service quality in Madagascar can be accelerated through focused investments on reforms to incentives given to teachers, and in the skills of providers to ensure that inputs and skills come together at the same time and in the same place. This will be critical to ensure that Madagascar's gains in human development outcomes continue beyond 2020.

112. Finally, this report is not and should not be viewed as a criticism of teachers, directors or pupils. In fact, it only provides a snapshot of Madagascar's education sector as a whole at a given point in time. This snapshot reflects management weaknesses, low level of salary and salary delays, and dilapidated teaching environment, amongst other systemic problems. Over time, as the impact of reforms is tracked through repeat surveys in the country, the indicators will allow for identifying reforms that have the most potential to improve the education system and should be deepened.

Annex A: Madagascar SDI Sampling Strategy

1. The overall objective of the SDI is to produce accurate and representative indicators at the national, urban, and rural levels. In some countries, like Madagascar, it may be required that the indicators be representative at a sub-national level (for example, region or province). The main units of analysis are schools as well as teachers. In the case of education, the SDI also aims to produce accurate information on standard four pupils' performance on language and mathematics.

2. The sampling strategy for the SDI in Madagascar was done by INSTAT the national statistics office.

A1. Sampling schools, teachers, and pupils

3. Now that the total sample size and its allocation across strata had been decided, the sampling of the actual schools that were included in the final sample and, within each school, the assessment of pupils and teachers remained. This was done using a two-stage sampling method. First, in each stratum schools were chosen within the selected councils. Once at a selected school, the enumerator selected teachers and pupils depending on the structure of the classrooms.

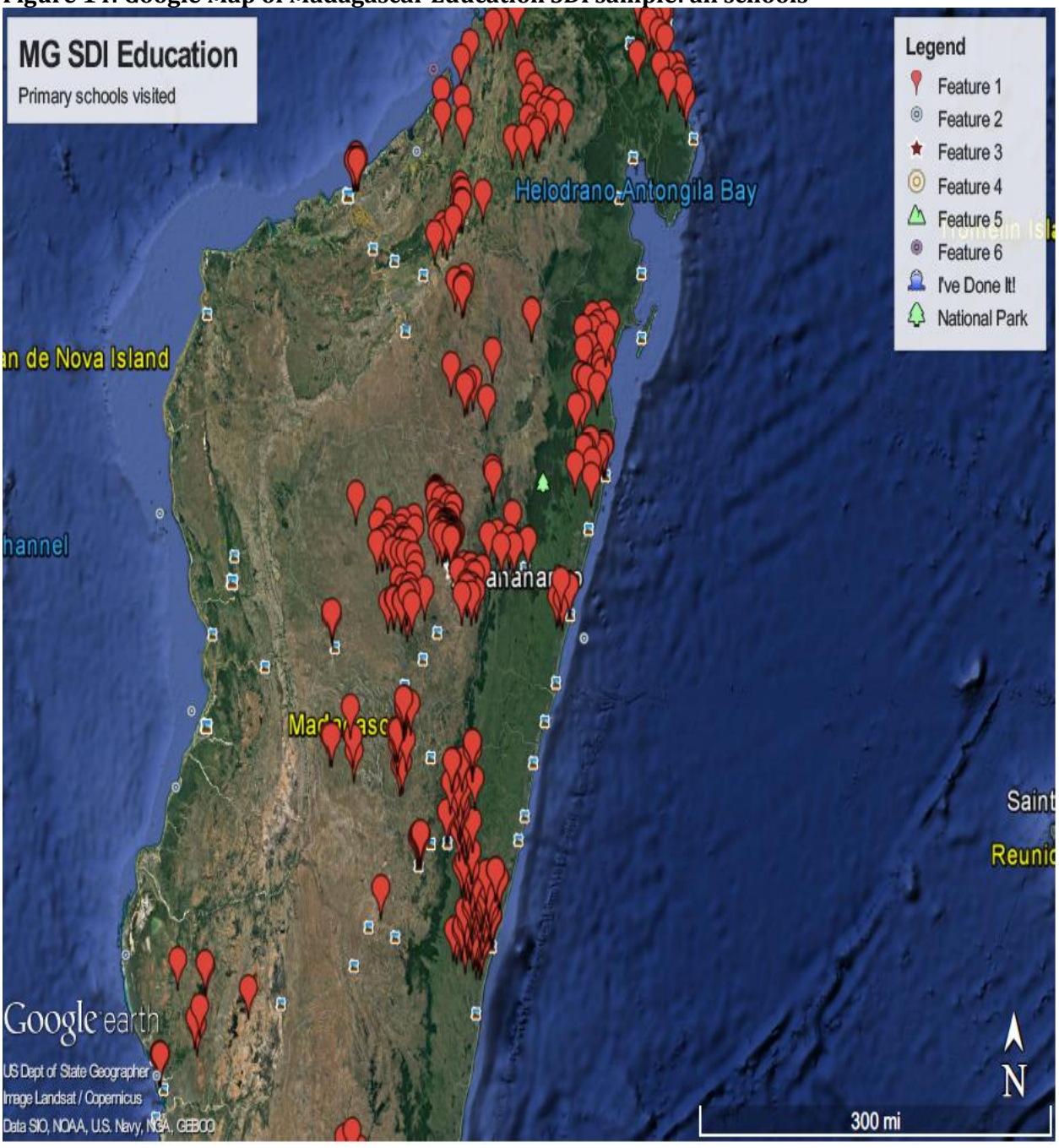
4. The schools were chosen using probability proportional to size (PPS), where size was the number of standard two pupils as provided by the 2014 EMIS database. As for the selection of the cluster, the use of PPS implied that each standard four pupil within a stratum had an equal probability for her school to be selected.

5. Finally, within each school, up to 10 standard four pupils and 10 teachers were selected. Pupils were randomly selected among the grade-four pupil body, whereas for teachers, there were two different procedures for measuring absence rate and assessing knowledge. For absence rate, 10 teachers were randomly selected from the teachers' roster and the whereabouts of those teachers was ascertained in a return surprise visit. For the knowledge assessment, however, all teachers who were currently teaching in primary four or taught primary three the previous school year were included in the sample. Then a random number of teachers in upper grades were included to top up the sample. These procedures implied that pupils across strata, as well as teachers across strata and within a school (for the knowledge assessment) did not all have the same probability of selection. It was, therefore, warranted to compute weights for reporting the survey results.

A2. Weights for schools, teachers, and pupils

6. To be representative of the population of interest, sample estimates from the 2014 Tanzania SDI had to be properly weighted, using a sampling weight, or expansion factor. Note that different weights needed to be applied depending on the relevant level for the variable, which could be the school, teacher, or pupil. The basic weight for each entity was equal to the inverse of its probability of selection, which was computed by multiplying the probabilities of selection at each sampling stage. All the weights were computed and included in the dataset.

Figure 14: Google Map of Madagascar Education SDI sample: all schools



Annex B: Definition of Indicators

School absence rate	
Share of a maximum of 10 randomly selected teachers absent from school during an unannounced visit	This indicator is measured as the share of teachers who are absent from school at the time of an unannounced visit. It is measured in the following way: During the first announced visit, a maximum of 10 teachers are randomly selected from the list of all teachers (excludes volunteer and part time teachers) who are on the school roster. The whereabouts of these 10 teachers are then verified in the second, unannounced, visit. Teachers found anywhere on the school premises are marked as present.
Classroom absence rate	
Share of teachers who are present in the classroom during scheduled teaching hours as observed during an unannounced visit	The indicator is measured as the share of teachers not in the classroom at the time of an unannounced visit. The indicator is constructed in the same way as school absence rate indicator, with the exception that the numerator now is the number of teachers who are either absent from school, or present at school but absent from the classroom.
Time spent teaching per day	
Amount of time a teacher spends teaching during a school day	This indicator reflects the typical time that teachers spends teaching on an average day. It combines data from the staff roster module (used to measure absence rate), the classroom observation module, and reported teaching hours. The teaching time is adjusted for the time teachers are absent from the classroom, on average, and for the time the teacher teaches while in classrooms based on classroom observations. While inside the classroom distinction is made between teaching and non-teaching activities. Teaching is defined very broadly, including actively interacting with students, correcting or grading students' work, asking questions, testing, using the blackboard, or having students working on a specific task, drilling or memorization. Non-teaching activities includes working on private matters, maintaining discipline in class, or doing nothing, and thus leaving students not paying attention.
Minimum knowledge	
Share of teachers with minimum knowledge	This indicator is measured as the percentage of teachers who can master the curriculum they taught. It is based on a mathematics and language tests covering the primary curriculum administered at the school and is calculated as the percentage of teacher who score more than 80 percent on the language and mathematics portion of the test. The test is given to all mathematics or language teachers who taught third grade last year or fourth grade in the year the survey was conducted.
Test score	It is measured as the overall score of mathematics, language, and pedagogy tests covering the primary curriculum administered at the school level to all mathematics and language teachers who taught third grade last year or fourth grade in the year the survey was conducted.

Minimum infrastructure availability	
Unweighted average of the proportion of schools with the following available: functioning electricity and sanitation	It is a binary indicator capturing availability of (a) functioning toilets and (b) classroom visibility. Functioning toilets is defined as whether toilets were functioning, accessible, clean, and private (enclosed and with gender separation) as verified by an enumerator. To verify classroom visibility we randomly select one fourth grade classroom in which the enumerator places a printout on the board and checks whether it was possible to read the printout from the back of the classroom
Minimum equipment availability	
Unweighted average of the proportion of schools with the following available: functioning blackboard with chalk, pens or pencils, and notebooks or paper	It is a binary indicator capturing availability of (a) functioning blackboard and chalk and (b) pens, pencils, and exercise books in fourth grade classrooms. In one randomly selected fourth grade classroom in the school the enumerator assessed if there was a functioning blackboard by looking at whether text written on the blackboard could be read at the front and back of the classroom, and whether there was chalk available to write on the blackboard. We considered that the classroom met the minimum requirement of pens, pencils, and exercise books if both the share of students with pen or pencils and the share of students with exercise books are above 90%.
Share of pupils with textbooks	
Number of mathematics and language books used in a grade four classroom divided by the number of pupils present in the classroom	The indicator reflect the typical ratio in student to textbooks in the fourth grade classroom. It is measured as the number of students with the relevant textbooks (mathematics or language conditional on which a randomly selected class is observed) in one randomly selected fourth grade class and divided by the number of students in that classroom.
Observed pupil-teacher ratio	
Average number of grade four pupils per grade four teacher	This indicator reflects the typical ratio in pupils to teachers in the fourth grade classroom. It is measured as the number of students in one randomly selected fourth grade class at the school.

Annex C: Additional Results

Table C 1. School Inputs

	Madagascar	Urban	Rural	Urban Public	Rural Public	Private	Public
Pupils per teacher (units)	**36.6**	**31.9**	**37.2**	**38.5**	**38.3**	**31.4**	**38.3**
Observed pupil-teacher ratio	**17.5**	**23.0**	**16.9**	**27.2**	**16.2**	**19.9**	**16.7**
Share of pupils with pencils	92.6	93.1	92.5	86.8	92.3	94.4	92.0
Share of pupils with paper	97.4	98.0	97.4	97.6	97.3	97.8	97.3
Have a board (% of classrooms)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Have chalk (% of classrooms)	99.8	98.5	100.0	100.0	100.0	99.3	100.0
Sufficient contrast to read board (% of classrooms)	77.8	83.7	77.0	88.7	77.7	76.2	78.3
Minimum equipment availability (% of classrooms)	**64.6**	**66.6**	**64.3**	**52.3**	**65.2**	**64.6**	**64.5**
Share of pupils with textbooks	**10.3**	**20.1**	**9.1**	**7.0**	**6.8**	**21.1**	**6.8**
Functioning toilet (% of schools)	40.9	57.4	38.9	33.1	32.9	65.7	32.9
Has toilet (% of schools)	69.8	89.2	67.4	77.7	61.8	91.9	62.6
Toilet clean (% of schools)	49.4	67.3	47.2	49.5	42.7	69.1	43.0
Toilet private (% of schools)	61.6	79.7	59.5	69.7	52.6	86.8	53.5
Toilet accessible (% of schools)	63.5	84.1	61.0	65.1	54.2	90.7	54.7
Visibility judged by enumerator (% of classrooms)	72.7	77.9	72.1	87.0	75.2	63.0	75.8
Minimum infrastructure availability (% of schools)	**20.2**	**37.1**	**18.0**	**21.9**	**15.6**	**32.9**	**15.9**

Table C 2. Official teaching time, loss of teaching time, and time spent teaching per day

	Scheduled teaching time (in minutes)				Share of time devoted to teaching activities				Time spent teaching per day (in minutes)			
	Average time	Robust Std. Err.	[95% Conf. Inter.]		Percent	Robust Std. Err.	[95% Conf. Inter.]		Average time	Robust Std. Err.	[95% Conf. Inter.]	
Madagascar	311.7	6.3	295.6	327.8	95.9	99.6	96.9	94.9	189.6	23.3	129.7	249.5
Urban	320.8	6.7	303.5	338.1	95.3	99.2	97.4	93.1	225.6	25.7	159.7	291.6
Rural	310.6	6.6	293.6	327.6	96.0	99.6	97.0	94.9	185.1	23.5	124.7	245.6
Urban Public	298.1	4.8	285.7	310.6	97.0	99.7	97.9	96.1	157.3	41.7	50.1	264.5
Rural Public	303.1	7.0	285.0	321.1	96.3	99.5	97.5	95.1	177.0	27.6	106.0	248.0
Private	338.4	5.0	325.5	351.3	94.5	99.3	96.3	92.7	230.3	10.6	203.0	257.6
Public	302.8	6.9	285.2	320.4	96.4	99.6	97.5	95.2	175.9	28.4	102.9	249.0

Source: Madagascar SDI 2016 and author's calculations

.

Figure C 1. Orphan classrooms

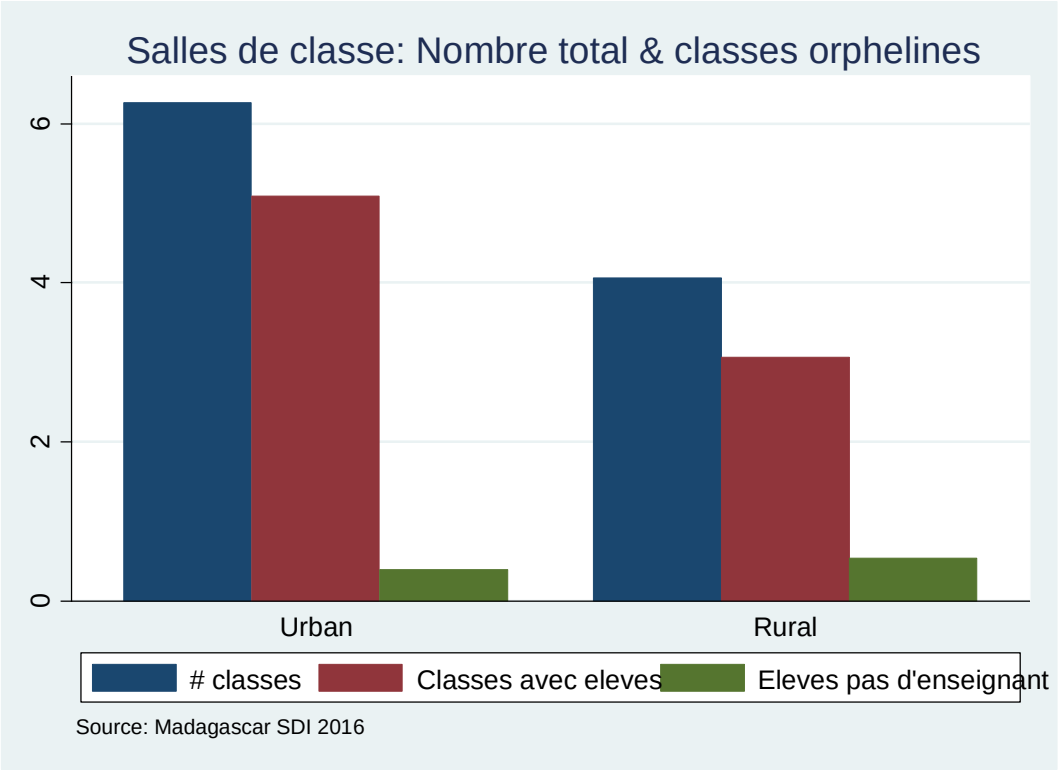


Table C 3. Teachers' mathematics assessment scores

(Percent)	Madagaascar	Urban	Rural	Urban Public	Rural Public	Public	Private
Mathematics (complete test)	45.0	46.9	44.6	45.0	43.5	49.7	43.7
Lower Primary	52.6	54.0	52.3	52.0	51.4	56.7	51.5
Upper Primary	30.7	33.7	30.1	31.8	28.8	36.6	29.1
Adding double digit numbers	95.1	92.5	95.7	88.9	95.4	96.9	94.6
Subtracting double digit numbers	80.6	79.1	80.9	74.9	80.9	81.8	80.2
Adding triple digit numbers	86.0	84.8	86.2	82.2	85.9	87.8	85.5
Dividing double by single	64.9	67.6	64.3	66.0	64.6	65.2	64.8
Multiplying two digit numbers	79.0	79.7	78.9	77.4	79.0	79.7	78.8
Adding decimals	44.7	50.9	43.4	50.4	42.8	48.3	43.7
Division two-digit numbers - conceptual understanding	64.7	68.2	63.9	66.9	63.0	69.0	63.5
Comparing fractions different denominators	19.6	23.3	18.9	23.9	17.6	24.4	18.3
Monetary units - multiplication	36.4	35.8	36.6	31.8	35.0	42.8	34.7
Geometry - 2D shapes	71.9	75.4	71.2	71.9	69.5	79.7	69.8
Geometry - types of lines	55.3	63.2	53.6	60.0	52.2	63.1	53.1
Time (reading a clock) - problem solving	29.0	38.2	27.1	33.1	25.7	37.5	26.6
Interpreting data on a Venn diagram	35.2	40.2	34.2	39.0	33.1	40.5	33.8
Interpreting data on a graph	18.4	22.5	17.5	21.0	16.3	23.8	16.9
Square root (no remainder)	41.6	40.0	41.9	38.9	39.1	50.5	39.1
Subtraction of numbers with decimals	44.2	39.2	45.3	40.3	42.9	50.2	42.6
Division of fractions	21.1	18.2	21.7	17.1	20.6	24.3	20.2
One variable algebra	13.3	12.0	13.6	7.3	12.3	19.1	11.7
Geometry - computing perimeter of a rectangle	32.2	32.9	32.1	31.7	30.1	39.1	30.3
Geometry - computing area of a rectangle	28.6	29.1	28.5	27.7	27.7	31.8	27.7

Source: Madagascar SDI 2016 and author's calculations.

Table C 4. Pupils' test scores – Language

(Percent)	Madagascar	Urban	Rural	Urban Public	Rural Public	Private	Public	Boy	Girl	No breakfast	Breakfast
Average Scores											
French and mathematics	50.6	68.1	47.8	55.4	45.8	61.1	46.6	49.1	52.1	48.3	50.7
French	44.5	71.2	40.1	56.7	38.1	57.0	39.7	42.5	46.4	41.8	44.6
Non-verbal reasoning	55.9	65.6	54.3	59.4	53.5	60.8	54.0	56.6	55.3	54.6	56.0
Can read a letter	72.3	91.7	69.2	84.8	68.6	78.5	70.0	70.6	74.1	73.3	72.3
Can read a word	70.7	88.8	67.8	80.1	66.6	78.4	67.8	68.9	72.4	69.0	70.8
Has basic vocabulary	26.3	53.3	21.8	33.1	19.6	40.8	20.7	28.1	24.6	20.5	26.5
Can read a sentence	40.6	70.4	35.7	52.7	33.6	54.7	35.2	39.1	42.0	38.6	40.7
Can read a paragraph	10.2	40.3	5.3	15.1	3.2	26.0	4.2	9.1	11.2	11.0	10.2
Comprehension score	17.5	36.3	14.4	21.2	13.1	27.1	13.8	15.1	19.7	19.4	17.4
Comprehension (factual)	16.9	39.9	13.1	20.1	11.0	30.2	11.8	15.0	18.7	20.9	16.7
Comprehension (analytic)	18.7	29.0	17.0	23.5	17.4	20.9	17.9	15.5	21.7	16.3	18.8
Words read per minute	16.9	35.5	13.9	21.7	12.4	26.5	13.2	15.0	18.7	15.9	17.0

Table C 5. Pupils' test scores – Mathematics

(Percent)	Madagascar	Urban	Rural	Urban Public	Rural Public	Private	Public	Boy	Girl	No breakfast	Breakfast
Average Scores											
French and mathematics	50.6	68.1	47.8	55.4	45.8	61.1	46.6	49.1	52.1	48.3	50.7
Mathematics	56.8	64.9	55.4	54.2	53.4	65.2	53.5	55.8	57.7	54.8	56.8
Non-verbal reasoning	55.9	65.6	54.3	59.4	53.5	60.8	54.0	56.6	55.3	54.6	56.0
Number recognition	95.9	96.5	95.8	97.5	95.2	97.3	95.4	95.7	96.1	93.9	96.0
Ordering numbers	59.9	75.4	57.4	65.9	55.9	68.2	56.7	59.2	60.5	56.4	60.1
Addition (one-digit)	89.0	95.2	88.0	93.4	88.1	90.3	88.5	88.5	89.5	85.0	89.2
Addition (two-digit)	70.9	76.1	70.0	64.6	68.4	78.1	68.1	69.6	72.1	64.9	71.2
Addition (three-digit)	72.7	78.7	71.7	64.5	69.4	82.5	69.0	71.4	74.0	68.1	72.9
Subtraction (one-digit)	80.9	86.7	80.0	82.4	79.3	84.5	79.6	77.8	83.9	77.5	81.1
Subtraction (two-digit)	36.8	50.9	34.5	33.7	30.7	52.0	31.0	34.8	38.7	41.8	36.6
Multiplication (one-digit)	30.1	39.6	28.6	21.3	26.9	39.6	26.5	27.9	32.2	32.0	30.0
Multiplication (two-digit)	17.1	30.7	14.9	11.1	11.1	32.9	11.1	15.6	18.6	16.9	17.1
Multiplication (three-digit)	14.4	26.1	12.5	8.0	8.7	29.3	8.7	13.1	15.6	14.5	14.4
Division (one-digit)	52.3	69.0	49.5	47.3	45.6	69.2	45.8	51.8	52.8	48.3	52.5
Division (two-digit)	23.9	40.3	21.2	19.4	17.3	40.6	17.4	24.4	23.4	20.5	24.0
Division (analytical)	15.5	16.0	15.4	8.7	14.6	19.1	14.1	15.0	15.9	14.2	15.5
Multiplication (prb. solv.)	11.2	15.5	10.5	3.5	9.2	17.6	8.7	10.2	12.1	11.4	11.2
Complete sequence	9.8	15.0	8.9	7.7	8.3	13.9	8.2	10.3	9.3	15.3	9.5

Table C 6. Correlations between the SDI and test scores – French

	School absence rate	Classroom absence rate	Time spent teaching per day	Teacher test score (French)	Teacher test score (Maths)	Teacher test score (Pedagogy)	Minimum equipment availability	Minimum infrastructure availability	Observed pupil-teacher ratio	Share of pupils with textbooks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A – All Schools										
Coef.	-0.135**	-0.107*	0.143**	0.286***	0.0611	0.140**	0.00426	0.163**	-0.0590	0.180**
Std. Err	(0.0405)	(0.0467)	(0.0458)	(0.0624)	(0.0421)	(0.0450)	(0.0413)	(0.0483)	(0.0963)	(0.0516)
Observations	465	465	459	472	472	472	473	473	473	472
Adj. R-square	0.104	0.096	0.102	0.168	0.091	0.103	0.088	0.109	0.091	0.113
Panel B – Urban Schools										
Coef.	-0.268***	-0.211**	0.166	0.264**	0.127*	0.0157	0.142	0.158	-0.210**	0.171**
Std. Err	(0.0637)	(0.0743)	(0.101)	(0.0942)	(0.0630)	(0.118)	(0.125)	(0.0963)	(0.0566)	(0.0466)
Observations	154	153	153	154	154	154	154	154	154	154
Adj. R-square	0.127	0.200	0.174	0.129	0.208	0.148	0.128	0.156	0.165	0.185
Panel C- Rural Schools										
Coef.	-0.0809	-0.0509	0.0862*	0.181***	0.0478	0.115*	-0.0266	0.0708	-0.00717	0.105*
Std. Err	(0.0513)	(0.0430)	(0.0388)	(0.0445)	(0.0418)	(0.0462)	(0.0551)	(0.0513)	(0.107)	(0.0468)
Observations	311	312	312	318	318	318	318	319	319	318
Adj. R-square	0.141	0.146	0.140	0.140	0.176	0.143	0.153	0.142	0.145	0.149

Note: Each cell represent a regression where test score is regressed on the indicator noted in the column and a constant. The regression uses sampling weights. Panel A is all schools. Panel B is public schools, controlling for rural-urban location. Weighted robust standard errors in parenthesis. Time spent teaching is measured in minutes. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table C 7. Correlations between the SDI and test scores – Mathematics

	School absence rate	Classroom absence rate	Time spent teaching per day	Teacher test score (French)	Teacher test score (Maths)	Teacher test score (Pedagogy)	Minimum equipment availability	Minimum infrastructure availability	Observed pupil-teacher ratio	Share of pupils with textbooks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A – All Schools										
Coef.	-0.0898	-0.113	0.122	0.152	0.143*	0.113*	-0.0732*	0.129***	-0.0501	0.141*
Std. Err	(0.0555)	(0.0702)	(0.0788)	(0.0801)	(0.0619)	(0.0510)	(0.0332)	(0.0163)	(0.102)	(0.0583)
Observations	473	465	465	472	472	472	472	473	473	472
Adj. R-square	0.063	0.066	0.071	0.063	0.079	0.077	0.067	0.068	0.076	0.073
Panel B – Urban Schools										
Coef.	-0.368***	-0.324**	0.257	0.124	0.210**	-0.00514	0.115	0.0926	-0.223*	0.235***
Std. Err	(0.0816)	(0.0910)	(0.139)	(0.0926)	(0.0764)	(0.0793)	(0.0777)	(0.0558)	(0.0981)	(0.0336)
Observations	154	153	153	154	154	154	154	154	154	154
Adj. R-square	0.135	0.221	0.203	0.136	0.146	0.171	0.135	0.147	0.180	0.206
Panel C- Rural Schools										
Coef.	-0.0410	-0.0681	0.0758	0.0840	0.131*	0.102	-0.103**	0.0767**	-0.00821	0.0737
Std. Err	(0.0557)	(0.0707)	(0.0733)	(0.0813)	(0.0596)	(0.0663)	(0.0350)	(0.0289)	(0.116)	(0.0595)
Observations	319	312	312	318	318	318	318	319	319	318
Adj. R-square	0.066	0.062	0.066	0.063	0.067	0.078	0.069	0.078	0.071	0.064

Note: Each cell represent a regression where test score is regressed on the indicator noted in the column and a constant. The regression uses sampling weights. Panel A is all schools. Panel B is public schools, controlling for rural-urban location. Weighted robust standard errors in parenthesis. Time spent teaching is measured in minutes. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table C 8. Correlations between the SDI and test scores – Overall score

	School absence rate	Classroom absence rate	Time spent teaching per day	Teacher test score (French)	Teacher test score (Maths)	Teacher test score (Pedagogy)	Minimum equipment availability	Minimum infrastructure availability	Observed pupil-teacher ratio	Share of pupils with textbooks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A – All Schools										
Coef.	-0.127**	-0.117*	0.146*	0.256**	0.0969*	0.140**	-0.0250	0.162***	-0.0599	0.178**
Std. Err	(0.0415)	(0.0548)	(0.0572)	(0.0704)	(0.0413)	(0.0473)	(0.0358)	(0.0340)	(0.0905)	(0.0575)
Observations	465	465	459	472	472	472	473	473	473	472
Adj. R-square	0.091	0.087	0.089	0.143	0.085	0.092	0.078	0.100	0.081	0.102
Panel B – Urban Schools										
Coef.	-0.326***	-0.269**	0.213	0.230*	0.168*	0.00887	0.142	0.144	-0.230**	0.208***
Std. Err	(0.0697)	(0.0816)	(0.120)	(0.0931)	(0.0670)	(0.110)	(0.114)	(0.0873)	(0.0698)	(0.0436)
Observations	153	153	151	154	154	154	154	154	154	154
Adj. R-square	0.229	0.202	0.188	0.192	0.171	0.141	0.165	0.167	0.202	0.212
Panel C- Rural Schools										
Coef.	-0.0716	-0.0612	0.0885*	0.157**	0.0829*	0.119*	-0.0579	0.0782	-0.00809	0.101
Std. Err	(0.0432)	(0.0483)	(0.0419)	(0.0591)	(0.0340)	(0.0552)	(0.0462)	(0.0391)	(0.0984)	(0.0545)
Observations	312	312	308	318	318	318	319	319	319	318
Adj. R-square	0.116	0.114	0.115	0.142	0.122	0.127	0.120	0.121	0.116	0.122

Note: Each cell represent a regression where test score is regressed on the indicator noted in the column and a constant. The regression uses sampling weights. Panel A is all schools. Panel B is public schools, controlling for rural-urban location. Weighted robust standard errors in parenthesis. Time spent teaching is measured in minutes. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table C 9. Teaching practices by gender

	Male Teacher				Female Teacher			
	Percent	Std. Err.	[95% Conf. Interval]		Percent	Std. Err.	[95% Conf. Interval]	
Teacher used textbook	74.0	3.0	68.1	79.9	71.8	2.9	66.1	77.5
Teacher wrote on blackboard	99.9	0.3	99.3	100.4	98.2	0.9	96.5	99.9
Pupils wrote on blackboard	66.2	3.2	59.8	72.6	66.6	3.0	60.6	72.6
Teacher visited pupils	**43.4**	**3.4**	**36.8**	**50.1**	**62.3**	**3.1**	**56.1**	**68.5**
Called pupils by name	78.0	2.8	72.4	83.5	85.7	2.3	81.3	90.2
Teacher was smiling/joking	50.1	3.4	43.3	56.8	41.7	3.2	35.4	47.9
Teacher was hitting/scolding	2.0	0.9	0.1	3.8	3.5	1.2	1.2	5.8
Asked to apply new info.	44.6	3.4	38.0	51.3	39.4	3.2	33.2	45.7
Tested creativity	27.1	3.0	21.1	33.1	19.9	2.6	14.8	25.0
Gave positive feedback	40.7	3.4	34.1	47.3	42.4	3.2	36.1	48.7
Gave corrective feedback	51.4	3.4	44.7	58.1	49.2	3.2	42.8	55.5
Introduced lesson	83.2	2.6	78.1	88.2	77.1	2.7	71.8	82.4
Summarized lesson	**39.1**	**3.3**	**32.5**	**45.7**	**27.2**	**2.9**	**21.5**	**32.8**
Assigned homework	5.0	1.5	2.1	7.9	4.0	1.3	1.5	6.5
Reviewed homework	2.3	1.0	0.3	4.4	4.4	1.3	1.8	7.0
Used local language	98.8	0.8	97.3	100.2	95.4	1.4	92.7	98.0

Source: Author's calculations using 2016 Madagascar SDI data.

Table 32: Correlates of teachers' French and mathematics performance

VARIABLES	(1) French	(2) French	(3) French	(4) French	(5) French	(6) French	(7) Maths	(8) Maths	(9) Maths	(10) Maths	(11) Maths	(12) Maths
Terminale	0.128***	0.179***	0.129***	0.0975***	0.102***	0.100***	0.281***	0.295***	0.266***	0.251***	0.251***	0.256***
	(0.0368)	(0.0353)	(0.0349)	(0.0342)	(0.0341)	(0.0344)	(0.0384)	(0.0384)	(0.0386)	(0.0374)	(0.0374)	(0.0376)
Baccalauréat	0.664***	0.719***	0.493***	0.368***	0.365***	0.355***	0.608***	0.636***	0.567***	0.459***	0.459***	0.460***
	(0.0355)	(0.0346)	(0.0345)	(0.0342)	(0.0341)	(0.0345)	(0.0371)	(0.0376)	(0.0382)	(0.0374)	(0.0374)	(0.0377)
Post Bac	1.148***	1.101***	0.838***	0.700***	0.709***	0.680***	0.610***	0.606***	0.547***	0.441***	0.440***	0.426***
	(0.0507)	(0.0487)	(0.0498)	(0.0486)	(0.0485)	(0.0490)	(0.0529)	(0.0529)	(0.0551)	(0.0532)	(0.0532)	(0.0536)
Enseignante		0.352***	0.188***	0.0949***	0.0774**	0.0606**		0.0361	0.0152	-0.0624*	-0.0618*	-0.088***
		(0.0299)	(0.0309)	(0.0301)	(0.0302)	(0.0305)		(0.0325)	(0.0342)	(0.0329)	(0.0332)	(0.0334)
Ecole publique			-0.171***	-0.094***	-0.0782**	-0.0601*			-0.132***	-0.0678**	-0.0672**	-0.0614*
			(0.0306)	(0.0305)	(0.0306)	(0.0313)			(0.0339)	(0.0334)	(0.0336)	(0.0342)
Ecole rurale			-0.512***	-0.563***	-0.539***	-0.516***			-0.0163	-0.0731**	-0.0756**	-0.0341
			(0.0310)	(0.0300)	(0.0304)	(0.0313)			(0.0343)	(0.0329)	(0.0333)	(0.0342)
Fianarantsoa				-0.338***	-0.272***	-0.289***				-0.102**	-0.107**	-0.163***
				(0.0395)	(0.0413)	(0.0420)				(0.0432)	(0.0454)	(0.0460)
Toamasina				-0.116***	-0.101**	-0.167***				-0.173***	-0.170***	-0.267***
				(0.0430)	(0.0433)	(0.0453)				(0.0471)	(0.0475)	(0.0496)
Mahajanga				-0.600***	-0.555***	-0.552***				-0.907***	-0.911***	-0.955***
				(0.0434)	(0.0446)	(0.0452)				(0.0475)	(0.0489)	(0.0494)
Toliary				-0.614***	-0.554***	-0.600***				-0.500***	-0.503***	-0.551***
				(0.0450)	(0.0463)	(0.0477)				(0.0493)	(0.0508)	(0.0522)
Antsiranana				-0.650***	-0.596***	-0.545***				-0.597***	-0.599***	-0.621***
				(0.0509)	(0.0517)	(0.0529)				(0.0557)	(0.0568)	(0.0579)
Equipement					0.0265	-0.00540					-0.0149	-0.0187
					(0.0295)	(0.0301)					(0.0324)	(0.0329)
Infrastructure					0.130***	0.124***					-0.0101	-0.0143
					(0.0319)	(0.0324)					(0.0351)	(0.0354)
No book in classroom					-0.116***	-0.0757*					-0.0173	-0.0325
					(0.0395)	(0.0408)					(0.0434)	(0.0446)
Introduced lesson						-0.00286						-0.006***
						(0.00176)						(0.0019)
Summarized lesson						0.00184						0.00878
						(0.0050)						(0.0055)
Assigned homework						-0.00028						-0.00430
						(0.0027)						(0.0029)

Reviewed homework						-5.50e-07						0.0082***
						(0.0011)						(0.0012)
Used local language						-0.256***						-0.0850
						(0.0489)						(0.0535)
Pupils sent to board						-0.00511						0.0979***
						(0.0279)						(0.0306)
Teacher used textbook						0.119***						0.0278
						(0.0314)						(0.0343)
age		0.0170***						0.0065***				
		(0.0012)						(0.0012)				
Constant	-0.308***	-1.205***	0.0434	0.447***	0.442***	0.586***	-0.277***	-0.551***	-0.175***	0.198***	0.229***	0.268***
	(0.0218)	(0.0521)	(0.0436)	(0.0485)	(0.0636)	(0.0807)	(0.0228)	(0.0566)	(0.0483)	(0.0531)	(0.0698)	(0.0883)
Observations	4,260	4,260	4,260	4,260	4,260	4,128	4,260	4,260	4,260	4,260	4,260	4,128
R-squared	0.147	0.217	0.246	0.307	0.312	0.319	0.071	0.077	0.075	0.170	0.170	0.192

Teachers' performance regressions

Table C 10. Regression results by specific classroom teaching practices

	HM-TF	HF-TMes	HF-TF	% female teachers	# Obs.	R-squared
Number of pupils in classroom	6.556***	2.500	-0.631	11.36**	473	0.131
% of girls in classroom	-0.0311	0.0222	0.00164	0.0939*	473	0.074
Share pupils have book	-0.0175	-0.0269	0.00304	0.115*	473	0.173
% of girls with textbook	**0.134***	0.104	**0.242****	-0.239**	70	0.139
Share pupils used textbook	0.0347	0.0459	0.0203	0.0433	473	0.055
% girls using textbook	0.0438	0.105*	0.216	-0.0798	52	0.195
Teacher wrote on board	-0.0152	0.00890	-0.0157	-0.0183	473	0.032
Pupils wrote on board	0.0459	0.0505	0.0520	-0.147	472	0.009
% girls wrote on board	-0.0986	-0.0360	0.0258	0.0878	324	0.053
Share of pupils with pens/pencils	-0.0375	-0.0543	-0.0745	0.0422**	473	0.076
% girls with pen/pencil	**-0.0298***	0.0351	0.0119	0.0893**	463	0.070
Share of pupils with exercise books	0.00619	-0.00615	-0.00533	-0.00917	473	0.035
% girls with exercise book	-0.0228	0.0366	0.0143	0.0837*	471	0.074
Teacher went to pupils	0.0973	0.0460	0.131	0.193**	473	0.094
% girls teacher went to	-0.0692	0.0290	-0.0521	0.169	264	0.055
Teacher called pupils' name	0.0622	0.0189	0.0814	0.0514	473	0.045
% of pupils teacher called	0.0337	-0.0240	**0.0867***	-0.0719	473	0.037
Teacher kept attendance	0.0634	**0.148***	-0.0187	0.135*	473	0.061
Teacher had scheme of work	0.0451	0.0726	-0.0356	0.254***	473	0.091
Teacher had lesson plan	0.0218	**0.0820****	0.128	0.0359	473	0.080
Teacher introduced lesson	-0.686	-0.699	0.573	-0.522	473	0.013
Teacher summarized lesson	-0.174	0.00700	0.434	0.612	467	0.025
Teacher assigned homework	-0.812	-0.837	0.0914	-1.698	470	0.025
Teacher reviewed homework	-1.059	0.908	1.510	2.658	472	0.045
Teacher hit pupils	**0.0719****	-0.0140	0.0219	0.00184	472	0.030
Teacher asked questions	**-0.123***	0.0977	-0.0106	0.0123	473	0.056
Teacher asked apply info	-0.0401	0.0438	-0.0695	-0.0377	473	0.064
Teacher tested creativity	-0.00441	**0.0606***	0.00118	-0.0856	473	0.161
Teacher gave positive feedback	-0.000615	0.0436	-0.0344	0.134	473	0.016
Teacher gave corrective feedback	0.00451	-0.0344	0.0552	0.0816	473	0.036
Teacher scolded pupils	**0.141*****	0.0709	0.0623	0.119	473	0.120
Teacher used local language	0.00967	0.0315	-0.0342	-0.180**	467	0.107

Note: Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 33: Correlates of Teacher's School Absence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Teacher's Absence from School									
30<=age <=39	-0.0330	-0.0340	-0.000830	-0.00259	0.00185	-0.0248	-0.0256	-0.0366*	-0.0346	-0.0333
	(0.0239)	(0.0238)	(0.0237)	(0.0238)	(0.0237)	(0.0239)	(0.0237)	(0.0222)	(0.0222)	(0.0219)
40<=age<=49	-0.0232	-0.0154	0.0314	0.0290	0.0305	0.00797	-0.00498	-0.0143	-0.0131	-0.00307
	(0.0269)	(0.0268)	(0.0270)	(0.0272)	(0.0270)	(0.0270)	(0.0270)	(0.0252)	(0.0252)	(0.0250)
50<=age<=59	-0.0582**	-0.0555**	-0.00150	-0.00382	-0.00319	-0.0390	-0.0659**	-0.0675***	-0.0617**	-0.0487*
	(0.0259)	(0.0257)	(0.0261)	(0.0263)	(0.0262)	(0.0265)	(0.0269)	(0.0251)	(0.0252)	(0.0250)
60 and above	-0.186***	-0.187***	-0.108*	-0.108*	-0.0867	-0.0761	-0.110*	-0.112*	-0.113*	-0.0936
	(0.0660)	(0.0657)	(0.0653)	(0.0653)	(0.0651)	(0.0645)	(0.0645)	(0.0602)	(0.0601)	(0.0595)
Female		-0.1000***	-0.0637***	-0.0633***	-0.0375*	-0.0286	-0.0313	-0.0330*	-0.0229	-0.0119
		(0.0200)	(0.0202)	(0.0202)	(0.0207)	(0.0205)	(0.0205)	(0.0191)	(0.0193)	(0.0193)
FRAM			0.168***							
			(0.0198)							
FRAM subsidized				0.172***	0.137***	0.0463*	0.0311	0.0135	0.00539	-0.000729
				(0.0206)	(0.0216)	(0.0255)	(0.0256)	(0.0239)	(0.0240)	(0.0237)
FRAM not subsidized				0.142***	0.107***	0.00798	0.00613	-0.0316	-0.0521	-0.0511
				(0.0404)	(0.0407)	(0.0432)	(0.0430)	(0.0402)	(0.0404)	(0.0402)
Rural school					0.105***	0.0733***	0.0610***	0.0247	0.0163	0.0276
					(0.0206)	(0.0210)	(0.0212)	(0.0199)	(0.0200)	(0.0200)
Public school						0.160***	0.144***	0.144***	0.143***	0.136***
						(0.0248)	(0.0249)	(0.0233)	(0.0233)	(0.0234)
Terminale							-0.0564**	-0.0497**	-0.0508**	-0.0362
							(0.0236)	(0.0221)	(0.0220)	(0.0221)
Baccalauréat							-0.121***	-0.115***	-0.107***	-0.0776***
							(0.0233)	(0.0217)	(0.0218)	(0.0222)
Post-Bac							-0.0875**	-0.0653**	-0.0638**	-0.0327
							(0.0342)	(0.0320)	(0.0320)	(0.0320)
Head is absent								0.325***	0.324***	0.310***
								(0.0182)	(0.0182)	(0.0181)
Min. Equipment									-0.0421**	-0.0275
									(0.0185)	(0.0189)
Min. Infrastruct.									-0.0550***	-0.0194

									(0.0200)	(0.0204)
No books in									0.00464	-0.000228
									(0.0251)	(0.0251)
Fianarantsoa										0.125***
										(0.0268)
Toamasina										-0.0213
										(0.0268)
Mahajanga										0.0361
										(0.0287)
Toliara										0.188***
										(0.0301)
Antsiranana										0.0321
										(0.0321)
Constant	0.274***	0.343***	0.224***	0.225***	0.155***	0.122***	0.206***	0.138***	0.179***	0.0881**
	(0.0155)	(0.0206)	(0.0246)	(0.0247)	(0.0282)	(0.0284)	(0.0328)	(0.0309)	(0.0414)	(0.0444)
Observations	2,192	2,192	2,192	2,192	2,192	2,192	2,192	2,192	2,191	2,191
R-squared	0.005	0.016	0.048	0.048	0.059	0.077	0.088	0.205	0.211	0.233

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 34: Correlates of Teacher's Classroom Absence

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	Teacher's Absence from classroom									
30<=age<=39	-0.0417	-0.0427*	-0.00890	-0.0106	-0.00508	-0.0335	-0.0350	-0.0450*	-0.0422*	-0.0416*
	(0.0255)	(0.0254)	(0.0254)	(0.0255)	(0.0253)	(0.0255)	(0.0254)	(0.0242)	(0.0242)	(0.0238)
40<=age<=49	-0.00259	0.00583	0.0537*	0.0513*	0.0531*	0.0291	0.0156	0.00707	0.00884	0.0207
	(0.0288)	(0.0287)	(0.0289)	(0.0291)	(0.0289)	(0.0288)	(0.0289)	(0.0276)	(0.0275)	(0.0271)
50<=age<=59	-0.0676**	-0.0646**	-0.00951	-0.0118	-0.0110	-0.0492*	-0.0751***	-0.0766***	-0.0695**	-0.0532*
	(0.0277)	(0.0275)	(0.0280)	(0.0282)	(0.0280)	(0.0283)	(0.0288)	(0.0274)	(0.0275)	(0.0272)
60 and above	-0.179**	-0.181***	-0.100	-0.101	-0.0737	-0.0624	-0.0952	-0.0970	-0.0979	-0.0827
	(0.0706)	(0.0702)	(0.0699)	(0.0699)	(0.0695)	(0.0689)	(0.0690)	(0.0658)	(0.0656)	(0.0647)
Female		-0.109***	-0.0717***	-0.0712***	-0.0390*	-0.0295	-0.0313	-0.0328	-0.0213	-0.00725
		(0.0214)	(0.0216)	(0.0216)	(0.0221)	(0.0220)	(0.0219)	(0.0209)	(0.0210)	(0.0210)
FRAM			0.171***							
			(0.0212)							
FRAM w/ subsidy				0.175***	0.131***	0.0350	0.0208	0.00478	-0.00441	-0.00918
				(0.0220)	(0.0231)	(0.0273)	(0.0274)	(0.0261)	(0.0261)	(0.0258)
FRAM w/o subsidy				0.146***	0.103**	-0.00333	-0.00668	-0.0410	-0.0639	-0.0543
				(0.0432)	(0.0435)	(0.0462)	(0.0460)	(0.0439)	(0.0441)	(0.0437)
Rural school					0.131***	0.0972***	0.0855***	0.0525**	0.0429**	0.0595***
					(0.0220)	(0.0224)	(0.0227)	(0.0217)	(0.0218)	(0.0217)
Public school						0.171***	0.158***	0.158***	0.157***	0.151***
						(0.0265)	(0.0267)	(0.0254)	(0.0254)	(0.0254)
Terminale							-0.0384	-0.0323	-0.0339	-0.0190
							(0.0253)	(0.0241)	(0.0240)	(0.0240)
Baccalauréat							-0.115***	-0.110***	-0.101***	-0.0699***
							(0.0249)	(0.0237)	(0.0238)	(0.0241)
Post-Bac							-0.0635*	-0.0434	-0.0406	-0.00829
							(0.0366)	(0.0349)	(0.0349)	(0.0348)
Head is absent								0.296***	0.295***	0.278***

								(0.0199)	(0.0199)	(0.0197)
Min. Equipment									-0.0541***	-0.0427**
									(0.0202)	(0.0206)
Min. Infrastruct.									-0.0619***	-0.0171
									(0.0219)	(0.0222)
No books in									0.00770	0.000806
									(0.0274)	(0.0273)
Fianarantsoa										0.141***
										(0.0291)
Toamasina										-0.0383
										(0.0292)
Mahajanga										-0.00703
										(0.0312)
Toliara										0.205***
										(0.0328)
Antsiranana										0.0952***
										(0.0349)
Constant	0.335***	0.409***	0.288***	0.289***	0.201***	0.166***	0.240***	0.178***	0.226***	0.126***
	(0.0165)	(0.0220)	(0.0264)	(0.0264)	(0.0301)	(0.0304)	(0.0351)	(0.0337)	(0.0451)	(0.0482)
Observations	2,192	2,192	2,192	2,192	2,192	2,192	2,192	2,192	2,191	2,191
R-squared	0.006	0.017	0.046	0.046	0.061	0.079	0.088	0.172	0.180	0.208

Table 35: Correlates of head teacher's absence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
30<=age <=39	0.00897	0.0146	0.0284	0.0288	0.0303	0.0285	0.0260	0.0136	0.0185
	(0.0777)	(0.0781)	(0.0794)	(0.0795)	(0.0794)	(0.0797)	(0.0798)	(0.0805)	(0.0801)
40<=age<=49	-0.00464	0.00539	0.0267	0.0273	0.0380	0.0368	0.0399	0.0346	0.0549
	(0.0770)	(0.0782)	(0.0814)	(0.0815)	(0.0817)	(0.0819)	(0.0821)	(0.0824)	(0.0822)
50<=age<=59	0.00780	0.0161	0.0437	0.0440	0.0484	0.0428	0.0425	0.0418	0.0466
	(0.0724)	(0.0733)	(0.0789)	(0.0790)	(0.0789)	(0.0803)	(0.0813)	(0.0817)	(0.0814)
60 and above	-0.00969	-0.00610	0.0214	0.0202	0.0551	0.0577	0.0315	0.0308	0.0489
	(0.118)	(0.118)	(0.121)	(0.122)	(0.124)	(0.124)	(0.126)	(0.127)	(0.127)
Female		-0.0354	-0.0273	-0.0280	-0.0156	-0.0149	-0.0199	-0.0131	-0.0111
		(0.0473)	(0.0480)	(0.0482)	(0.0488)	(0.0489)	(0.0492)	(0.0502)	(0.0508)
FRAM			0.0586	0.0545	0.0401	0.0316	0.0364	0.0355	0.0159
			(0.0618)	(0.0643)	(0.0649)	(0.0689)	(0.0698)	(0.0701)	(0.0705)
FRAM w/ subsidy				0.0919	0.0840	0.0761	0.0661	0.0164	0.0362
				(0.155)	(0.154)	(0.156)	(0.157)	(0.166)	(0.167)
FRAM w/o subsidy					0.0823	0.0751	0.0931	0.0853	0.0832
					(0.0552)	(0.0585)	(0.0618)	(0.0623)	(0.0634)
Rural school						0.0220	0.0376	0.0252	0.0565
						(0.0586)	(0.0655)	(0.0664)	(0.0678)
Public school							-0.0530	-0.0508	-0.0420
							(0.0626)	(0.0629)	(0.0634)
3.education							0.0102	0.0138	0.0313
							(0.0707)	(0.0712)	(0.0725)
4.education							0.0364	0.0226	0.0422
							(0.0823)	(0.0836)	(0.0844)
Minimum Equipment								0.0405	0.0606
								(0.0513)	(0.0524)
Infrastructure								-0.0192	0.0143
								(0.0615)	(0.0631)
No book in classroom								0.0459	0.0581
								(0.0757)	(0.0767)
Fianarantsoa									0.0574
									(0.0785)
Toamasina									-0.180**
									(0.0795)
Mahajanga									-0.0380
									(0.0842)
Toliara									0.0448
									(0.0872)
Antsiranana									-0.0478

									(0.0903)
Constant	0.328***	0.337***	0.301***	0.301***	0.233***	0.228***	0.208*	0.162	0.116
	(0.0606)	(0.0619)	(0.0725)	(0.0726)	(0.0857)	(0.0870)	(0.109)	(0.131)	(0.140)
Observations	420	420	420	420	420	420	419	418	418
R-squared	0.000	0.002	0.004	0.004	0.009	0.010	0.014	0.015	0.041

References

Dickerson, A., S. McIntosh, and C. Valente. 2015. "Do the Maths: An Analysis of the Gender Gap in Mathematics in Africa." *Economics of Education Review* 46: 1–22.

Government of Tanzania. 2013. "Education NKRA Lab Report: Executive summary. Big Results Now."

Hanushek, E. A. 2011. "The Economic Value of Higher Teacher Quality." *Economics of Education Review* 30: 466–79.

Herrmann, M. A., and J. E. Rockoff. 2012. "Worker Absence and Productivity: Evidence from Teaching." *Journal of Labor Economics* 30 (4) 749–82.

Holmlund, H., and K. Sund. 2008. "Is the Gender Gap in School Performance Affected by the Sex of the Teacher?" *Labour Economics* 15: 37–53.

Kitta, S., and D. Fussy. 2013. "Bottlenecks in Preparation of Quality Teachers in Tanzania." *Time Journals of Arts and Educational Research* 1 (5): 29–38.

Metzler, J., and L. Woessmann. 2012. "The Impact of Teacher Subject Knowledge on Pupil Achievement: Evidence from Within-Teacher Within-Pupil Variation." *Journal of Development Economics* 99: 486–96.

MoEVT (Ministry of Education and Vocational Training, Tanzania Institute of Education). 2007. "Curriculum for Diploma in Teacher Education Programmes in Tanzania."

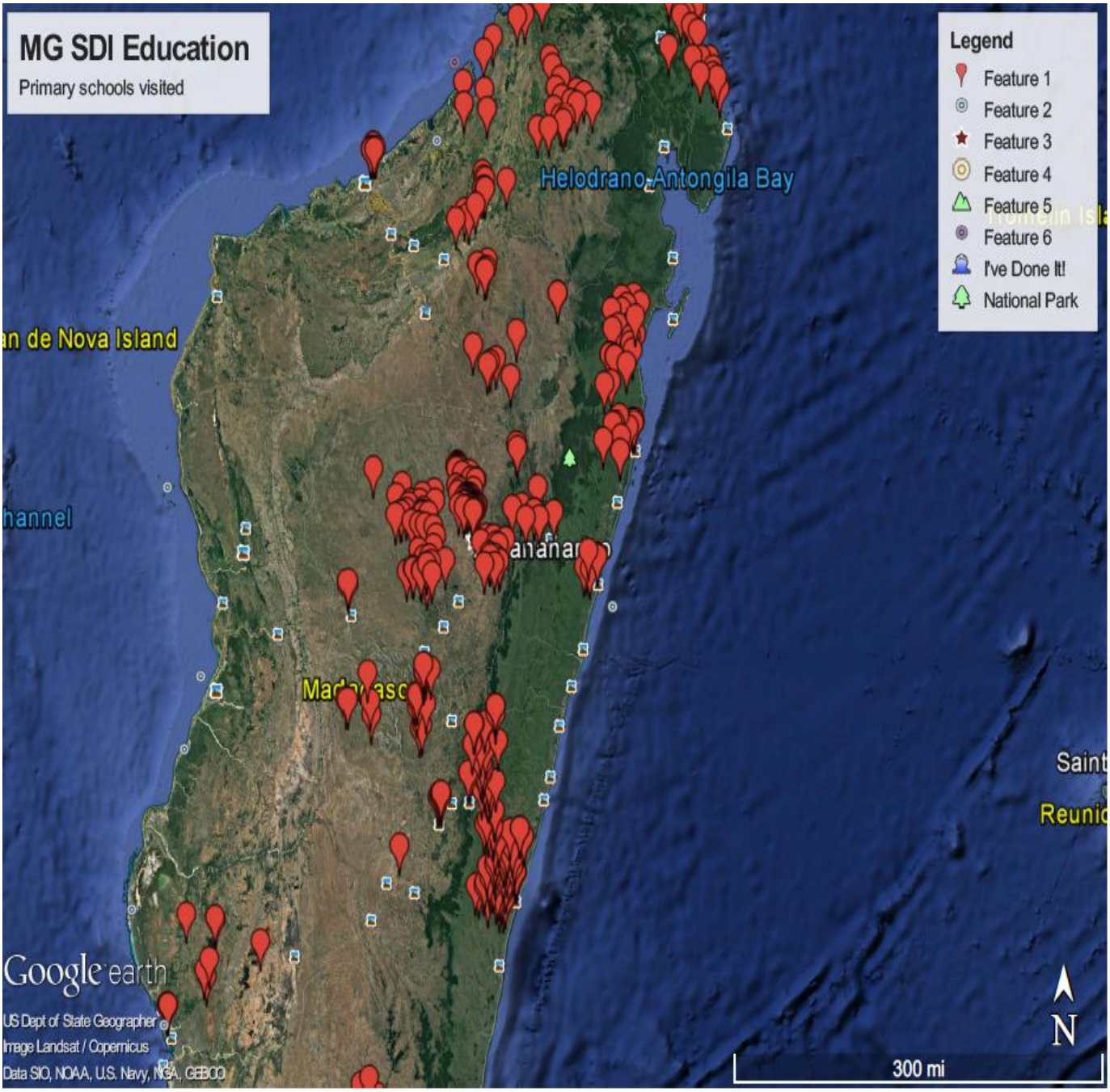
Mott, M. S., D. H. Robinson, A. Walden, J. Burnette, and A. S. Rutherford. 2012. "Illuminating the Effects of Dynamic Lighting on Pupil Learning." *SAGE Open* 1–9.

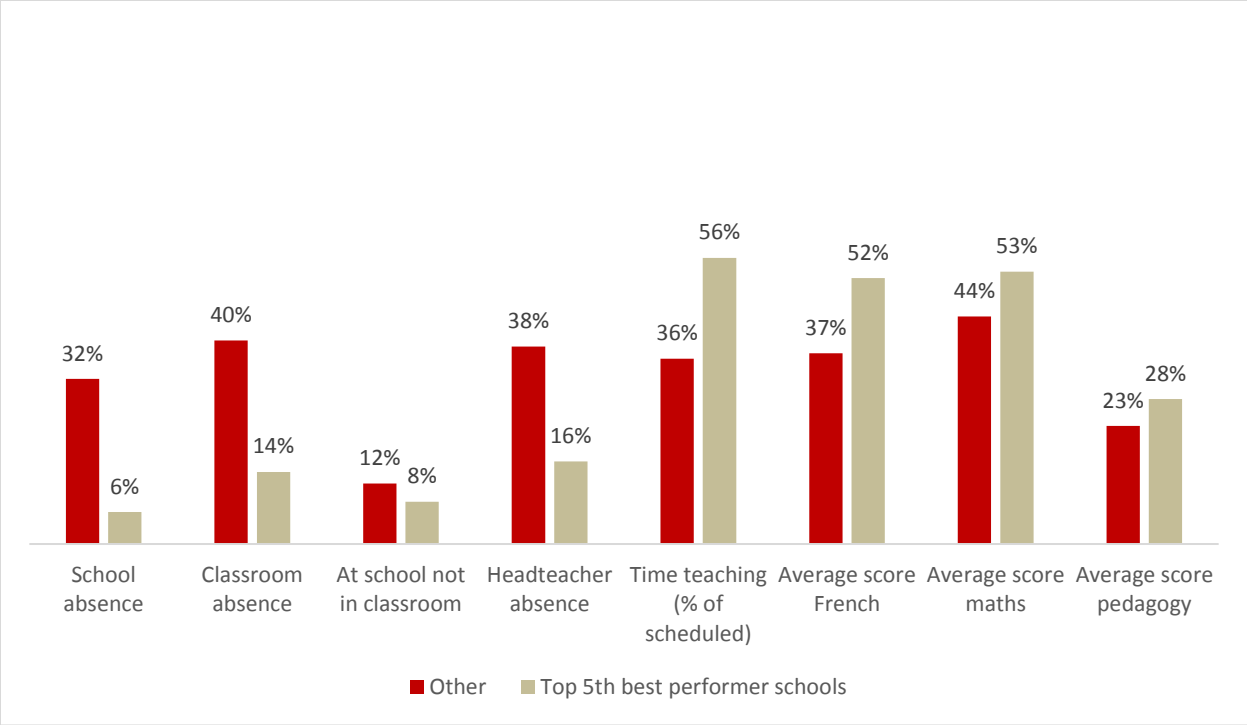
Rivkin, S. G., E. A. Hanushek, and J. F. Kain. 2005. "Teachers, Schools, and Academic Achievement." *Econometrica* 73 (2): 417–58.

Sabarwal, S., D. Evans, and A. Marshak. 2014. "The Permanent Input Hypothesis: The Case of Textbooks and (No) Pupil Learning in Sierra Leone." World Bank Policy Research Working Paper 7021.

World Bank. 2004. *World Development Report 2004: Making Services Work for Poor People*. Washington, DC: World Bank.

Which schools were visited

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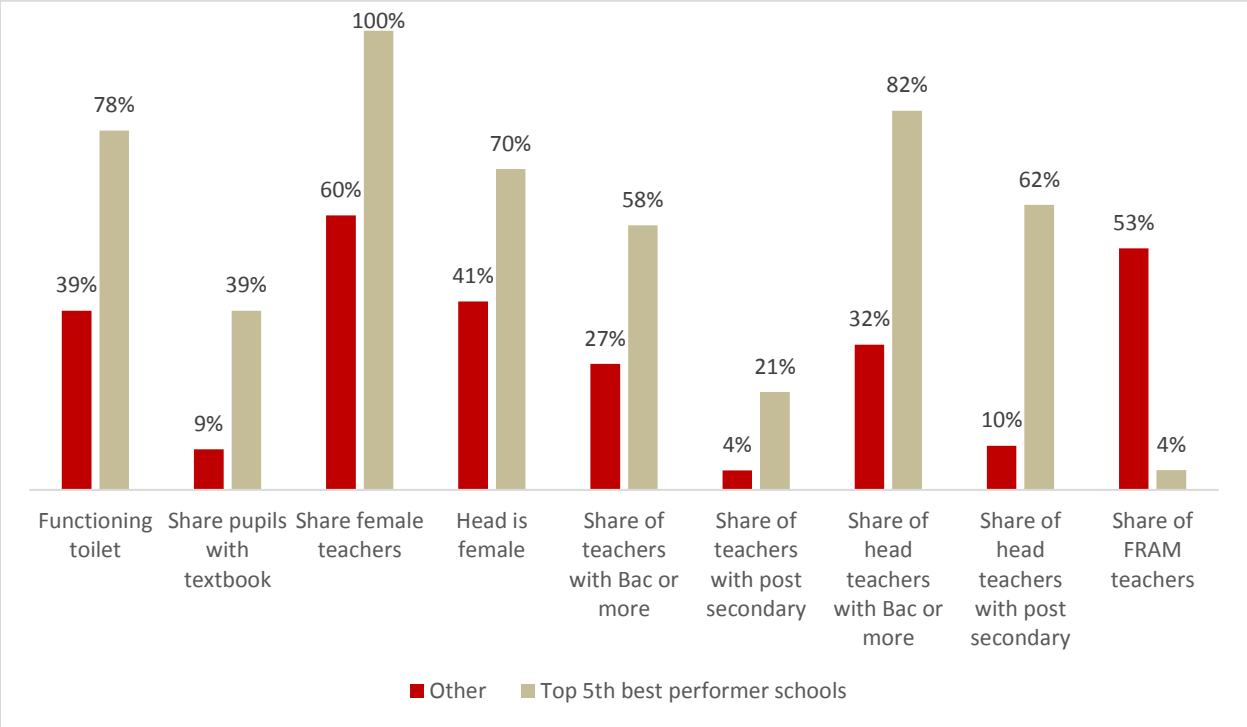
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Functioning toilet
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Share female teachers
Head is female
Share of teachers with Bac or more
Share of teachers with post secondary
Share of head teachers with Bac or more
Share of head teachers with post secondary
Share of FRAM teachers
Other
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