



*EdData II*

# Measurement and Research Support to Education Strategy Goal 1

## Rationale for Using Lot Quality Assurance Sampling (LQAS) in Projects

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## Rationale for Using Lot Quality Assurance Sampling (LQAS) in Projects

Prepared for:

Office of Education  
Bureau for Economic Growth, Education, and Environment (E3)  
United States Agency for International Development (USAID)  
Penelope Bender, Contracting Officer's Representative

Prepared by:

Amy Mulcahy-Dunn, Matthew Jukes, and Jonathan Stern  
RTI International  
3040 East Cornwallis Road  
Post Office Box 12194  
Research Triangle Park, NC 27709-2194  
USA

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## LQAS Introduction

Lot quality assurance sampling (LQAS) is the basis for a monitoring approach that uses binary indicators and small school sample sizes to quickly collect and process local data to inform decision making and improve program effectiveness. In order to separate the sampling methodology and the analysis model from the overall monitoring approach and associated instruments, the name *Local Education Monitoring Approach* is now used to refer to the total package.<sup>1</sup> As more projects consider incorporating LQAS into their design, questions have arisen regarding how and when to best use this methodology. In this brief, we provide an overview of LQAS and how and when it can be applied to support project and ongoing program implementation.

## LQAS Background<sup>2</sup>

### The Problem

The promise of monitoring systems to improve education program implementation fidelity and effectiveness is often unfulfilled because such systems are cumbersome, take too long to produce actionable results, and do not generate disaggregated data at local levels. Ministry inspectorate systems often aim to monitor performance in all schools but in reality, struggle to achieve the goal of comprehensive coverage. For both project and ongoing ministerial program monitoring, LQAS is a technique that allows relatively low-cost, routine, and quick monitoring that provides representative disaggregated, actionable data needed to flag implementation challenges and to target needy areas in a timely manner.

### LQAS Origins

The LQAS technique was first developed in the 1920s in the manufacturing industry as a way to monitor the quality of production. A small sample of items was randomly selected from each production lot and examined for any imperfections. If the number of defective items was greater than a pre-set threshold level, then the lot was rejected (Robertson et al., 1997, p. 199). Rejected lots were then “examined more closely and either repaired or discarded” (MEASURE *Evaluation Project*, 1998, p. 5). Application of this classification method has since spread far beyond manufacturing into other domains, including the social sciences. For example, the LQAS concept has been adapted for use in the health sector and has been gaining popularity as a way to efficiently monitor health programs over time. More recently, LQAS has been adapted for use in the education sector.

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<sup>1</sup> Note: This brief has not been updated to reflect the revised terminology and therefore still refers to LQAS throughout.

<sup>2</sup> Portions of the background material in this report were adapted from a concept note prepared for USAID by RTI International during early discussions about a case study application of LQAS under the Education Data for Decision Making (EdData II) project.

## LQAS Applied to Education

The argument for the use of LQAS in monitoring education systems may be explained quite simply. Improving education practice requires frequent feedback. To achieve this, data must be collected using relatively low-cost methods and should be manageable at the local level. LQAS can do all this.

LQAS is particularly appealing for the education sector as more and more governments strive to decentralize education responsibilities. Local-level managers need a way to monitor the programs or communities in their area and determine which ones are “meeting particular targets and goals” (Robertson et al., 1997, p. 199).

There are a few key characteristics associated with this approach that should be noted. First, LQAS divides populations into small, “administratively meaningful units (lots)” (Mabirizi, Orobato, David, & Nsabagasani, 2004, p. 5) where a local supervisor can influence or ensure quality of effective school management and instruction. Lots must be small enough to be homogeneous in nature, with similar socioeconomic characteristics (Mabirizi et al., 2004, p. 5). In the case of education, lots are typically defined as districts.<sup>3</sup> Second, as a classification tool, LQAS identifies which districts are meeting performance expectations and which are not. Framing the analysis in this binary fashion means that only a relatively small sample size is needed (Robertson et al., 1997, p. 199).<sup>4</sup> The LQAS methodology, which combines small random sample sizes with binary questions, yields data that can be relatively quickly and easily scored and analyzed.

District-level results are locally available in only days as they can easily be tabulated with pen and paper (Robertson et al., 1997, p. 207). Third, although designed to estimate binary results at the district level, data can be aggregated to estimate regional or national averages (Espeut, 2000, p. 4). For example, while at the district level LQAS allows us to classify districts as meeting or not meeting minimum student performance standards, by aggregating district data up to the regional level, we can estimate average regional student performance levels.

### Example

A practical application of LQAS in the education sector looks something like the following. First, identify key research questions and actionable information to be collected. Then develop relevant indicators necessary to answer these questions. These indicators could be based on curricular standards or project design. Examples of indicators could include students’ ability to read with comprehension, sufficient length of teachers’ reading lessons, minimum proportion of teachers in

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<sup>3</sup> Note that throughout this brief we assume that our “lot” is a district. The LQAS methodology could be applied to different units but this would depend on the specific country’s administrative structure.

<sup>4</sup> LQAS uses “one-sided hypothesis testing for analysis” of resulting data (Robertson et al., 1997, p. 199). The null hypothesis used in LQAS is that the number of defective items in the lot exceeds the allowable pre-set limit and the lot has to be rejected. In the social sector, “rejection” is not an option. Thus, rather than setting a limit as the number of defective items, the hypothesis requires setting the limit as the number of individuals or institutions that are performing above targeted expectations.

attendance at the start of the school day, teachers having students read silently, and sufficient availability of textbooks in the classroom. When linked to program design, these indicators provide insight into overall program implementation. Although a set of instruments and a protocol have been developed specifically to accompany the LQAS methodology when it is applied to education in the early grades, other assessment tools or questionnaires may be used. The tools used in LQAS applications must generate binary results. Almost all assessments can be reduced to binary results so this is not a limiting factor. In addition, if LQAS will be used at a very disaggregated level, the instruments should be quick to administer and simple enough to ensure that observers can apply them reliably with only limited training and supervision. Simple instruments that focus on a very small number of key indicators will help ensure rapid data collection and data tabulation.

Once the indicators are chosen, current school practices and student performance levels are used to set minimum performance standards. A small sample of schools is then randomly chosen and formally observed on those indicators. Districts whose schools are unable to meet these performance standards can then be targeted for additional support right away. At the system level, support for the districts could take the form of additional training for teachers and head teachers, more routine monitoring and coaching of teachers, and/or provision of needed pedagogical materials. At the program level, corrective steps could be taken to address identified weaknesses in either the design or the implementation of a program. Examples of corrective steps might include making adjustments in curricular content, making changes in teacher-training approaches, reviewing resource allocation decisions, or sending out district-wide communication regarding proper program applications.

## LQAS Processes (In Brief)

While a complete, detailed description of the procedures and processes associated with applying LQAS to the education sector can be found in Betts, Mulcahy-Dunn, and Valadez (2016), the *Toolkit for the Local Education Monitoring Approach (LEMA)*, a brief overview may be useful. This information is displayed in **Table 1**.

**Table 1: LQAS Processes**

<b>School Sample</b>	19 schools (plus 3 alternates) are randomly selected from sampling frame that includes all schools in population lot (e.g. all public schools in a district).
<b>Student Sample</b>	19 students (plus 2 alternates) are randomly selected from a randomly selected classroom for each grade, in each of the sampled schools.
<b>Student Testing</b>	19 students are tested in a group setting using a paper/pencil based Group Administered Literacy Assessment (GALA).
<b>Instruments</b>	RTI has chosen to adapt a new school instrument and GALA for data collection in each project/system, but this approach is not limited to these instruments; and even if these instruments are used, they should be adapted to reflect the program or local education system being evaluated.

<b>Indicators</b>	School-level, classroom-level, and student-level indicators are selected through an iterative process with key stakeholders in order to ensure that information is gathered across key indicators that can be used for improvements in teaching and learning. Any binary indicator can be used with this approach.
<b>Data Tabulation</b>	SMS or tablet-based data entry systems should be used whenever possible to reduce time and user error. Otherwise, paper-based summary sheets are provided in order to simplify the process of scoring and tabulating key indicators.
<b>Use of Results</b>	In order to ensure proper use of data for district-level decision-making, it is recommended that a core technical team be created for each district (or region). This team will be responsible for ensuring timely dissemination of results and for leading discussions on how the data should be used for decision-making.
<b>Training</b>	Standard trainings for district-level data collectors last two weeks (i.e. one week of training on procedures and instruments; one week of data collection, tabulation, and reporting).

## LQAS System Requirements

There are no system prerequisites for using an LQAS approach per se, but, if the goal is introducing LQAS as an integral monitoring tool to be used by a ministry, then it will be ultimately easier and more sustainable if the system has an existing inspectorate and school monitoring system. Accordingly, it is recommended to build on existing systems to the greatest extent possible, in order to maximize ministry involvement, reduce redundancies, take advantage of previously trained school inspectors, and provide an approach that can be sustained once a project has ended. Capacity building therefore depends on the strength of the existing monitoring system (including inspector training, school accessibility, and school monitoring instruments). Strong monitoring systems will require less capacity building; weak or nonexistent monitoring systems will require extensive capacity building. In initial meetings with ministry counterparts, it is important to gain an understanding of the current system capacity for school monitoring, in order to appropriately plan for the training, materials development, and capacity building.

## LQAS for Monitoring Systems

In countries where ministries are struggling to establish a rigorous school monitoring system, working closely with the ministry of education in the adaptation and implementation of LQAS and its accompanying data collection instruments provides an opportunity to help establish more rigorous and locally sustainable school monitoring systems. Requiring inspectors to visit just a sample of schools in the district means that costs associated with the LQAS administration are lower than would be required for census-based inspections. Implementation costs can be further reduced by having subdistrict-level staff administer the LQAS. In Ghana, for example, subdistrict staff (known as Circuit Supervisors) are responsible for collecting data for the LQAS from schools within their circuits. Given the number of circuits in a district, a Circuit Supervisor would be asked to visit a maximum of one or two schools in a two-week span as part of the LQAS data collection.

## **LQAS in Implementation Projects Where Other Data Are Already Being Collected**

Given the plethora of data being collected under many implementation programs, when and for what reason should data be collected using the LQAS methodology as well? What benefit would result from the inclusion of LQAS in a project design? Below we describe some scenarios where an application of LQAS could benefit program fidelity, effectiveness, and sustainability.

### **1. Programs that collect nationally representative outcome data, but no monitoring data**

With intervention projects that collect sample based nationally (or even regionally) representative outcome data at baseline, midline, and endline, but do not collect routine monitoring data, LQAS could provide routine district-level monitoring data and could help establish a sustainable monitoring system for use by the ministry of education.

### **2. Programs that collect nationally representative outcome data, with coaches who collect fidelity of implementation data from all schools**

When coaches visit all schools to collect fidelity of implementation data, it may seem that an LQAS assessment is not necessary. However, in such cases LQAS can be useful:

- To collect information that is not part of the coach's data collection process, for example by adding student achievement tests;
  - To provide a quality check on coach data;
  - To provide more data that are more representative of all schools, where coaches' visits are skewed towards urban high-performing schools;
  - To indicate which districts are meeting minimum performance targets; and
  - To set up a more sustainable monitoring system that extends beyond the life of the project.
- Under both of the scenarios described above the benefits of LQAS may be summarized as follows.

Purpose of LQAS:

- To increase the likelihood of data-driven action being taken through data collection processes that are simple and easy to interpret
- To improve local decision making by providing district-level data

Both of these factors will increase program fidelity and effectiveness by (1) identifying districts in need of additional support, and (2) identifying changes needed in program design and implementation:

- To increase program fidelity and effectiveness by monitoring fidelity and/or impact of implementation at a decentralized level to:
  - Identify districts in need of additional support,
  - Identify needed changes in program design and/or implementation.
- To encourage programs to use data to guide changes needed to increase program effectiveness
  - To establish a systematic and sustainable monitoring approach that can continue beyond the tenure of the donor-funded project.

## Limitations

There are some limitations to the LQAS methodology that should be noted. First, LQAS measures whether something is present or absent; it does not differentiate gradations in between. Similarly, as a classification tool, the only district-level information available identifies simply whether the district is meeting or not meeting minimum performance standards—no information is provided at the district about average performance levels or percentage increases necessary to meet these standards. Lastly, school-level information is only available for sampled schools. Actionable data at the district level are in terms of district-wide performance (as opposed to targeted school-level indicators).

Finally, although LQAS has been applied extensively in the health sector and the structure of LQAS should make this a more sustainable monitoring approach, applications in the education sector have been limited to date. Pilots have been conducted in Ethiopia, Ghana, Tanzania, and Uganda. In addition, the greater Accra region in Ghana is starting to implement LQAS as a way to monitor school quality. Jordan has recently applied LQAS on a national scale to select schools and students for participation in a student assessment. The student assessment data will be used to supplement existing coaching data to help guide decisions about program implementation.

## Conclusions

Despite the limitations noted above, LQAS does offer an efficient, systematic monitoring approach. With its use of binary indicators and small school sample sizes, LQAS applications are able to quickly collect and process local data. The ready availability and easy interpretation of data at the local level increase the likelihood of data-driven decisions. The ability to aggregate LQAS data to the regional and national level to estimate average performance levels can help to further inform decision-making. The ability of LQAS to (1) identify districts in need of additional support, and (2) identify changes needed in program design and implementation will work to

increase program fidelity and effectiveness. Finally, application of LQAS can help to establish a systematic and sustainable monitoring approach for use by a country's ministry of education that can continue beyond the tenure of a donor-funded project.

## References

- Betts, K., Mulcahy-Dunn, A. D., & Valadez, J. (2016). *Toolkit for the Local Education Monitoring Approach (LEMA)*. Prepared for USAID under the Education Data for Decision Making (EdData II) project, Task Order No. AID-OAA-12-BC00003 (RTI Task 20, Activity 5). Research Triangle Park, NC: RTI International.
- [Espeut, D. (2000).] Effective monitoring with efficient methods: Plan/Nepal's experience with LQAS in project monitoring. *Child Survival Connections: Successes, Innovations, and Promising Practices from Projects Around the World* 1 (2). Publication of the Child Survival Technical Support (CSTS) Project and the Child Survival Collaborations and Resources Group (CORE). [http://pdf.usaid.gov/pdf\\_docs/PNACL923.pdf](http://pdf.usaid.gov/pdf_docs/PNACL923.pdf)
- Mabirizi, J., Orobato, N., David, P., & Nsabagasani, X. (August 2004). *UPHOLD LQAS final report 2004: Results from 20 districts of Uganda*. Prepared for USAID under the Uganda Program for Human and Holistic Development (UPHOLD), Contract No. 617-A-00-02-00012-00. Washington, DC: John Snow, Inc. [http://uphold.jsi.com/Docs/Resources/Research/LQAS/lot\\_quality\\_assurance\\_sampling\\_2004\\_report.pdf](http://uphold.jsi.com/Docs/Resources/Research/LQAS/lot_quality_assurance_sampling_2004_report.pdf)
- MEASURE Evaluation Project. (July 1998). *Report of a technical meeting on the use of lot quality assurance sampling (LQAS) in polio eradication programs*. Working paper based on research conducted for USAID under Contract No. DPE-3060-C-00-1054-00. Chapel Hill, NC, USA: Carolina Population Center, University of North Carolina. [http://gametlibrary.worldbank.org/FILES/1313\\_Evaluation%20of%20Use%20of%20LQAS%20in%20polio%20pro grams.pdf](http://gametlibrary.worldbank.org/FILES/1313_Evaluation%20of%20Use%20of%20LQAS%20in%20polio%20pro%20grams.pdf)
- Mulcahy-Dunn, A., Valadez, J.J., Cumiskey, C., & Hartwell, A. (2013). *Report on the pilot application of lot quality assurance sampling (LQAS) in Ghana to assess literacy and teaching in primary grade 3*. Prepared for USAID under the EdData II project, Task Order No. EHC-E-07-04-00004-00 (RTI Task 7). Research Triangle Park, NC, USA: RTI International. <https://www.eddataglobal.org/countries/index.cfm?fuseaction=pubDetail&ID=545>
- Robertson, S., Anker, A., Roisin, A., Macklai, N., Engstrom, K., & Laforce, F.M. (1997). The lot quality technique: A global review of applications in the assessment of health services and disease surveillance. *World Health Statistics Quarterly*, 50, 199–209.

