Education Management Information Systems in the Era of HIV and AIDS:
An Introduction

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MOBILE TASK TEAM
ON THE IMPACT OF HIV/AIDS ON EDUCATION

About the authors

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PREFACE

This paper is an introduction to Education Management Information Systems (EMIS) in the context of the era of HIV and AIDS. It provides an overview of EMIS, its aims and objectives, and provides detail around its design and function. In addition it considers the importance of management information systems in the context of HIV/AIDS. This document is the first in a two-part series, the second focusing on District Education Management and Monitoring Information Systems (DEMMIS), for capturing a limited amount of local data on a more regular basis than the annual EMIS.

Who should read this publication?

This Occasional Paper is specially written for those working in and with Ministries of Education.

▼   If you are concerned about the provision of data and information-based planning and decision-making within the education sector, this publication will interest you.

▼   If you are particularly interested in how to measure and collect data using indicators of the impact of HIV and AIDS on the education sector, you will benefit from working through the text.

Education Management Information Systems in the Era of HIV and AIDS: An Introduction will help you consider:

▼   The purpose of an Education Management Information System and its relevance in your Ministry;

▼   The phases of developing an Education Management Information System (EMIS);

▼   What categories of data are important for measuring and tracking the impact of HIV and AIDS on the education sector, and strategies for collecting data;

▼   Potential indicators for tracking the impact on pupils and teachers, as well as for monitoring responses in your Ministry.

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1. INTRODUCTION

Since the 1970s more and more countries have been setting up ways to better plan and monitor the performance of their education systems, in order to respond to the need for accountability about universal primary education and delivering education of a high standard. Large amounts of public funds are spent on education and other social sectors are competing for this expenditure. The public at large is interested in knowing how this money is spent, and to what effect. With these demands for public accountability from various interest groups, the state needs its education system to generate massive amounts of systematic, formal information. Information is also required for planning and to inform decision-making. Policy review and reform are also guided by information. Thus a basic step, for government to increase its accountability, monitor its effectiveness and efficiency and plan and take decisions for the future, is to maintain and use quantitative measures of its delivery (McMahon 1993:28). This auditing function ensures simple accountability around policies, proposals and plans related to education.

1.1 AIMS AND OBJECTIVES

Since the nature of government and informed planning necessitates the collection of data, Ministries of Education across Africa have routinely distributed annual or bi-annual school level survey forms. These forms require school head teachers to provide information such as the number of pupils enrolled as well as the number of teachers in service at a particular school in a given year. More recently, this information has been collected systematically and captured through a system known as Education Management Information Systems (EMIS). One goal of EMIS is to provide government with relevant, accurate and up-to-date information for reporting and planning in education.

The availability and use of EMIS goes beyond accountability. Another aim of EMIS is to improve efficiency in the management of education. This is achieved in meeting the challenge of collecting, monitoring, archiving and analysing data and disseminating information. An EMIS system facilitates the link between having information about the education system and using that information effectively to make policy decisions and monitoring the implementation of policy.

One measure of whether EMIS is effective is if it meets the diverse requirements from different groups that it is meant to serve. International studies reveal that an EMIS system is largely developed in response to demands, with the needs of different user groups determining the data to be collected. An effective EMIS needs to facilitate:
▼ Policy development
▼ Decision making in the broadest sense
▼ Planning
▼ Management
▼ Monitoring of system change
▼ Evaluation of policy implementation and service delivery

In doing so, EMIS and the information it provides, can be used in three principle ways (Chapman and Mahlck 1993):
▼ *To secure or allocate resources*. This represents the most direct use of EMIS information. For example, if data indicates an increase in demand for education, government officers may motivate for additional schools to be built. By the same token, if data indicates a shortage of teachers in a particular district, more teachers may be assigned there.
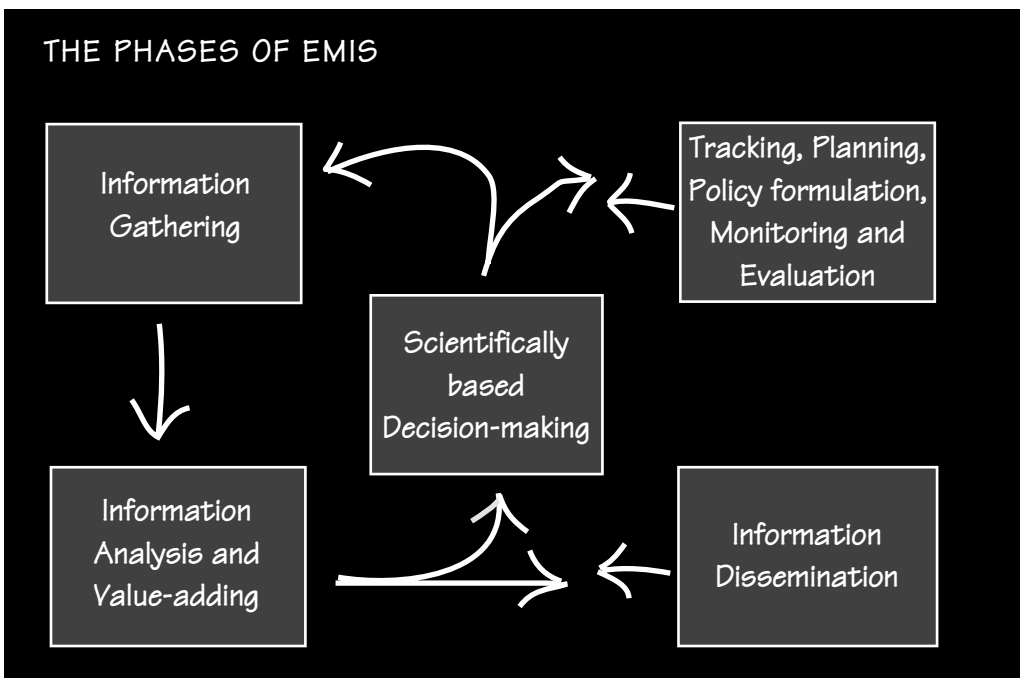
▼ *To guard against and limit bad decisions.* Unfortunately, data may at times be used more often by politicians to head off a policy decision or outcome, which they regard as unfavourable, rather than using the data to find weaknesses in policy and re-formulate policies.

▼ *To detect inefficient use of resources.* When used correctly, information can clarify performance of the education system, by analysing the relationship between inputs and outputs.

1.2 DESIGN AND FUNCTION

To meet the needs detailed above, EMIS should be an integrated, open-ended system. It ought to be able to facilitate and process information from a variety of sources, and provide information to a variety of users. This means that the data collected by the various components of the education system (human resources managers, physical infrastructure planners, quality assurors, and so on) should be integrated, and data able to flow bi-directionally – both upwards and downwards to the relevant education decision maker.

If EMIS is to have any value whatsoever, the system should be as simple, accessible and accurate as possible. In many countries decentralised systems appear to have the ability to collect and process data better than highly centralised databases. This results in information that is accurate and current because it is easily checked and regularly updated. These aspects suggest that EMIS data should be processed, analysed and published as close as possible to the point where data was collected.

The phases and typical functions of EMIS are illustrated in the diagram below:

THE PHASES OF EMIS

Information Gathering

Tracking, Planning, Policy formulation, Monitoring and Evaluation

Scientifically based Decision-making

Information Analysis and Value-adding

Information Dissemination

Each of these phases will now be outlined and consideration given to the functions and role players at each phase.

Information Gathering

During this phase it is critical that the people tasked with managing and developing the EMIS system (the system developers) should work closely with those who generate the information and those who will be its users. System developers must seek agreement from the information gatherers and users on all decisions that may affect them.

Agreement needs to be about what information is needed and how it will be collected. Generally, *surveys* are designed for collecting the required data. The data collection instrument (usually a survey questionnaire) needs to be carefully designed and **tested** to ensure that the required information will be obtained. Questions asked must be clearly structured and unambiguous. It is worth investing a great deal of time on this phase and even requesting the assistance of question formulation specialists.

Once the questionnaire has been tested and proven to be manageable and informative, the survey is taken to scale. This means that the questionnaire is distributed to everyone who is meant to fill in that particular survey. Once the completed forms are returned, the filled-in data needs to be **captured**. This can be done manually but, given the speed and power of computers, it is recommended that this should be done electronically.

There are several options available for data capture including data typists, who are appointed to key the data onto computer, or specific technologies such as 'optical character or mark recognition' (OCR/OMR) which employ scanning technology to pick up marks on specifically designed and printed forms.

After the data is captured from all the returned survey forms, the data has to be compiled, **cleaned** and verified. This can be a lengthy process and involve several persons, but it is important if EMIS is to be a reliable management and decision-making tool. Generally, preliminary data is fed back to providers so that they can verify accuracy and completeness. Error reports, which highlight exceptions or improbabilities, can also be provided for checking and verification.

Information Analysis and Value-adding

During this phase raw data is converted to information, by adding value to the data. 'Value-adding' can be done by simply presenting the data in a user-friendly manner or framing it within a context so that its wider significance and meaning becomes apparent. This may mean tabulating totals, calculating appropriate indicators, determining projections or forecasts, doing time series analysis or using other statistical techniques, as well as drawing on contextual information from other sources. Generally, the value-adding process requires support from people with data management and data manipulation skills. People with a background or exposure to statistics are also invaluable at this stage.

Information Dissemination

This is a critical aspect of EMIS. During this phase the suppliers and users of the information receive feedback in the form of information being disseminated to them. This step is critical in terms of accountability and reporting. Studies show that where there is increased accountability to local decision makers, they will naturally move towards making greater use of local data and needing it.

Information can be made available in a wide variety of forms. In print, this may take the form of reports, brochures, posters, and maps. Electronic forms of dissemination may be through the world wide web, intranet, or storage devices such as CD or flash keys. The

Testing an instrument is when a few people from the group who are meant eventually to fill in the questionnaire, are asked to complete the *nearly-finalised* questionnaire. How they struggle with the questions, and whether or not they fill in answers that are expected, will tell the questionnaire designer if the wording of the questions are well directed and clearly phrased. After testing, the designer will know which questions need to be adjusted or changed altogether in order to get the required information.

Capturing data is when the answers or responses for each question on completed questionnaires are converted onto summary schedules or captured into a database. The set of answers can then be analysed and reduced or summarised to reveal totals, averages, variances, spreads, frequencies, exceptions, and so on.

Cleaning data is a process of checking that the answers were not confused or that errors did not creep in by mistake at some earlier stage. The answers must make sense in relation to the question that was asked. If data is not checked and cleaned, and errors have crept in, then the analysis cannot be reliable.

information could then be presented as a database, analytical tool or spreadsheet model. Many countries now include a 'query service' or 'call centre' attached to their EMIS system as a matter of course, since the demand for information and questions requiring responses have grown. Most of the information for dissemination can be standardised by creating generalised information products such as Annual Reports, Statistical Overviews, or Comparative Summaries. Once they have been developed, these products only need to be up-dated periodically and re-released. Those with some creative flair and experience in producing published material are invaluable to the dissemination process. Most importantly, though, the task requires the ability to interrogate the database and present the information, solution or outcome, in a simple, understandable manner.

During this phase, the principle of bi-directional flow of information is critical. Any feedback from those who generate the data or who use the information should be incorporated to improve both the data and the EMIS system as a whole.

Decision-Making

EMIS does not make decisions or solve problems. People are required to do this. However, EMIS should provide information that supports the decision making process. For that to happen, EMIS should be structured for and have support personnel to assist with:
▼ Identifying possible problems or weaknesses in decision-making processes
▼ Identifying possible solutions
▼ Accessing and providing the information required for problem solving and decision-making
▼ Analysing how one possible decision might impact on another decision
▼ Simulating possible solutions and their likely results and effect
▼ Provide early identification of possible system failure and/or problems

An important aspect of this phase is that EMIS information is used to support and inform the dialogue at all levels of the education system. If this happens, decision makers will have more available for them to make better and informed decisions.

Tracking, Planning, Policy Formulation, Monitoring & Evaluation

Throughout the process, EMIS information should be used to:
▼ Track progress towards targets
▼ Inform planning and policy formulation
▼ Monitor and evaluate any growth or improvements made

EMIS information needs to be used regularly for measuring the impact of policy on delivery and informing new decisions. The results of the tracking and monitoring analysis may mean that policies and programmes of intervention will need to be changed to better suit the needs of the system or avoid problems and obstacles encountered. In this way information is being used well to improve the efficiency and effectiveness of the education system.

If EMIS databases are computerized and programmed to provide the required information at appropriate intervals, and if they are used regularly, they can be used to generate early warning signals about troubles to come in the education system. Unfortunately this is not the case with most EMIS systems in Africa. Very little serious analysis is undertaken or value added to data. Since information is either incomplete and patchy or not up to date, many decisions are taken and programs introduced based on estimations, unfounded assumptions or invalid projections. All the while, however, management of education goes on, still needing to generate reports about constant monitoring or implementation of new policies or strategies.

2. HIV/AIDS AND EMIS

Although information is necessary for planning quality education, data alone cannot improve quality (Levin, Windham and Bathory 1990:71). At best, the availability of appropriate information is a necessary condition for improvement, but not a sufficient one. An EMIS system can provide information in the form of indicators of quality education, and when that information is used to guide decision-making, the quality of education will begin to improve.

HIV and AIDS have potential to impact on the education system in a number of important ways that affect quality education. Achieving development goals such as universal primary education is under threat from HIV and AIDS. In addition, an annually distributed survey form cannot capture the diverse ways in which the epidemic will impact schools. Nevertheless, variations in school enrolment, attendance and educator attrition for example, should be tracked on a regular basis. Education managers need and should have access to more and better data from the school and district level. This can be made possible by reviewing EMIS and how it currently operates.

2.1 DATA NEEDS

Some of the important areas of impact to consider in so far as HIV/AIDS and education management are concerned, include:

▼   Changing enrolment
▼   Increasing drop-out/drop-in rates
▼   Decreasing retention and transition
▼   Increasing number of orphans
▼   Teacher and general education sector workers and employees absenteeism, attrition and relocation
▼   Loss of experience, quality and contact
▼   Reduced school graduation and higher education entrance among strong students
▼   Post-graduate attrition and levels of skills in the workplace
▼   School revenue collection

It is important for the Ministries of Education to be able to monitor all of these areas of impact, in a way that allows a rapid response if needed. Ideally, information and monitoring systems should be able to generate a set of early warning signals to identify systems, districts and institutions threatened with severe dysfunction and that require intervention. Different areas may be impacted on differently. Monitoring impacts so that interventions can be made will protect pupils and employees. Data and analyses disaggregated by gender, age and socio-economic status should be used where feasible to guide responses, and clarify key gender-related and other equity issues raised by HIV and AIDS.

2.2 MANAGEMENT INFORMATION SYSTEM IMPLICATIONS

Besides the important issue of what information to collect, there is also the issue of how to collect it, which may be done in a number of different ways. A useful framework is to classify the information by the method used to collect data and the level at which it is analysed. This would include the following:

Routinely collected data analysed at a national level, including the Annual Return, Annual Census or Annual School Survey, and other national surveys. Instruments used for these surveys should be scrutinised to ensure that they capture HIV/AIDS-appropriate information. This is discussed in tables below.

Routinely collected information analysed at sub-national levels. There is increasing recognition that data collected at school level, which is analysed and used at a school, cluster/circuit or district level, is crucial to develop timely and appropriate responses to the AIDS epidemic.

Analyses of secondary data. In some cases other organisations may have collected data that is relevant for the Ministry. Examples of this are illness and treatment cases and death data collected and held by medical insurers and pension fund managers. The Education Ministry may want to keep track of these sources, to complement its own information.

The use of sentinel sites, where more intensive research is done. This is likely to be particularly important to assess new interventions such as orphan support mechanisms. Research targeted at answering specific questions. This could include KAP surveys and targeted HIV sero-prevalence surveys.

Qualitative research or monitoring. This is likely to be critical to understand AIDS impacts that may not be adequately revealed through quantitative analyses. This may be incorporated into routine management through development of instruments that, for example, enable school inspectors to elicit qualitative information from staff and students.

Adverse events monitoring. This is likely to be critical to understand AIDS impacts that may not be adequately revealed through quantitative analyses. This may be incorporated into routine management through development of instruments that, for example, enable school inspectors to elicit qualitative information from staff and students.

Some considerations in tracking HIV and AIDS impacts are presented in two tables below. They are drawn from experience in Botswana, a high HIV prevalence country. Table 1 and 2 illustrate the potential of routinely collected indicators to monitor AIDS impacts among pupils and personnel respectively, and point to areas where special surveys or alternate strategies to collect data may be needed. This is a relatively comprehensive list of data needs, and will need to be prioritised in consultation with various stakeholders so that EMIS meets national, district and/or local requirements.

Table 1: Potential Indicators to Track Impacts on Pupils

INDICATOR	PRIORITY	COMMENTS
Enrolment The number of pupils officially registered to attend daily lessons at school constitutes the enrolment.	✓✓✓	Numbers about pupils enrolled are routinely collected in the Annual Return. However, the establishment of sentinel sites and repeat surveys including questions on enrolment, attendance and progress through the school system, may be warranted to allow tracking of enrolment over time. Ministries should strive to identify schools where lower pupil numbers stem from social and economic HIV and AIDS impacts on households. Furthermore, school enrolment data from the Annual Returns should be interpreted together with drop-out and transfer data.
Drop-outs and re-entrants Drop-outs are children or youths of school-going age who were once enrolled at school but have since interrupted their schooling and cease to attend classes. When those who previously dropped out resume their education by re-enrolling at school, they are referred to as re-entrants.	✓✓✓	Overall numbers by grade and gender are generally collected in Annual Return forms, but overall data may hide growing disparities at school or district level. As mentioned earlier, with any annual survey there are difficulties in accessing up to date information. It may be appropriate to expand data collected on drop-outs and re-entrants in the Annual Return form, as this is likely to become a more important indicator of sector performance and challenges. Monitoring drop-outs and out-of-school youth through sentinel sites and repeat surveys will be important to assess educational needs of these children, as needs may be more appropriately met outside the formal school system e.g. for over-age youths. Finally, incentive schemes to reward schools which assist drop-outs to re-enter the formal system or other forms of education may be appropriate so as to encourage school management to monitor and support drop-outs.
Transfers This indicator refers to the number of pupils who, in a given year, moved their enrolment away from one school in order to enroll and attend classes at another school.	✓✓	Data on transfers may be collected through Annual Return forms, but such surveys may not capture all relevant movement between schools. It is important for Ministries also to consider comparisons of transfers into and out of schools in order to monitor the success of referral systems between schools.
Repetitions The number of pupils who are attending classes of a given grade for a second year because they were not promoted to attend classes for the next grade.	✓✓	Data on repetitions may be collected through Annual Return surveys. This can be a useful indicator of the impact of HIV and AIDS or other socio-economic issues on student performance.
Transition rates This indicator refers to the number of pupils progressing on the	✓✓✓	Data about rates of transition may be available from Annual Return surveys. Typically, drop-out at key transition stages e.g. between Grade 9 and Grade 10, may point to an important manifestation of HIV and AIDS impact. As higher level transition is often strongly influenced by availability of places rather than

HIGH PREVALENCE IMPACT INDICATORS   cont....

completion of a grade to the next grade, and/or progressing from one key stage or phase in schooling to the next.		demand, Ministries should consider tracking cohorts of pupils to check whether the best quality candidates are progressing or liable to drop out due to socio-economic and HIV and AIDS factors.
Absenteeism The number of pupils not attending school daily, based on the number of school days in a given period.	✓✓	This level of information is not usually captured in Annual Return forms, even though absenteeism is thought to strongly influence pupil performance. Absenteeism is recorded at school level, but the quality and availability of data to track trends is uncertain. Tracking absenteeism is possibly feasible as part of action-linked district or school level management information systems. The relevance of prolonged or frequent absenteeism information as an early warning signal of impending drop outs should be explored.
Pupils with special needs, including OVC Pupils with needs that require an appropriate specialised response from the schooling system.	✓✓✓	Many Ministries' Annual Return forms request names and details of pupils with special needs. This system should be reviewed to assess the efficiency and usefulness of this approach and consider variations on it in the Annual Survey for tracking Orphans and Vulnerable Children (OVC). Orphan registers with details of individuals are probably only feasible and useful at school level, but reporting overall numbers of OVC (categorised by particular types of vulnerability) at district level is probably critical. In addition, it is important to develop reliable indicators for early identification of vulnerable children for routine use at local level. Registries of OVC compiled by social workers and some schools, can be used to better design instruments that assess care, support needs and trends. Ministries may consider closer tracking of education outcomes among special needs children who may be more vulnerable to HIV and AIDS impacts.
Other indicators of education quality e.g. examination results as school performance indicators	✓✓✓	Pass rates usually recorded on Annual Return forms, and are important independently of HIV and AIDS impacts. However, it is important to monitor trends at individual schools or district level, which may be hidden in aggregated national statistics. Ministries could consider studies to identify any correlations between performance and indications of teacher illness or orphan rates in preceding years. However, qualitative information on school performance among orphans may be important to consider (for example, the effects of grief and stress on their performance).
Indicators of quality in the school environment e.g. Counselling rooms and School safety	✓	Information about special facilities, such as counselling rooms, and school safety indicators are not often included on Annual Return forms, though it is relevant in the era of HIV and AIDS. Given the importance of keeping children infected and affected by HIV and AIDS at school, Ministries may include infrastructure and environment on the Annual Return form e.g. lighting and incident reporting, which provide important information on suitable conditions and levels of safety and support at school.
Age range in classes The range between youngest and oldest pupils enrolled for a particular grade.	✓	This is available from existing Education Management Information Systems. Increases in late enrolments, temporary drop-out and failure rates may significantly increase the range of pupil ages in classes. This may have implications for the teaching process and approaches, as well as for high risk sexual activity among pupils.

HIGH PREVALENCE IMPACT INDICATORS

Table 2: Potential Indicators to Track Impacts on Teachers and Monitor Responses

INDICATOR	PRIORITY	COMMENTS
Rates of HIV infection amongst teachers	✓✓✓	Ministries should strongly consider anonymous HIV sero-prevalence surveys to validate the findings from projections, and to mobilise support for responses. In reality, however, system-wide HIV testing is unlikely to be a priority. Data on repetitions is available from Annual Surveys, and may be a useful indicator of the impact of HIV/AIDS and other socio-economic issues on pupil performance.
Teacher and support staff attrition due to ill health, death and other causes	✓✓✓	Information on teacher mortality can be requested in Annual Returns, in addition to information on numbers and causes of teacher deaths. It is critical to consider the analysis of the school or district level to assess the severity of impacts which may be hidden in aggregated national statistics especially when there is a delay in publishing national data. Ministries should also strengthen information systems (e.g. through exit interviews) to establish reasons for teacher attrition. Reasons for attrition that may be indirectly related to HIV/AIDS, such as skills shortages elsewhere in the labour market or stress, may become at least as important as death or illness as other reasons for attrition.
Teacher absenteeism	✓✓	This is important information but generally, reliable information is not available. A district level information system may provide more reliable information to inform planning, since it will allow for monitoring absenteeism in urban centres to which staff are reported to migrate to be closer to health care, and will allow an analysis of the causes to inform policy development e.g. around funeral attendance.
Time taken to fill posts of teachers and managers	✓	Time taken to fill vacant posts is generally not routinely tracked. This information may be key to planning that reduces disruption due to attrition and transfer, and the design of relief teacher systems.
Teacher work performance	✓✓	This qualitative information is likely to be important to understanding impacts of HIV/AIDS on educator performance.
Teacher workload	✓	This information should be monitored, especially in relation to specialist subjects (for example, Mathematics and Science).
Intake and output of teacher training	✓✓✓	For many Ministries, consolidation and routine tracking of intake and output of teacher training is required. In addition, analysis of trends in specific skills areas is likely to be critical. Finally, Ministries should attempt to monitor attrition during training and after graduation.
No. of teachers transferred on health and other grounds	✓✓	Ministries should monitor the number and geographical distribution of teachers' health and other transfers, and the resulting impact on the availability of scarce skills and equity of teacher distribution.

HIGH PREVALENCE IMPACT INDICATORS

This section has detailed the important issue of what information to collect, as well as the issue of how to collect it – which may be done in a number of different ways. Who will use the data is a further critical issue. As mentioned earlier, most EMIS systems currently collect data from schools and other learning sites on an annual or bi-annual basis. Local information, such as school information provided by head teachers, is generally returned to a central venue for capturing and processing. There is usually a lag of many months between when the data is reported and when it is captured and analysed. Feedback, in either electronic or paper form, is then channeled back through the different levels. It is usually said that the further that collection and analysis of data are from the source, the greater will be the delay in providing relevant information back to the local level. Sadly, in many instances the generators or suppliers of information never receive any feedback. This could have an adverse effect on their diligence the next time they are required to fill in a survey form.

In the context of HIV and AIDS, when Ministries need a system that provides early warnings, the annual survey methodology and coverage are insufficient. Many African countries have decentralised the management of schools without decentralising the management of information. HIV and AIDS provide an opportunity to accelerate the decentralised management of data so that the impact of HIV and AIDS at school and district levels can be assessed, and assessed more accurately.

3. CONCLUSION

This publication has provided a general overview of EMIS, how it can function and operate, and the purposes it can serve. In addition, the challenges and concerns that HIV and AIDS have for EMIS have also been explored, together with a consideration of new data needs. Ways to strengthen the data collection tools of a central EMIS system were considered, and a decentralised EMIS system was explored. The second publication in this series focuses on the advantages of decentralising parts of an EMIS system. It considers issues of designing and implementing a district level management and monitoring information system that can produce monthly reports on indicators of HIV and AIDS impact. It provides a closer look at the data collection tool than does this publication, and provides a step-by-step implementation guide for those considering whether to introduce it in their education systems.

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