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The immunization data quality self-assessment (DQS) tool

Immunization, Vaccines and Biologicals

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The data quality self-assessment (DQS) has been developed subsequently to the immunization data quality audit procedure (WHO/V&B/03.19), which was designed for use for the Global Alliance for Vaccines and Immunization (GAVI). The DQS has been tested in a number of countries (Nepal, Morocco and Togo) in which local support and feedback was extremely useful and appreciated. Respective WHO regional and country offices and ministries of health (immunization divisions) of these countries are deeply acknowledged. Financial support from GAVI has contributed to the design and testing of the DQS.

Abbreviations

AD	auto-disable (syringe)
AEFI	adverse events following immunization
BCG	bacille Calmette-Guérin (existing TB vaccine)
DTP	diphtheria–tetanus–pertussis vaccine
DQS	data quality self-assessment
HU	health unit
MOH	ministry of health
NA	not available
NGO	nongovernmental organization
NID	national immunization day
OPV	oral polio vaccine
QI	quality index
QQ	questions on quality
RED	Reaching Every District
SE	standard error
TT	tetanus toxoid
UNICEF	United Nations Children's Fund
VVM	vaccine vial monitor
VPD	vaccine-preventable disease

Executive summary

What is the DQS? The DQS is a flexible toolbox of methods to evaluate different aspects of the immunization monitoring system at district and health unit (HU) levels. Immunization "monitoring" refers to the ***regular ongoing*** measurement of the level of achievement in vaccination coverage and other immunization system indicators (e.g. safety, vaccine management). Monitoring is closely linked with reporting because it involves data collection and processing.

Target audience. This document is to be used primarily by staff who will adapt the toolbox for a specific area (usually staff at national and regional levels). The adapted tool should then be used by staff collecting and using immunization data at the national, provincial or district levels.

Uses of the DQS. The DQS aims to assist countries in diagnosing problems and to provide orientation to improve district monitoring, as highlighted in the Reaching Every District (RED) approach.

The DQS aims to determine:

- the ***accuracy*** of reported numbers of immunizations, and
- the ***quality*** of the immunization monitoring system.

The assessment includes a review of data accuracy at different levels and a self-designed questionnaire reviewing monitoring quality issues (e.g. availability of vaccination cards, use of tally sheets, directly-observed recording and reporting practices). These are then analysed, strengths and weaknesses identified, conclusions reached and practical recommendations made. These recommendations aim to improve the use of ***accurate***, ***timely*** and ***complete*** data for action at all levels.

How is a DQS performed? One approach is to hold an initial national participatory DQS workshop involving key people from the national and district levels to review country monitoring practices and design a self-assessment. This workshop is immediately followed by a practical assessment in a number of districts and health units to provide a self-diagnosis of the monitoring system of the country. Other approaches can be developed and self-assessments can be designed and conducted without this preliminary workshop.

The final goal of the DQS is to integrate into routine practice the tool options that are most relevant for a country so that constant attention is given to improve monitoring practices and management of immunization activities.

How to use this document? A number of options for evaluating monitoring processes are presented in this document. They should be explored, selected and refined according to specific needs. The DQS does ***not*** aim to be standardized across countries. The same flexibility is required when selecting where to conduct the DQS in a country.

A. Introduction

The data quality self-assessment (DQS) consists of a flexible toolbox, designed for staff at the national, provincial or district levels to evaluate different aspects of the immunization monitoring system at district and **health unit (HU)** level in order to determine the ***accuracy*** of reported numbers of immunizations and the ***quality*** of the immunization monitoring system.

In this manual, monitoring refers to the measurement of the level of achievement in vaccination coverage and other system indicators (e.g. safety, vaccine management, etc). Monitoring is linked closely with reporting because it involves data collection and processing.

The options described in the toolbox (Section B) should be explored, selected and refined according to specific needs. The tool does not aim to be standardized across countries. The same flexibility should be applied for the selection of DQS sites, which is discussed in Section C.

The DQS aims to diagnose problems and provide orientation to improve district monitoring and use of data for action, as highlighted in the Reaching Every District (RED) approach.[1] Basic knowledge of Excel is helpful when entering and analysing collected data but the self-assessment can be conducted without computerized support. To date, two Excel workbooks are available for different components of the toolbox (Section D).

The approach described here to introduce the DQS concept in one country is through a national participatory workshop (see Section E) involving key people from the national and district levels. This workshop is immediately followed by an assessment in a number of districts and HUs that provides a self-diagnosis on the monitoring system of the country. Other approaches can be developed and self-assessments can be conducted *à la carte*.

The **final goal** of this assessment tool is to integrate the options that are most relevant for one country into routine practice (Section F) so that constant attention can be given to improve monitoring practices and management of immunization activities.

[1] *Increasing immunization coverage at the health facility level.* Geneva, WHO, 2002 (WHO/V&B/02.27). RED is a global strategy aimed at increasing coverage and decreasing drop-out rates. It is a five-part strategy: reaching the underserved, providing supportive supervision, increasing use of data for action, increasing micro-planning capacity at district levels and using local populations in planning immunization sessions.

B. Immunization data quality self-assessment toolbox

1. DQS options: overview

The DQS toolbox proposes several options to assess different aspects of the monitoring system at different levels.

Table 1. Description of the main areas a DQS can assess

Option	District	Health Unit	Main measures
Assess reporting accuracy	X	X	Accuracy ratio
Assess recording accuracy (sample in the community)		X	Accuracy ratio
Assess completeness/ timeliness of reporting	X	X	Completeness of district reporting (%) Timeliness of district reporting (%) District report availability at national level (%) Completeness of HU reporting (%) Timeliness of HU reporting (%) HU report availability at district level (%)
Assess the quality of the monitoring system	X	X	Quality index (QI) scores
Assess the quality of immunization card recording		X	Integrated in the QI
Estimate vaccine wastage	X	X	Unopened vial wastage at district store level Opened vial wastage at HU level

2. Data accuracy

2.1. Assess reporting accuracy

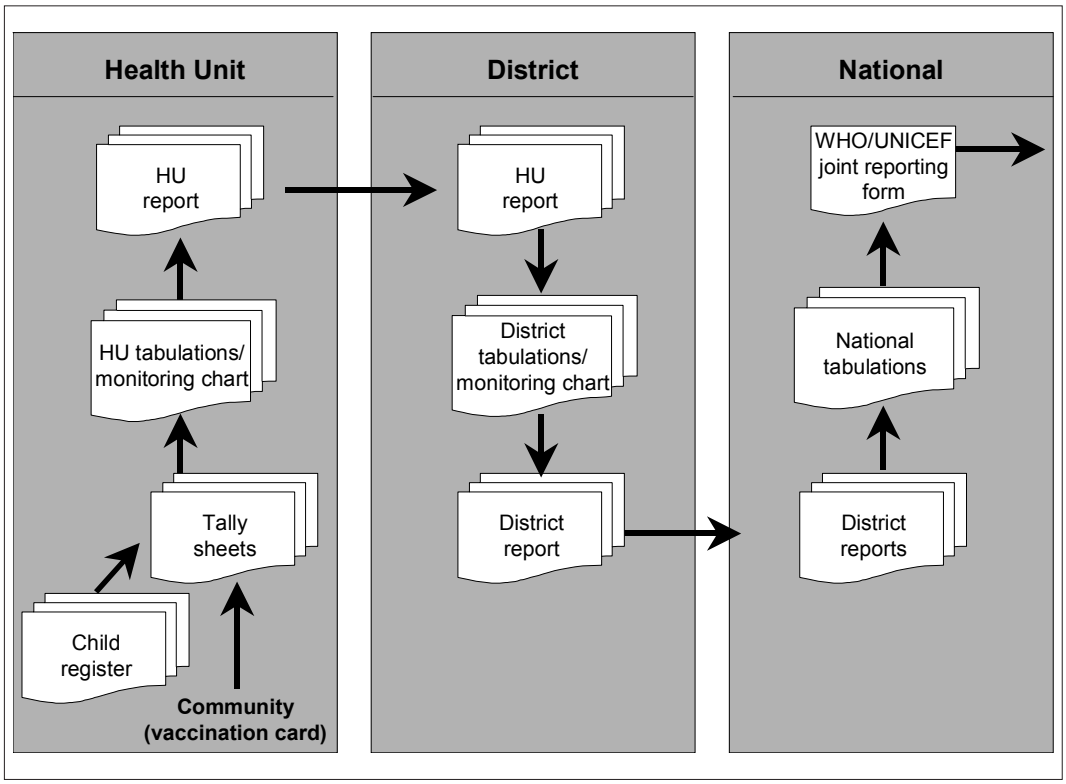
The principle is to verify the reported information on coverage data, that is, to compare the data available from one level (a form, report, chart, etc.) against the same information that has been collated or reported at a more central level. "More central" should be understood as higher in the data flow: it could be in the same facility (e.g. tally sheets against registers in the same HU) or between two different facilities (e.g. registers at the HU against monthly reports found at the district level). A description of a typical data flow follows (para 2.1.1).

This exercise is critical because it provides an opportunity to evaluate coverage data accuracy and correct it. But also, by looking at data and the associated work, it is an appropriate gateway to stimulate discussion on the use of the tools and the meaning of the data; it also motivates staff concerned with data entry and use.

2.1.1. Description of the administrative immunization-reporting system flow

A typical reporting flow of immunization coverage data is shown in Figure 1. In some countries there may be, in addition to the district level, other intermediate levels between district and national, such as the province, governorate, region, zone, or state as well as intermediate levels between HU and district (subdistrict, etc).

Figure 1: Reporting flow of immunization coverage data



The flow of information begins at the **HU** level. An HU is defined as the administrative level where the vaccinations are first recorded; it might include private health facilities, facilities of nongovernmental organizations (NGOs), hospitals, or a simple health post. Typically, when a health worker administers a dose of vaccine, the date of vaccination is immediately recorded on the *child's individual vaccination card* and on the *immunization register* and the dose is tallied on an appropriate sheet allowing for the easy re-counting of all doses provided. The individual vaccination card is either kept in the HU or (preferably) stays with the child's caretaker (in the community) while the register and the *tally sheets* are archived in the HU.

HUs usually report to a district health office on a regular basis (monthly or quarterly). The *HU report* includes the number of doses of every antigen given during the reporting period. To prepare the report, an HU officer obtains the number of doses administered from the tally sheets. Alternatively he/she uses the child registers to count the doses administered and put the added figure in the report.

The HUs should keep a copy of all reports sent to the district. The HUs should display the cumulative number of doses administered in a graph on display to monitor the progress towards coverage targets (Annex A, the monitoring chart).

At the **district office** level, administrative personnel receive the reports, log the date they are received (e.g. on a completeness and timeliness chart – see Annex B), and follow up on late reports. They then aggregate the information from all the HUs they oversee and send a periodic *district report* to the national level (or to the next intermediate level - if one exists). *Tabulations* (number of doses reported by each HU) are made (computerized or not) to allow for the calculation of the district totals. Copies of the reports sent to the national level are kept in the district office.

At the **national** level (national headquarters of the national immunization services/ programme), tabulations collating the district report information are made. Subsequently, the country sends the national data to the international community as an official report to WHO and UNICEF (available under the immunization coverage link found in each www.who.int country profile pages).

Important note: In parallel with the upward flow of information, data should be analysed at each level and fed back to appropriate levels so that the information is used for direct action.

It is important to note that the availability of all the forms is subject to many factors, including the national policy in use. It is recommended that reports and registers should be kept for a minimal period of three years after the end of the calendar year they have been used.

2.1.2. Selecting the information to be assessed

To check that reported immunization coverage data are precise and accurate, a number of verification processes can be undertaken and virtually all possible sources of information (those described in Figure 1) could be retrieved and verified, i.e. compared with another source. Therefore, in order to save time and resources it is important to determine:

- which level (or levels) need to be checked against other level(s);
- which antigen (may include any antigen: infant, maternal vaccination or any other supplement e.g. vitamin A) will be verified;
- which documents (form/report) need to be retrieved for each level and where on the form/report the information should be looked for;
- which time period the verification will cover. This provides a good idea of a system. A full year is preferable i.e. the whole previous year. However, local factors will influence this decision, such as a change in the reporting system, time available, availability of forms, etc.

In addition, an agreement needs to be made in the case of missing information: should one document not be available, it can be considered either as zero information (0 dose verified) or as unavailable information (NA). In the former case, the information to which it is compared is kept. In the latter, the information, to which it is compared is disregarded. An alternative in the case of missing information is to check for the same information in another document (e.g. in case of an HU report missing at the district level, replace it by the HU report available at the HU level).

Note: The levels selected below include the district and HU levels only, but the same principles apply should one or several intermediate levels exist.

2.1.3. Verifying coverage data sent by the health unit level

HU coverage data on the number of immunizations provided to the community is sent to the district on the HU monthly or quarterly reports. The data is potentially verifiable from the following sources:

- immunizations recorded in an immunization register;
- immunizations tallied on a form;
- monitoring charts describing the progress of the coverage of the HU throughout the year;
- meeting reports, feedback or feed-forward forms describing achievements.

The assessor will decide which source will be used to verify the information contained in the HU reports. The HU monthly or quarterly report can be retrieved at the HU or district level.

Accuracy of the HU sources can also be checked and bring useful information on the correct use of one or the other tool. For example, the verification of tally sheets against registers could lead to the finding that a higher number of tallied vaccinations are due to the poor recording in the registers.

Important note: Full understanding of the correct and recommended recording and reporting procedures is required when selecting the sources that will be verified. Recommendations do vary from country to country and this influences the interpretation of results.

***Example*:** In Zanzibar, according to the national policy, immunized children who do not belong in the target area of one health unit should be tallied (on a tally sheet), but not recorded on the health unit immunization register. Hence the comparison of re-counted immunizations in the register and in the tally sheet for the same time period might bring out discrepancies attributable to a correct practice (according to the national policy) and not due to poor recording.

2.1.4. Verifying the coverage data sent by the district level

There are two possibilities to verify the information that is collated by the district and sent to the more central level: (a) the information coming from HUs collated at the district level, and (b) the information sent by the district to the more central level. For the latter, the information reported to the more central level needs to be available.

a) A monthly or quarterly district report sent to the more central level (coverage data on the number of immunizations provided in all HUs of the district) is potentially verifiable from the following sources:

- all HUs (or subdistrict) monthly or quarterly reports (physical copy) that are sent to the district;
- tabulations (computerized or not) compiling the HU reports (or subdistrict reports);
- monitoring charts describing the progress of the coverage of the district throughout the year;
- meeting reports or feedback or feed-forward forms describing the achievements.

There needs to be a decision on which source will be used to verify the information contained in the district reports. The district monthly or quarterly report can be retrieved at the district or national level.

b) The district reports, district summary data or district tabulations may also be compared against district data available at higher levels. The sources at national level include the most recent national tabulations or the district reports (physical copy) found at national level.

2.2. Verifying in the community the accuracy of the recorded information available in a health unit

The only verifiable recorded information on individual vaccinations is the coverage information recorded on an immunization register. The principle is to check for discrepancies between infants or mothers vaccinated according to the register and those according to the child vaccination card (or mother vaccination card).

The exercise is not only useful in detecting overreporting or underreporting but also allows examination of the correct recording of immunization cards. It can also assess the proper use of the immunization register and allow an estimation of valid doses (i.e. doses given at the right time and with a proper interval).

In situations where the child was indeed vaccinated but the date put on the register was systematically wrong (for example because the health worker puts the date of planned vaccination instead of the actual date of vaccination), the exercise can provide an estimation of timely doses, i.e. given in the recommended time schedule, according to the information retrieved from the card.

The two following options can be proposed:

a) If the suspected problem is **overreporting** in the register, a sample of infants or mothers should be taken from the immunization register in the HU. Then the assessor can search for the children/mothers in the community to verify the information recorded (antigen, date of vaccination, etc).

b) If the suspected problem is **underreporting** in the register, a sample of children or mothers should be taken from the community. The assessor takes the available information (antigen and date of vaccination) from the immunization cards if the childen or mother and verifies it later in the HU register.

Card retention in the community may be a problem and the assessors need to agree on what to do in case of missing cards. It is recommended that the history of vaccination by parents' recall is used if a card is not available.

Similarly, the assessors need to think about which strategy to adopt if a child in the community cannot be retrieved – option a. Reasons may indeed include overreporting but also family move, temporary absence, etc. It is recommended to make every attempt (including contacting neighbours, administrative entity, etc.) to verify whether children recorded on a register exist.

In option b, the assessors should make sure that the vaccinations that are verified from immunization cards in the community have been provided by the selected HU(s) and not by other units so that they can potentially be retrieved in the registers.

Experience has shown that verification at the community level is a time-consuming exercise and a cheaper alternative can be to take infants coming to the HU. With this method, a balance is found between the number of children/mothers to be verified and the logistic and time constraints.

Selection of children/mothers in a register (option a)

A minimum of 5–10 children/mothers should be selected per HU. According to time and logistics, they can be selected from the register:

- from the same locality (to limit transportation costs) if the address is mentioned in the register;
- by retrieving x of the most recently immunized infants/mothers in the register (the most recent will be less likely to have moved from the area);
- by choosing randomly within a time period;
- or a combination of the above options.

Selection of children in the community (option b)

A minimum of 5–10 children/mothers should be selected per HU. According to time and logistics, they can be taken from the same locality (to limit transportation costs) or from different areas among the population covered by an HU. Once a village/area has been selected, it is recommended that the strategy developed in the immunization coverage cluster survey reference manual: *Immunization coverage cluster survey reference manual* (in print) is used to randomly retrieve the defined number of children/mothers. The age of the children to be retrieved should be in the range of the children recorded in the register. For example, if the HU registers from the last three years are available, children 0–36 months could be retrieved in the community. However, it is recommended that children 0–12 months are assessed (although taking one birth cohort only will take more time than several birth cohorts) in order to determine the current recording practice.

2.3 The measure (accuracy ratio)

2.3.1 Definition

The main quantitative measure of data accuracy is the ratio between the number of vaccinations verified or re-counted from a source at one level (numerator), compared to the number of vaccinations reported by that level to more central levels (denominator). This ratio gives the proportion of reported numbers that could be verified. It is expressed as a percentage. The antigen, the source of information and the time period will need to be defined.

Examples of accuracy ratios:

- ***Verifying coverage data sent by the HU level:***

$$\frac{\text{No. of re-counted DTP3 (0–11 months) in the HU register during given time period}}{\text{No. of DTP3 (0–11 months) reported in the HU reports found at the district level during same time period}} \times 100$$

- ***Verifying the coverage data sent by the district level:***

$$\frac{\text{No. of TT2+ reported in all HUs of the district (as in the HU reports found at the district level) in year Z}}{\text{No. of TT2+ reported by the district in the same time period}} \times 100$$

- ***Verifying in the community the recorded information available in an HU:***

$$\frac{\text{No. of vitamin A doses recorded on immunization cards of children in the community}}{\text{No. of vitamin A doses recorded on the registers for the same children in the HU}} \times 100$$

Each time, the verified information (from the "lower" level in the data flow) is on the numerator and the reported information (retrieved from the "higher" level in the data flow) is on the denominator, so that:

- a **percentage < 100%** shows that not all reported information could be verified;
- a **percentage > 100%** shows that more information was retrieved than was reported.

It is theoretically possible to develop several accuracy ratios, basically for each level and source assessed against another one. The assessment should focus on accuracy ratios that are most relevant in order to avoid confusion with a high number of different accuracy ratios.

2.3.2 Interpretation

Possible reasons for low verification: accuracy ratio < 100%

Overreporting

- Intentional
  - Often linked with pressure from a higher level
- Non intentional
  - Inclusion of vaccination conducted outside target group
  - Reporting of doses used instead of immunizations
  - No use of standard tools to adequately report the daily number of immunizations performed
  - Transcription or calculation error

Loss of verifiable information

Possible reasons for very high verification: accuracy ratio > 100%

Underreporting

- Reports not complete at the time of forwarding
- No use of standard tools to adequately report the daily number of immunizations performed
- Transcription or calculation error

Loss of information

These lists are not exhaustive.

2.3.3 Aggregating the accuracy ratios

The exercise of extrapolating values (*e.g. HU values*) to a level (*e.g. to the district level*) to obtain a **valid** estimate for that level is only correct either when all facilities of this level (*all HUs of the district*) have been assessed or when the selection of facilities (*e.g. selection of 3 HUs*) has been unbiased, i.e. randomly conducted. If this is not the case, it may be preferable not to aggregate the accuracy ratios and interpret them according to the local situation. Section C describes the site-selection options.

2.3.3.1 To aggregate the **same** *accuracy ratios (same level)*

If the assessment has been conducted in a number of districts and health units, it is possible to aggregate the same accuracy ratios in order to obtain a national ratio (when the district or provincial ratios are aggregated), or a district figure (when HU ratios are aggregated). The principle is to **weight** each district/HU according to its importance – in terms of total target population – which can also be estimated by the number of vaccinations reported during a year.

In the following example, an accuracy assessment has been conducted in two randomly selected HUs in each of three randomly selected districts of province A. The vaccinations (one determined antigen) re-counted in the registers of six HUs from the three districts were compared to the reports sent by the respective HUs for the same time period. Table 2 also shows the total number of vaccinations that were reported by each district during the same time period. Table 2 also shows the total number of vaccinations that were reported by each distribut during the same period.

We would like to get an estimate of the HU registers/HU reports accuracy-ratio for Province A (see Table 2).

Table 2: Findings of accuracy assessment (HU registers/HU reports) in six HUs, province A

District (target population)	HU	Re-counted number of vaccinations in the HU register	Reported number of vaccinations by the HU	HU accuracy ratio	Target population of the HU	Weight of the HU in the district sample
1	1	315	336	94%	447	58.2%
(5000)	2	280	275	102%	321	41.8%
2	3	125	154	81%	151	43%
(3000)	4	120	139	86%	200	57%
3	5	60	54	111%	81	48.5%
(1000)	6	78	79	99%	86	51.5%

First, we will obtain an accuracy ratio for each district, giving each HU its respective weight. The weight of each HU corresponds to the proportion of HU population out of the total sample:

e.g. for District 1, the weight of HU1:

= 447 / (447+321)

= 58.2%

Then the District 1 accuracy ratio is:

$$\left(\frac{315}{336} \times 58.2\%\right) + \left(\frac{280}{275} \times 41.8\%\right) = 0.97 \text{ or } 97\%$$

Then, to obtain a provincial estimate, the weight of each district will be taken into account. Each district accuracy ratio should be multiplied by the proportion of the district in the province in a similar calculation:

$$\left(\frac{5000}{9000} \times 97\%\right) + \left(\frac{3000}{9000} \times 84\%\right) + \left(\frac{1000}{9000} \times 105\%\right) = 0.94 \text{ or } 94\%$$

which is the provincial HU registers/HU reports accuracy ratio estimate. One ***should not*** simply take an average of the three accuracy ratios of the three districts to obtain a provincial accuracy ratio such as: $\frac{97 + 84 + 105}{3} = 0.95$ or 95%. This is because the weight of each district should be taken into account.

2.3.3.2 To aggregate accuracy ratios from different *levels*

One can also combine the accuracy ratios of two different levels to provide an overall accuracy figure. The basic principle is to **multiply** the ratios. Procedures to obtain an estimate for one level should have already been conducted as described in 2.3.3.1.

In the following example, the two accuracy ratios for the same antigen and time period:

register HU / reports HU found at district, i.e. $\frac{regHU}{repHU}$

and

copies of all district reports found at the district/district data found in the national tabulation, i.e. $\frac{repDIS}{tabDIS}$

are multiplied to provide one accuracy measure:

$$\frac{(regHU)}{(repHU)} \times \frac{(repDIS)}{(tabDIS)}$$

For example: (94%) x (97%) = 0.91 or 91%

2.3.4. Calculating confidence intervals around an accuracy estimate

- If facilities assessed have been randomly selected, the aggregated measure of the sample can be inferred to the whole area with **confidence intervals** around the estimate. In the case of a 95% confidence interval, one can say that there is a 95% chance that the interval will include the population parameter. Confidence intervals are constructed using the standard error (SE), characterizing the variability of the sample statistic. The basic formula proposed here for the calculation of upper and lower bounds for 95% confidence intervals around an accuracy ratio is:

  $P \pm 1.96 \times SE(p)$

Where

$$SE(p) = \sqrt{\frac{P \times (1-P)}{N}}$$

P is the accuracy ratio

N is the total sample size (reported values)

2.4. Designing the assessment forms for data accuracy

Once the team has decided which antigen (including vitamin A) to verify and the time period that will be verified, ad hoc forms should be designed allowing for easy data collection on site. The following four tables (Tables 3, 4, 5 and 6) present standard collection sheets that can be locally adapted.

Table 3 corresponds to paragraph **2.1.3: verifying coverage data sent by the HU level**. As it is designed, the assessor can tally in the row "*Register (tally)*" the number of re-counted immunizations and put the re-counted monthly figure in the column"*Register (total)*". Tally sheets can also be verified. The assessor may indicate whether the re-count is based on complete available information or not (e.g. if one register or some tally sheets were lost), and may then base the ratio re-counted : reported on the full amount of months ("Total" column) or on those selected months [column "Total (selected months)"] where they are sure the information was fully available.

The information can be verified against the HU reports available at the HU, aggregated data tables (if the HU had to aggregate the information) in HU tabulations, HU reports available at the district level, or in tabulations (aggregated data tables) of the district.

A number of accuracy ratio options are presented in Table 3 but it should be decided which are going to be the most relevant.

Table 4 corresponds to (a) under paragraph **2.1.4, verifying the coverage data sent by the district**. It assesses whether the monthly totals of the HUs (as found in the HU reports) correspond to the figure aggregated and sent by the district to the higher level. It can also be used for assessing the availability of HU monthly reports at district level. It should be adapted for the number of HUs in the district, number of months for which the HU reports are checked, etc.

Table 5 corresponds to (b) under paragraph **2.1.4, verifying the coverage data sent by the district**. It compares all sources of information for the reported district figure, either at district or national level. Again, the appropriate accuracy ratio(s) should be chosen.

Table 6 corresponds to option (a) under paragraph **2.2, verifying recorded information available in an HU**. It aims to compare immunizations recorded in a register to those recorded on the immunization cards (community level). The example here aims to retrieve 10 children from an HU register for a specific antigen.

Table 3: Collection sheet for accuracy of health unit record versus report[a]

Indicate the antigen: _____ Indicate the year: _____

	Vaccinations – number retrieved:												Total	Total (selected months)[b]
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Register (tally the re-counted immunizations)														
Register (total)													a	a'
Month complete (Yes/No)														
Tally sheet													b	b'
Month complete (Yes/No)														
HU reports (HU level)													c	c'
HU tabulation													d	d'
HU report (district level)													e	e'
District tabulation													f	f

[a] If information not available put NA.

[b] For the column "Total (selected months)" it is optional to circle the months to be considered.

Accuracy ratios:

a/b: % a'/b': %

b/e: % b'/e': %

b/f: % b'/f': %

Table 4: Collection sheet for accuracy of district tabulation. Example for three selected months and two antigens[a]

Region: _____ District: _____

Monthly reports Year X	Antigen 1			Total	Antigen 2			Total
Health unit name	**Oct**	**Nov**	**Dec**		**Oct**	**Nov**	**Dec**	
HU1								
HU2								
HU3								
HU4								
HU5								
HU6								
HU7								
HU8								
HU9								
HU10								
HU11								
HU12								
TOTAL (calculated sum of HUs)				a1				a2

Total as sent by the district				**b1**				**b 2**

Date: _____/_____/_____

[a] Put NA if not available.

Accuracy ratios:

a1/b1: %

a2/b2: %

Table 5: Collection sheet for accuracy of district report[a]

Indicate the antigen: _____

Indicate the year: _____

	Vaccinations – number retrieved												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Reports (district level)													a
Tabulation (district level)													b
Reports (national level)													c
Tabulation (national level)													d

[a] If report not available put NA

Accuracy ratios:

c/d: %

b/d: %

Table 6: Data collection form for antigen X: from the register to the community

District: _____ Name of HU _____ Selected Village: _____

In the HU										In the community											
Serial No.	Register No.	Address	Name of child	Date of birth			Date antigen X vaccination (register)			Card possession		Date antigen X (card)			Antigen X vaccination history		BCG scar		Verified		Remarks[a]
				D	M	Y	D	M	Y	Yes	No	D	M	Y	Yes	No	Yes	No	Y	N	
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

Name of the interviewers _____ Team _____ Date of interview _____

[a] The "Remarks" column can be used to record whether the vaccination is timely, whether the dose is valid, etc.

3. Completeness/timeliness of reporting

Each district should be monitoring the completeness and timeliness of units reporting, as a quantitative core measure of the quality of the reporting system.

Completeness of HU reporting is defined as a percentage with the number of reports received in the numerator and the number of reports expected during a period of time as a denominator. This definition does not include the quality of reporting, i.e. whether a given report is complete (all fields filled in). This is addressed in the quality of the monitoring system.

Timeliness of HU reporting is defined as a percentage with the number of reports that were received on time (by the deadline set by the EPI office) as the numerator and the number of reports expected during a period of time as denominator.

During a DQS, a number of approaches can be adopted:

- These two measures are available at a more central level for a given district, and the assessment comprises verification of the measures provided by the district;
- These two measures are not available at a more central level for a given district, and the assessment involves getting the information available at the district.

In both situations, findings should be discussed in terms of causes, actions that have been taken to correct the problem, and solutions if the problem persists.

3.1 Verification of completeness and timeliness figures

- Reported completeness of HU reporting can be verified by re-counting the number of HU reports available at the district level for a given period. This is referred to as an indicator of the **availability** of reports, defined as the *proportion of reports physically available (retrievable) at the time of the assessment for a given time period divided by the total number of reports expected to be available*. Note that here, the non-available reports are excluded from the denominator but this could be discussed.
- Reported timeliness of HU reporting can be verified by looking at the date of sending/reception written or stamped on the reports. According to the national policy, this date can be +5 days or 1 week, etc. after the end of the reporting period. This is defined as the *proportion of reports physically available (retrievable) with a date stamped on time for a given time period divided by the total number of reports available*. Again note that the non-available reports are excluded from the denominator but this could be discussed. The notion "on time" should also be defined, depending on whether the assessor wants to be strict on a given timeline, or whether he wants to allow for some flexibility (deadline + x days). This verification obviously depends on the local policy to write the reception and sending dates on the report itself.

If the amount of time needed to verify each report of all HUs for one year is too high, an alternative is to choose randomly a number of months for which the information will be collected.

3.2 Obtaining the completeness and timeliness of health unit reporting for a district

The ideal situation is to obtain from a district a completeness/timeliness table (see Annex B) which should immediately provide the indicators for a given period of time.

If this is not available, the procedures described under paragraph 3.1 can also be done as a proxy for getting HU reporting completeness and timeliness figures. However, non-available HU reports may indeed not have been obtained from the lower level or may have been lost or destroyed (physically) by the district.

It is of particular interest for the national level to go into this option of the DQS; usually, the national level has an idea of the district to national completeness and timeliness but hardly knows the situation at the lower level (i.e. completeness and timeliness of HU to district level).

4. Assess the quality of the monitoring system

4.1 Overview

The assessment of the quality of the immunization monitoring system is based on questions or observations or exercises that can be posed or made or assessed at each visited level (district, sub-district, HU, etc). Each question should have a "yes", "no" or "NA" (not applicable) response so that they can be given a score according to the Yes or No response. A list of proposed questions for each level is presented in Annex C. These questions/observations/tasks can be grouped into the different assessed components of the monitoring system. Table 7 proposes a number of components of the monitoring system based on the usual steps of the collection and use of data.

Table 7: Proposed components of the monitoring system

District level	HU level
Recording Paper-form practices Computer practices	Recording
Archiving Paper-form practices Computer practices	Archiving
Reporting	Reporting
Demographic information	Demographic information
Core output / analyses	Core output/ analyses
Evidence of using data for action	Evidence of using data for action

The questions should be selected and revised according to each country situation. The grouping into components is also adaptable: these components can be used as well as other ones to be defined (e.g. availability of forms etc).

District data of the current and previous year should be analysed to identify and quantify causes of poor data quality and to find solutions. This will help to refine the qualitative questions that will be asked during the DQS process.

4.2 The measure – quality index

The quality index (QI) is a quantitative measure of the quality of each component of the monitoring system. In calculating QI scores, one to three points are given for each question answered or observation made or task performed correctly. Scores are calculated for each of the identified components, with the number of points corresponding to correct answers as the numerator and the number of possible scores as the denominator. A "no" scores 0, a "yes" scores from 1 to 3 according to its importance, and an "NA" is not recorded in the denominator. The overall QI is the proportion generated as the sum of all numerators and all denominators.

For each component and each level of the monitoring system, i.e. at district and HU, average scores can be obtained and standardized as a percentage or on a scale from 0 to 10.

The QI is the proportion of: $\frac{\text{scores for all questions answered "yes"}}{\text{sum of maximum scores that could be obtained}}$

How to determine the QI

Example of questions on quality (QQ) for HU level *reporting component:*

Q1: Have all the HU reports of the last year been sent on time to the district?

Q2: Are the HU reports correctly filled out?

Q3: Is the procedure for dealing with late reports known by the HU officer?

Q4: Is HU officer aware of the necessary form to complete if there is a report of a severe adverse event following immunization (AEFI)?

Q5: Were all the monthly reports from the HU signed by the HU officer for the current year?

	Possible score	Actual score	
Q1:	3	Yes	3
Q2:	1	No	0
Q3	2	No	0
Q4[a]	~~2~~	NA	–
Q5	2	Yes	2
TOTAL	8		5

QI = 5 / 8 = 62.5%

[a]If the HU officer was not trained in AEFI and did not receive the ad hoc forms, Q4 is NA and the possible score for Q4 is removed from the denominator.

The decision about which weight to assign to a question can be determined by asking each participant in the questionnaire to score the question, then divide the sum of the scores by the number of people in the team and choose the next round number to determine the weight (Table 8 below). The weights for each question should be agreed upon before the assessment.

Table 8: Method of assigning weights for each qualitative question in the DQS (scores in the table are examples, allowed range in the Excel tool is 1–3)

	Score Staff 1 a	Score Staff 2 b	Score Staff 3 c	Average score (a+b+c) / 3	Weight (rounding the decimal)
Q1	3	2	2	2.3	2
Q2	1	1	2	1.3	1
Q3	3	3	2	2.6	3
Etc…					

Once the QQs have been selected, a form should be printed in hardcopy for the field assessment.

5. Assessing the quality of immunization card recording (health unit level)

The assessment of the quality of the immunization card recording can be done during an immunization session: assessors ask the mother/father for filled cards after her/his child has been immunized and check whether the vaccination(s) were correctly provided and recorded. This is suggested in countries where the proportion of non-valid doses has been shown to be high (from coverage survey data).

If it is not possible to attend an immunization session it is also possible to conduct a "child immunization-card exercise", to simulate an actual immunization session. The child immunization card exercise requires advance preparation before arriving at the HU (Annex D).

To conduct the exercise, ask the vaccinator to complete a health card for a child who is supposedly brought to the HU on the day of the assessment. Then ask the vaccinator to determine the next return date. This will assess the vaccinator's abilities to determine what vaccines are needed for a child and to correctly complete the vaccination card. Annex D describes an example of exercise done for 20 children.

The observation and the exercise can be integrated into the quality index score and one should determine which score to give in case of successful and unsuccessful answers from the health worker (see QQs in Annex C).

6. Monitoring of wastage

6.1 Overview

Two options can be explored during a DQS at HU or district level:

- The **first option** is to go through the documents that provide information on vaccine wastage and *determine whether the wastage calculations and monitoring are understood and done correctly*. This can be assessed specifically or through QQs.

  Information about the number of used doses can usually be found in the following documents:

  – the HU/district vaccine ledger, describing all vaccine movements (shipments/deliveries and despatches), with the balance;
  – the HU/district monthly reports, where these contain information on the number of vials used at the HU or in the district (sum of the HUs).
  – stock receipts, invoices, etc.

  Questions can include enquiries about the availability of these documents, whether they have been correctly and completely filled in (e.g. recorded in the ledger, or reported in the monthly report); whether the wastage rate was monitored; and whether specific actions were undertaken. Annex C includes a list of proposed questions.

- The **second option** is to review the documents, allowing for wastage calculation for a specific time period, and *determine the vaccine wastage for the setting*. This second option allows you to obtain a figure for the HU or the district, discuss it, and promote monitoring of wastage based on real calculations.

6.2. Definitions

Unopened vial vaccine wastage can be calculated at the store level (district). [2]

At district level, the wastage of unopened vials falls mainly into the following categories:

- vaccines discarded due to vaccine vial monitor (VVM) indication,
- heat exposure,
- vaccines frozen,
- breakage,
- theft,
- vaccines discarded due to expiry dates,
- missing inventory.

[2] *Monitoring vaccine wastage at country level: Guidelines for programme managers*. Geneva, WHO, 2003 (WHO/V&B/03.18).

The last item corresponds to "unexplained number of doses not matching an inventory count" when one is conducted.

For example: on 1 August, according to the vaccine stocks ledger, the DTP balance is 3000 doses but the physical inventory of the refrigerator contents of that day records 2940 doses; the balance should therefore be adjusted to 2940 in the book, with a note that 60 doses are "missing". The 60 doses fall into the category of unopened-vial wastage.

The unopened vial wastage is calculated as the proportion of unopened doses wasted (numerator) out of the number of doses handled by the store (denominator), where:

Number of doses handled	=	Number of doses in stock at the beginning of the period	+	Number of doses received during the period

The information is usually available in the vaccine ledger of the district.

Additionally, the total vaccine wastage occurring in one district can be calculated from all figures coming from all HUs vaccinating in the district in addition to the unopened vial wastage at the district store. This calculation needs information from all HUs.

At HU level, the global vaccine wastage is calculated, corresponding to the wastage of **opened (administered wastage) and unopened vials**. Opened vials are those opened for vaccination, with a proportion of the doses being administered and the remaining being wasted.

The global vaccine wastage rate (%) = 100 - vaccine usage rate, where:

$$\text{vaccine usage rate (\%)} = \frac{\text{number of doses administered}}{\text{number of doses issued}}$$

and:

number of doses issued issued	=	number of doses in stock at the beginning of the period	+	number of doses received during the period	-	number of doses in stock at the end of the period

Interpretation

Whatever the figure found at any level, it is crucial to try to identify and discuss the main causes of wastage. The importance of monitoring wastage should always be stressed. The level of immunization coverage should also be taken into account in the interpretation: classically at higher coverage levels, including more difficult-to-reach children (e.g. through outreach sessions), the wastage rate is likely to increase, and a higher wastage figure may be more acceptable.

7. Monitoring of immunization safety

Immunization safety should be monitored by every district. Indicators should be defined and the information properly collected in order to be able to plan and take corrective actions.

Standard indicators for the monitoring of safety for a district include:

- proportion of HUs with AD syringes out of stock during the month;
- proportion of HUs with ratio: $\frac{\text{number of immunizations (injectable)}}{\text{AD syringe use}} < 1$;
- AEFI rate in the district (no. AEFI reported / target population of the district) given a time period;
- proportion of HUs with the ratio (Syringes used / Safety boxes used) < 100;
- proportion of HUs with incinerators / safe waste disposal;
- proportion of HUs reporting at least one needle-stick injury.

(This list is only indicative: it is not exhaustive and does not consist of a minimal set of necessary information.)

Options during a DQS may include the following.

1. *The verification that indicators have been effectively defined and that they are well monitored*. This can be done through QQs (see examples in Annex C, QQ 6, 21, 42 and 50 for the district level).
2. *The verification of the quantitative data collected which allowed for the calculated indicator.* This can be based on information available at the district or in selected HUs. A procedure similar to the verification of coverage data can be undertaken according to the selected indicator.

8. Denominators of immunization coverage

The different population groups targeted for routine immunization services are usually:

- infants (i.e. 0–11 months of age) for primary vaccinations, and
- pregnant women for TT vaccination.

Falsely high or low estimates of population numbers can introduce large inaccuracies in coverage estimates. District and locality denominators are often officially provided by a more central level, based on national statistics and census projection, but they may be inaccurate. It is therefore of great importance for the more peripheral levels (district and HU) to take into consideration local information to estimate and use a number for their populations that is as precise as possible. This can be done with the use of birth registries, local household census, etc.

In any case, the denominators should include the entire population living in the catchment area of the HU or the district, even in the case of moving populations, populations not registered, contraindications, etc.

Similarly, the denominators should not be determined in order to meet a local target. They should include the whole population of the area regardless of a target (i.e. a proportion of the total) set locally.

The DQS is assessing the denominator issue through the QQs in order to explore the understanding and practice (Annex C, QQs 23–31 for the district level, and QQs 29–32 for the HU level). These questions can of course be adapted and revised.

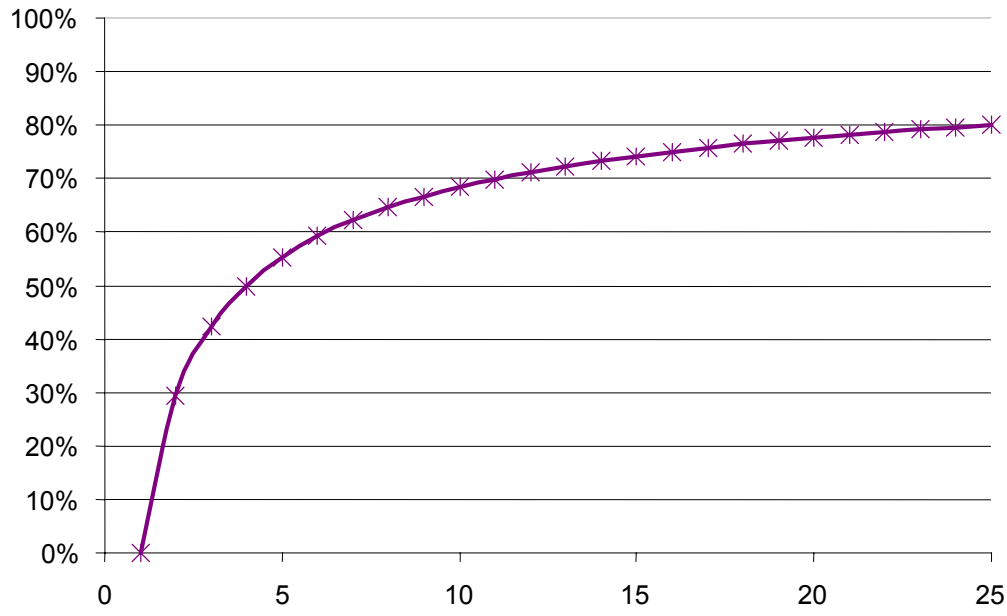
C. Where to conduct a DQS?

Ideally a DQS should be introduced in a country and conducted on an ongoing basis. In a district though, the number of sites to be visited is constrained by the desired precision and logistic issues, such as time available, the number of team members, distances, ease of travel, the ability to obtain security clearance in difficult areas, and the availability of vehicles, drivers and accommodation.

A choice of sites to be visited must be made. However, the greater the sample size, the more precise the results will be.

To provide a reasonable idea of the situation in one district, visits are recommended to at least three HUs per district, with a maximum of six HUs. Visits to more HUs are not are not recommended because this is not likely to provide additional information and will wastes resources. Figure 2 shows that the maximal reduction in the standard error (SE) – hence a higher precision, see para. 2.3.3.1 – is obtained when the sample size is increased up to six HUs; then, with higher sample sizes, the decrease of the SE is marginal. The DQS does not provide elements for sample size calculation as it is felt that the discussions behind all obtained figures is more important than the figures themselves. Common sense and logistic practicalities should dictate the number of visited places.

Figure 2: Standard error reduction (in %) according to the sample size (i.e. number of sampled health units)*



* Example calculating standard errors for a 1000 sample size per health unit with 50% accuracy ratio.

Alternatively, all districts/HUs can be assessed over a period of time by the higher level, for instance, as part of supervisory visits.

The selection of the visited districts or HUs can be done according to the following four options:

1) **Representative selection, based on random sampling:** This approach is based on the assumption that the selection of sites should be representative of the entire system if the recommendations are to be relevant to the whole system. This option has the advantage of providing estimates which can be applied to the district. It avoids any temptation to conduct the assessment in areas supposed to be very strong or weak. Annex D provides guidelines on how to proceed with random sampling.

2) **Representative selection within defined strata:** A stratum refers to a subpopulation of an entity. It may be defined in many ways, e.g. according to the importance of constitutional units (i.e. number of immunizations provided by an HU), its type [e.g. hospital/HU or urban/rural], its location.

   This option has the advantage of providing estimates which can be extrapolated to subpopulations. It is useful to differentiate problems and actions which can be different from one HU type to another.

3) **Convenient selection**. If a DQS is conducted in districts and HUs where data quality is suspected to be poor, it examines "the worst case scenario" within the district/country. This alternative method may be preferred as it has the greatest potential impact. In this approach, sites can be selected in cooperation with local staff who are aware of areas with potential problems.

   Potential problems in data quality, such as those outlined below, can be identified from district/HU data to orientate the selection:

   - inconsistencies in the reports from the district;
   - negative drop-out;
   - coverage >100%;
   - inconsistent coverage between antigens given during the same visit (e.g. big differences between OPV3 and DTP3);
   - poor completeness (missing reports);
   - poorly completed reports, including inaccuracies in sums or calculations ;
   - volatile trends (i.e. big changes from year to year);
   - poor timeliness of reporting;
   - discrepancies between survey and administrative coverage results;
   - poor card retention in coverage surveys;
   - incoherence between coverage and disease surveillance data;
   - incoherence between the vaccine wastage rate and district strategies;
   - proportion of the population vaccinated through outreach;
   - incoherence between the vaccine utilization or wastage rate and coverage figures (e.g. number of immunizations higher than vials open);
   - suspicion of overreporting (achievements systematically too close to target, discrepant achievements according to the antigen, etc).

   Poor data quality HUs/districts also include those where the turnover of health staff is high or where key posts are vacant. Supervision reports also indicate good or poor recording, reporting and monitoring practices.

4) **A combination of the above**. This approach combines the advantages of the problem-oriented approach and the fact that a selection bias for any "preference" can be avoided.

The conclusions drawn from the sample will need to take the sampling strategy into consideration. If the sample is not representative, then the results cannot be generalized; they can only be extrapolated to the structures which were sampled.

Findings obtained from one district cannot be extrapolated to other districts. However it is likely that common problems and difficulties are shared within a number of areas. Results could be disseminated through feedback reports and meetings so that solutions can be shared.

D. Present the DQS findings

The data quality assessment provides a certain amount of information on the status of records and practices related to the reporting system.

All options in the DQS toolbox provide quantitative measures which can be followed easily over time and used to compare different areas. The use of the tool will be particularly interesting when several districts can be compared or a district can be compared to itself over time.

Assessment findings should be presented and discussed to the level that was assessed but also to the national level so that lessons can be drawn and solutions proposed for the whole country.

1. Present the DQS results

1.1 Accuracy

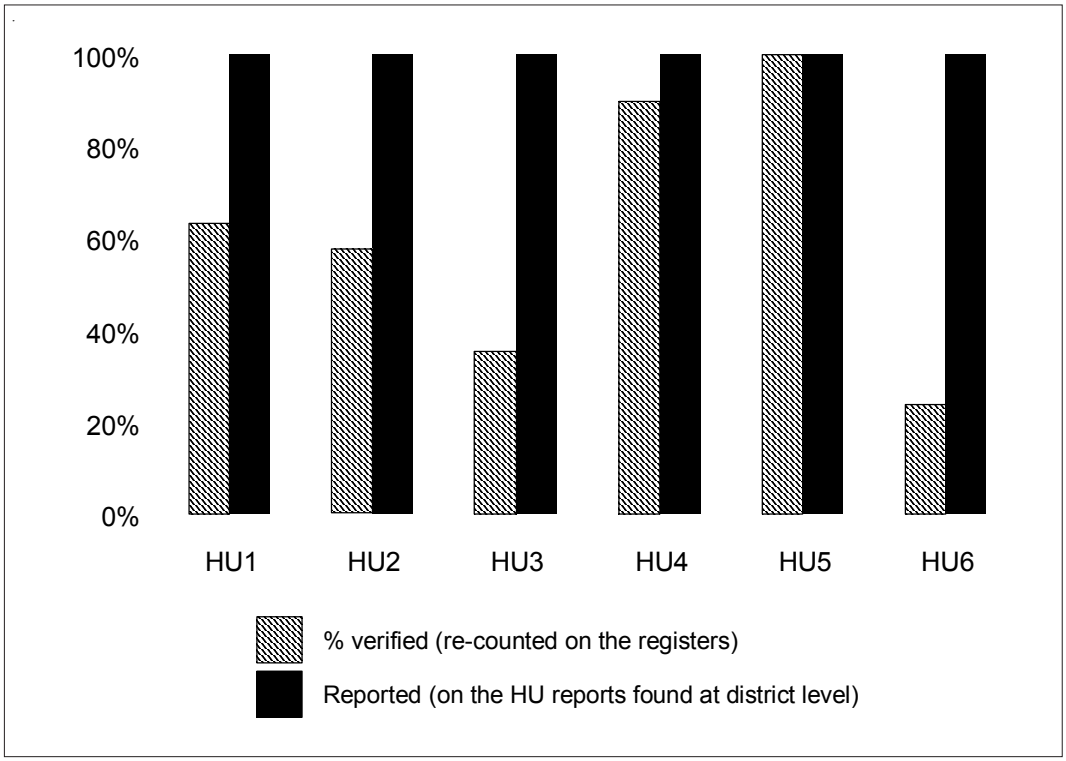
The raw figures and accuracy ratios can be presented in tables such as Table 9.

Table 9: Presentation of figures and accuracy rations

Accuracy of district tabulation, DTP3, year 2003 (October–December), district X	
• Total of HU reports • District tabulation • **Accuracy ratio**	• 3465 • 3545 • 98%
DTP3 re-counting at HU level (register against HU reports, year 2003) Based on 4 HUs, district X	
• Verified • Reported • **Accuracy ratio**	• 6848 • 10 845 • **63%**

Graphic presentations can be helpful to present and discuss the findings. An example is the use of a bar chart (Figure 3).

Figure 3: Example presentation showing the proportion of re-counted measles immunizations that were reported by 6 HUs in 2003, District X.



The accuracy can also be presented in terms of "accurate months" defined as months for which the verified information was perfectly accurate (100% match).[3]

For example, district W, 2003, measles vaccinations:

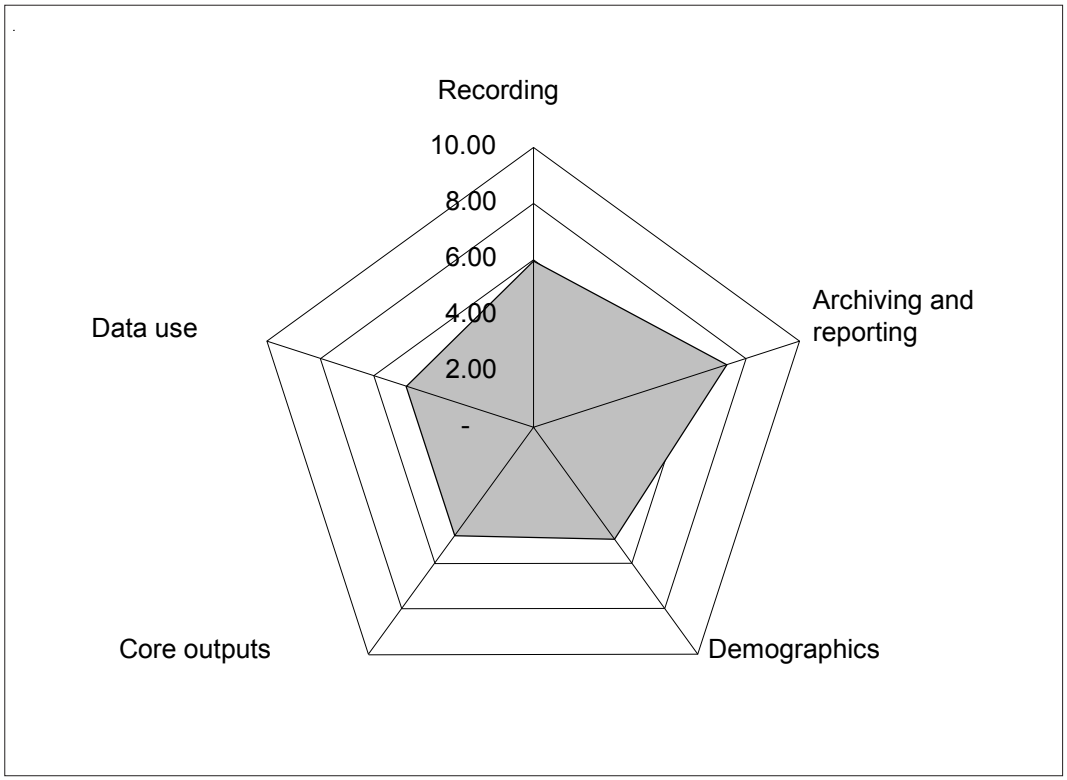
- HU A: 12 months verified, 11 months accurate;
- HU B: 12 months verified, 2 months accurate;
- HU C: 6 months verified, 6 months accurate;
- Aggregated figure for district W: 18 / 30 = 60%.

[3] This can be defined and some flexibility may be allowed, e.g. 95%; 90%...

1.2 Quality index scores

The measures can also be presented using bar charts, in percentages or using the raw numbers. The following representation (Figure 4), called a radar graph, provides a way to compare all components: average scores are presented in this example on a scale from 0 to 10. It is easily produced in Excel.

Figure 4: Example presentation showing the quality indices for five components of a monitoring system, on a 0–10 scale



These presentations need to be complemented by ad hoc discussions on each topic. The DQS findings are only important if strengths and weaknesses that were identified can be discussed at each level. The main intention is to present appropriate and realistic recommendations for improving the system. The major challenge is to ensure that the assessment is useful to the district concerned and that the recommendations are implemented.

Every presentation should be followed up by an action plan – drafted at the time of the meeting – outlining roles and responsibilities.

2. Using Excel to enter and represent the data

To date, two simple Excel workbooks are available to assist with data entry and analysis:

- One is on the QQs, which aggregates the quality indices of selected HUs for the district level. Automatic charts are presented using the radar graph option described above.
- One is on the calculation of wastage, which aggregates the vaccine wastage rates of selected HUs for the district level.

Instructions on how to use the workbooks are detailed on the respective "Read me" worksheets of the two workbooks.

E. Conduct a DQS workshop

The suggested approach is to introduce the DQS in a country through a national workshop, followed immediately by an assessment in a number of districts and HUs.

The workshop aims:

- to sensitize key health personnel on the importance of accurately monitoring immunization activities and data quality;
- to train key health personnel from the national and district levels in data quality self-assessment methodology (theoretical and practical);
- to enable the participants to conduct a data quality assessment in a number of districts and facilities of the country immediately after the workshop;
- to make appropriate recommendations to adapt the DQS to the country-specific context as a sustainable self-assessment tool.

A typical workshop schedule is proposed in Annex F. During *phase 1,* the participants revise and discuss available monitoring tools, then design and test their own assessment tool. During this phase participants thoroughly review the options they have selected from the DQS toolbox. The test makes sure that all components of the assessment are understood and allows last minute refinements.

Phase 2 consists of conducting the assessment itself, in the areas and facilities chosen by the participants, using the forms they will have designed (field work). After the assessment, the participants convene again to share the results, perform a global analysis, and make overall recommendations.

The suggested timeframe in Annex F is four days for phase 1, then three days for data collection and two days for data analysis and feedback, but this should be adapted to the time available, logistics and the number of participants. If people cannot take the above suggested time off, a DQS workshop can be organised in six days – specifically two days theory, two days field work, one and a half days data analysis and a half day providing recommendations and debriefing. Careful planning is essential to success. For this reason, the facilitators should be in the country for three days prior to the workshop for coordinated preparation.

Some proposed workshop principles

- **Target audience:** The number of participants should ideally fall between 15 and 25, with a ratio of 1 facilitator per 6 participants. Facilitators should receive a list of the names and titles of these individuals at least one week prior to training so they are familiar with their target audience and relevant skill base, including language skills. Staff should include a balanced representation from national (30%), provincial (40%) and district (30%) levels to permit:

  a) national level understanding of the principles of the DQS;

  b) training of certain key individuals who train others in the DQS in the future;

  c) district feedback into the processes.

- Although monitoring data is not a new concept, the practical aspects of applying the DQS are new and sometimes difficult to understand if only using theoretical concepts in a classroom-lecture style. Field work helps test the DQS but, just as importantly, it gives the opportunity for participants from provincial and national levels to witness the ground realities of immunization monitoring systems. The in-class sessions themselves are most successful when participants are actively encouraged to participate through a range of **adult learning techniques**, such as simulations, practical exercises, games, illustrated lectures, role plays, small group competitions and prizes.
- A good ice-breaking exercise consists of the **monitoring-card game** (day 1). It consists of a series of 50 questions on monitoring systems which are asked of the participants who should be split into groups. (An Excel workbook presents these questions on cards for participants to randomly choose.) If a group answers correctly, it is allowed to move (throwing a dice) on a 50-square game board and the participants can gently compete. The card questions provide an excellent overview of the available tools and best practices, and engender a spirit of camaraderie in the workshop.
- **Two approaches** can be envisaged during phase 1 of the workshop: (1) the "start-from-scratch" approach, with an entirely self-devised assessment, and (2) a "menu" approach with participants provided with a range of possible qualitative questions and forms that are locally relevant and presented as a menu of options from which to choose. In the menu approach, the questions can be simultaneously pre-assigned to their proper categories (recording, reporting, demographics, use of data, availability of forms, etc.) and structured by subgroup so participants can effectively choose how to prioritize questions and design their national questionnaire. For the accuracy component, the sources of data and levels of analysis could also be presented as a series of options from which the participants choose, with the possibility of revising or adaptating them after field work. The first approach provides better ownership of the process but is more time consuming and necessitates more intensive guidance throughout the workshop. The second approach necessitates careful planning and excellent understanding of the local situation prior to the workshop.
- If participants are able to use Excel, **computers** provide an opportunity to learn how to create small databases, analyse data and create ways of displaying data. This saves time when transferring data for presentations, and Microsoft PowerPoint presentations can also enhance the efficiency of the workshop.

- **Preparation**: All facilitators should arrive in country early to permit three full days of preparatory work before the workshop. This would permit **two field days** for travel to several health centres in several districts to be able to give a realistic overview of data flow from community up to national level, followed by **one day** for revising the menu of qualitative and accuracy questions. Promoting local facilitators is critical in encouraging ownership and sustainability of the process. Facilitators should receive adequate briefing one month in advance and should be allocated tasks so they can begin their individual preparations. Where possible, presentations and session plans from prior workshops should be shared widely.
- Because the field visits require good coordination, it is important that focal point(s) for **logistics** in-classroom are appointed. The facilitators should know who the focal points are and should have good channels of communication with these individuals. At least a week prior to the workshop, the organizers should prepare a detailed list of supplies needed; this should include an ample quantity of office items such as markers, flipcharts, scissors, staplers, as well as access to other necessary equipment (computers, printer, photocopier). Field travel should be carefully coordinated focal point to assure adequate cars for transport. The lead facilitator should be aware of the budget allocation in order to address any possible budget constraints. The workshop can be integrated with other health-sector monitoring issues as usually the same staff members are busy with a variety of health data. Hence this would be a good opportunity to explore whether DQS principles can be used for other health indicators.

After data collection on site, each team presents its findings and recommendations, emphasizes the most important or urgent points;,suggests persons/parties who should be responsible for follow-up action, and draws up a timetable of corresponding activities.

In presenting its findings, the team should review the terms of reference, explain the methodology used, summarize observations (supplemented by supportive objective information), provide recommendations and acknowledge the contribution of everyone who has helped to make the review a success. Any visual aids used during the presentation should be shared for use during future meetings/training sessions.

Involvement of local partners and academic institutions. In order to build the capacity for a country to perform data quality self-assessments and sustain the tool implementation, hence maintain a high standard of monitoring practices, it is important to involve local partners and academic institutions in a DQS workshop and its follow-up. This could also be a gateway for an eventual extension of the tool to other health indicators.

F. Integrate DQS results into the routine activities

The key to DQS success depends on the success of the workshop and first assessment. A well-focused assessment should result in the following.

- **A documented monitoring system:** The tool should help managers to estimate whether the information collected is reliable (accurate), and whether the information is properly used (the monitoring system is of good quality).
- **Identified weaknesses and strengths of the system:** Major problems should be localized.
- **Recommendations for improvement of the performance of the system:** Monitoring immunization services is meaningful only if the information that is produced can be used and leads to action. In particular, DQS results should be used to:
  - adjust district microplans accordingly;
  - review the effectiveness of applied strategies;
  - change priorities in the plan;
  - guide future supervisory visits to focus on the issues found in the DQS.
- **Suggestions on specific activities that the country concerned should introduce for improved reporting of data**.
- **Suggestions on how to improve the assessment itself.**
- **A follow-up plan:** A follow-up plan should be drafted, and include the creation of a team or focal point.

Finally, recommendations should include ways to use and promote the DQS options that the workshop participants developed. The goal of the DQS is to integrate the tool into routine practice (sustainable self-assessment) which should be facilitated by the fact that the tool is self-designed.

Options include the following.

- Integrate the DQS options into supportive supervisory visits/feedback practices. An ad hoc supervisory checklist can be built upon the QQs. A supervisory visit can also include the calculation of an accuracy ratio or wastage rate.
- Make a plan to repeat the assessment in the same districts or extend it to new districts.

- Integrate the DQS concept into the national training schedule.
- Form a core team or designate a focal point to be responsible for follow-up of DQS findings, help incorporate these into supportive supervisory visits, and involve local partners and academic institutions.
- Include key quantitative DQS measures as core indicators at the district level.
- Integrate DQS measures and tools into Reach Every District (RED) workshops and microplanning activities.
- Develop district-level DQS guidelines or a workbook (or integrate into existing district material).

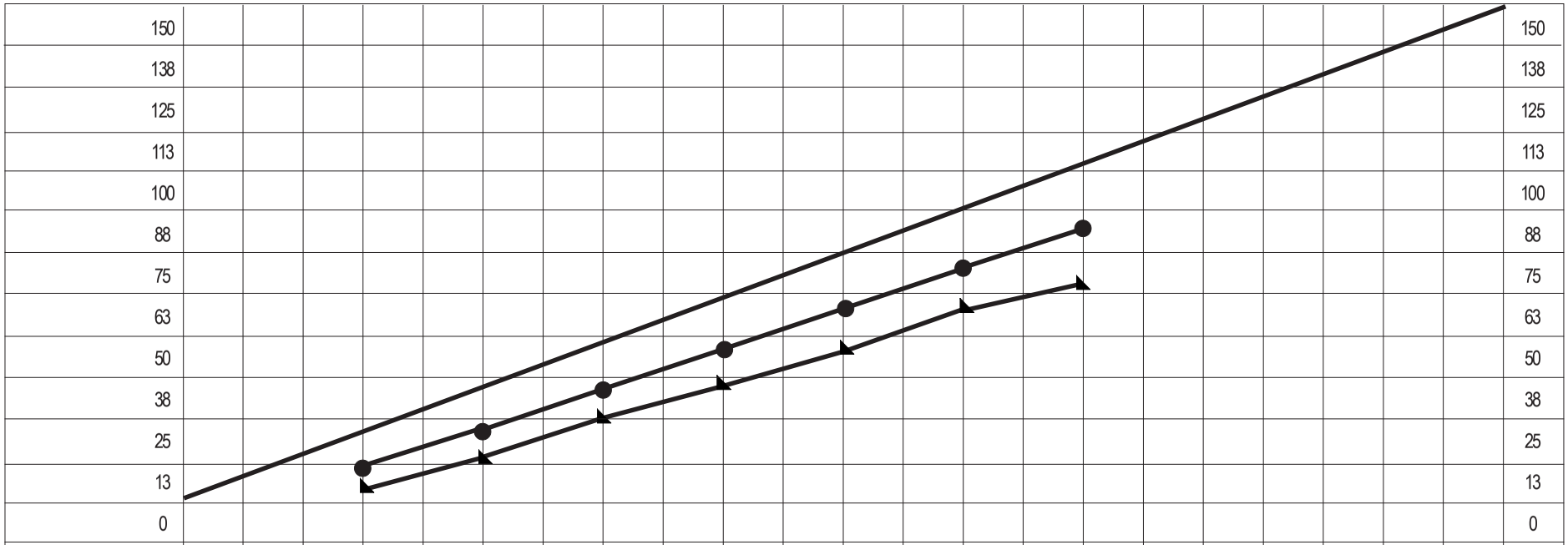
Annex A:

Sample chart for monitoring doses administered and drop-outs in children less than one year of age

Sample chart for monitoring doses administered and drop-outs in children less than one year of age

Fictia District, Peri-urban area

Year: 2001



	Jan	Feb	Total	Mar	Total	Apr	Total	May	Total	Jun	Total	Jul	Total	Aug	Total	Sep	Total	Oct	Total	Nov	Total	Dec	Total
DTP1	10	12	22	7	29	12	41	14	55	15	70	14	84	7	91								
DTP3	8	9	17	8	25	10	35	11	46	12	58	12	70	7	77								
DO#	2		5		4		6		9		12		14		14								
DO%	20		23		14		15		16		17		17		15								

DO = drop-out

Annex B:
Example of a completeness/timeliness reporting table

Example of a completeness/timeliness reporting table

Insert the date the HU reports were received at the district office. If a report is received after the deadline, enter the date in red. Display the table in the district office.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total completeness [a]	Total timeliness [a]
HU1														
HU2														
HU3														
HU4														
HU5														
HU6														
HU7														
HU8														
HU9														
HU10														
Total received this month (No.)														
Total received this month (%)														
Cumulative completeness [b] (%)														
Total on time this month (No.)														
Total on time this month (%)														
Cumulative timeliness [c] (%)														

Key

[a] Total completeness or timeliness: refers to the reporting completeness of the selected HU. Can be filled in at the end of the year, or could be updated each month giving the HU completeness and timeliness at each moment of the year. This may be easier in a computerized worksheet.

[b] Cumulative completeness: reports received up to that month divided by reports expected up to that month.

[c] Cumulative timeliness: reports received on time up to that month divided by reports expected up to that month.

Annex C:

Standard questions to assess the quality of the monitoring system

Standard questions to assess the quality of the monitoring system

QUESTIONS ON QUALITY (QQ), DISTRICT LEVEL

	Question	Comment	Weight (from 1 to 3)
Recording component (district)			
1	Are vaccine receipts and issues recorded in a vaccine ledger?	To assess appropriate record-keeping of vaccine receipts and issues.	
2	Does the district manager know the annual vaccine requirements for the district?		
3	Is the lot number/batch number and expiry date of the vaccine recorded?		
4	Is the current ledger up to date for a given vaccine (or vitamin A)?		
5	Is there a log of syringe supply and delivery to HU up to date?	Is the stock available identical to the quantity recorded in the register (count).	
6	Are district staff aware of standard operating procedures to record a severe adverse event following immunization (AEFI)?		
7	Do the district's reports (found at district level) have at least one date stamped or written on them?	Determine what proportion of correct HU reports you would need to answer "Yes". Define for which period (e.g. for the previous year) Define the date significance: the date the report was signed the date of receipt at district level (stamped or written on it by the district office)	
8	Are the district reports (that are sent to more central levels) completely and correctly filled in?	To select a number of fields to be checked in all district reports and check whether these have been correctly filled in.	

Standard questions to assess the quality of the monitoring system *(cont'd...)*

	Question	Comment	Weight (from 1 to 3)
Archiving component (district)			
9	Is there a separate file or sub-file for each HU and are the reports inside filed by date?	Storage should facilitate retrieval and monitoring (and be well organized).	
10	Have all HU data from the previous month been processed?		
11	Are supervisory reports available?		
12	Are copies of the last feedback to the health facilities easily available?		
13	Can copies of all district reports (that were sent to more central levels) be found?		
Computerized archiving (district)			
14	If the district is computerized is the last date of backup within one week? (look at the date the file was created on the diskette)	Check diskette for last saved date; look at the file creation date.	
15	Can the official immunization tabulations for the previous year be reproduced from an archived electronic file?	To check official immunization tabulations = final summary of previous year data.	
16	If more than one computer has immunization data, is there either a functioning network or a written, well-organized method of data transfer? (If yes, read it.)		
17	Is the date of printing /production on every tabulation/chart produced or, if the data is archived, is there a date showing when the archived file was created?		

Standard questions to assess the quality of the monitoring system *(cont'd...)*

Question		Comment	Weight (from 1 to 3)
Reporting component (district)			
18	Have the district reports of the last year month been sent on time?		
19	Is the procedure for dealing with late reports known and applied?		
20	Did all the monthly (quarterly) reports from the HUs use the same form/format for the current year?		
21	Is there a system for investigation of individual reports of adverse events following immunization (AEFI) from the district to the higher level functioning/operational?	Serious AEFIs should be rapidly reported and investigated. Investigators should be looking for any evidence of programmatic error that must be rapidly corrected and/or rumours that cause problems.	
22	Did all the visited HUs report adequate supply of administrative forms tally sheets/reporting forms/health cards?		

Standard questions to assess the quality of the monitoring system *(cont'd...)*

	Question	Comment	Weight (from 1 to 3)
Demographic information component (district)			
23	Is the district denominator for immunization of infants and pregnant women (and school children, if applicable) known?	Known: the interviewed senior staff member should be able to tell (without looking) approximately how many infants the district contained and how the figure was calculated (if relevant).	
24	Is there a district map of the catchment area showing HUs and providing immunization strategies (fixed, outreach, mobile)?	Ideally, the map should include denominator, target, type of strategy.	
25	Is the proportion of infants per strategy-type known for the district?	Usually fixed – outreach – mobile team, etc. This should be used in a district microplan.	
26	Has the same denominator for child immunization been used on different tabulations, reports, charts, tables, etc?	Indicate for which year.	
27	Are the denominators used in the current year different from the denominators used in the previous year?	Should be different from previous year.	
28	For the previous year, is the district denominator value (for child immunizations) found at the district the same as that used at national level?		
29	Is the denominator established independently?	The denominator should be established independently from locally set-up targets.	
30	Are the denominators of each HU available for the previous year?	Answer "Yes" if available. Totals should add up to the district total.	
31	For the previous year, has only one denominator value (check at least total population) been seen in all health projects/programmes?	Check with various initiatives (e.g. polio, nutrition, malaria) whether the denominator is consistent at district level.	

Standard questions to assess the quality of the monitoring system *(cont'd...)*

	Question	Comment	Weight (from 1 to 3)
Core outputs/analyses component (district)			
32	Is there a target number of children that the district strives to vaccinate during a calendar year or reporting period?		
33	Is there a chart or table of immunization coverage by report period for the current year (monitoring chart)?	Is it on display? Is it UP TO DATE? Does it cover all antigens?	
34	Is the completeness of the immunization reporting from HU recorded and monitored at district level?	District staff should be able to describe what percentage of HU reports was received on time, received but not on time, and not received at all during the previous year or the last months.	
35	Does the district record and monitor timeliness for HU immunization reporting?	District staff should be able to say (based on printed information) what percentage of HU reports was received on time during the previous year or the last months.	
36	Is the drop-out rate monitored?	Discuss the importance and reasons for drop-outs. Are there managerial practices that could be changed to reduce the drop-out rate?	
37	Is there monitoring of HU/district vaccine wastage?	Discuss the importance and reasons for wastage.	
38	Is there a graph by month of the incidence of vaccine-preventable diseases (VPDs) – broken down by VPD?	How do these data correspond to coverage data (i.e. more cases in areas with poor coverage). When was the last VPD outbreak? Was it investigated? Why did it occur?	
39	Is an up-to-date chart/table of the completeness of the current year's immunization data available?	Completeness = reports received or not received from the HUs. (Here the score 0/1 is only for completeness.)	
40	Is the HU performance monitored at the district level?	Monitoring of HUs: graph/figures showing how all HUs are performing during the current year.	
41	Are supervision activities monitored?	A written schedule of supervision that includes visiting every HU within a specific period of time.	
42	Has the district selected an indicator for the monitoring of immunization safety?		

Standard questions to assess the quality of the monitoring system *(cont'd...)*

	Question	Comment	Weight (from 1 to 3)
Evidence of using data for action (district)			
43	Is there an analysis of HU data performed regularly with HU staff?	Analysis can be done within supervisory visits, meetings at district level, etc. Explore the quality of analysis as well as the exhaustiveness of the HUs said to be analysed: none of them should be left out.	
44	Do you send regular monthly written feedback to the HUs?		
45	Are areas of low access identified and evidence of action taken to deal with it?	Discuss the importance and reasons for low access. How do the three strategies (fixed site, outreach and mobile teams) relate to the issue of access in the district?	
46	Have reasons for any high drop-out been identified, and are there plans/actions to deal with it?	Are there managerial practices that could be changed to reduce the drop-out rate?	
47	Is there monitoring of HU vaccine stock-outs? (A stock-out is an interruption in vaccine supply [for any vaccine].)	The manager should be able to say (based on written information) whether any HU has encountered a vaccine stock-out. If no vaccine stock-out is reported, ensure that the monitoring is possible and is being implemented. Staff should be monitoring the level of reserve stocks and taking action if stock goes below a specified reserve level.	
48	Are there problems with completeness and timeliness of reports?	Are the late or incomplete reports usually from the same HUs. What was done to follow them up? What other actions were taken to encourage/induce timely reporting.	
49	Are the recommendations made for the last three supervisory visits followed up in subsequent visits?		
50	Has the monitoring of the selected immunization safety indicator been adequate during the last 12 months?		
51	Are surveillance and coverage data compared to look for inconsistencies and then followed up to understand why?		

Standard questions to assess the quality of the monitoring system

QUESTIONS ON QUALITY (QQs), HEALTH UNIT LEVEL

	Question	This question should be designed to find out:	Weight (from 1 to 3)
Recording component (HU)			
1	Are there tally sheets for infant vaccinations on the desk (or easily available) and do they have entries for the last immunization day?	The main concern is evidence of use of availability (official form) and tally sheet.	
2	Are registers used for recording individual information about child immunizations?	Each HU should have a book or register where each immunization history can be registered and traced back.	
3	Can a child's vaccination history be easily and rapidly retrieved in the registers?	A new dose should not be entered as a complete new entry but entered in the location where previous doses have been entered. Score 0 if the register is used as a new entry for any immunization.	
4	Are registers (or pre-printed forms) used for recording individual information about women's TT immunizations?	There may be registers or health cards if cards kept in HU.	
5	Observe at least five vaccinations: Were all vaccinations well registered on the child health card/tally sheet/register?		
6	Are individual immunization records used, updated and given to the child's caretaker at the time of the immunization visit?	Blank cards should be available in the HU. Immunization cards are often integrated in "Road to Health" or other health cards.	
7	Are vaccine receipts recorded in a vaccine ledger?	Check against available stock (count doses in the refrigerator).	
8	Ask the child's caretaker: Do you know the expected date of receiving vaccine?	Find out whether the expected dates are known.	
9	Is the ledger up to date for all vaccines and/or a selected vaccine?	Up to date = all receipts and issues recorded immediately. Check against stock (in therefrigerator). Compare the date of last entry and the date of the last immunization session.	

Standard questions to assess the quality of the monitoring system *(cont'd...)*

Question		This question should be designed to find out:	Weight (from 1 to 3)
10	Is the receipt of a selected vaccine in the ledger complete for the entire year?		
11	Is there a log (vaccine ledger/stock card) for receipt/issuing of syringes supplied (AD/non-AD reconstitution syringes)?	Can perform a stock check.	
12	Does the HU record vaccine batch-number and expiry date?		
13	Are all individual recording forms available for the entire previous year?	Individual recording form = tally sheet or register.	
14	Did every person doing the child immunization card exercise get a perfect score for: DTP1 DTP3 measles?	Need to define how the scoring will be if a perfect score is not obtained.	
15	Is the cold chain temperature monitoring chart completed daily?	Check the chart and compare the latest reported temperature with the actual temperature in the refrigerator.	

Standard questions to assess the quality of the monitoring system *(cont'd...)*

Question		This question should be designed to find out:	Weight (from 1 to 3)
Reporting component (HU)			
16	Have all reports for the previous year been signed by the officer-in-charge or officer authorized to submit the HU report?	Score for example: If >50% reports are signed score "Yes". If <100% discuss with the HU why some have not been signed.	
17	Does each report from the previous year have at least one date stamped or written on it by the HU – either as "signed date" or "compiled date"?	If >50% reports are signed score "Yes". If <100% discuss with the HU why some have no data stamped or written in. This can be answered at district level.	
18	Are the HU reports correctly filled in?	Select a number of fields to be checked in all HU reports and check whether these have been filled in correctly.	
19	Are health staff aware of standard operating procedures and the necessary forms to complete if there is a report of a severe AEFI?	Ask health staff what is supposed to be done if a child becomes severely ill or dies after a vaccination. Ask to see any forms that are to be used.	
20	Are the HU reports completely filled in?	Select a number of fields to be checked in all HU reports from the previous year and check whether these have been filled in.	

Standard questions to assess the quality of the monitoring system *(cont'd...)*

Question		This question should be designed to find out:	Weight (from 1 to 3)
Archiving component (HU)			
21	Can copies of all previous reports from this HU be found in the HU?	For current and previous year.	
22	Is there one location where the previous immunization reports and recording forms are stored?		
23	Are the reports of the HU organized in a file by date?	The main concern is that the reports are easily retrievable.	
24	Are HU reports available for the entire year?		
25	Are the child registers available for all periods of the previous year?		
26	Can all tally sheets covering the previous year be found?		
27	Are registers for TT vaccinations to pregnant women available for the entire previous year?		
28	Is the latest feedback on data from district easily available?		

Standard questions to assess the quality of the monitoring system *(cont'd...)*

Question		This question should be designed to find out:	Weight (from 1 to 3)
Demographic information component (HU)			
29	Does the HU have data on the number of infants born in its catchment area?	The number of births should be different from the previous year. Discuss if there is a difference with the denominator available at more central level. Discuss ways to collect denominator information from community (e.g. birth register), data from national immunization days (NIDs), or other sources. Discuss if the target was set up by the district or HU level.	
30	Does the HU have a target set on the number of children that should be vaccinated during the calendar year?	Discuss how realistic the value is.	
31	Does the HU have a system that allows the collection of information on new births in the community?	This may include community health workers, traditional birth attendants, outreach clinics, etc. A system means (a) organized way to collect the information in every village/community and (b) a written track available at the HU.	
32	Does the HU have a target by type of strategy (fixed/outreach/mobile) with a map showing the catchment area by strategy including the outreach villages?		

Standard questions to assess the quality of the monitoring system *(cont'd...)*

Question		This question should be designed to find out:	Weight (from 1 to 3)
Core outputs/analysis (HU)			
33	Does the HU have a (target) number of children that it strives to vaccinate during a calendar year or a reporting period?		
34	Is there a mechanism in place to track defaulters?	Can be an appropriate use of a correctly filled register, tickler file, etc. When was the last time a child was followed up?	
35	Does the HU have achievements split by type of strategy – fixed/outreach/mobile?	It is important is to know the proportion of numbers actually reached by each strategy.	
36	Does the HU have an up-to-date chart or table (preferably on display) showing the number of vaccinations by report period for the current year?	Monitoring coverage chart – must be UP TO DATE.	
37	Is there a monthly chart/graph of VPD cases (broken down by VPD)?	How do these data correspond to coverage data (i.e. more cases in areas with poor coverage). When was the last VPD outbreak? Was it investigated? Why did it occur?	
38	Does the HU monitor drop-out rate?	Preferably on display with the same monitoring chart as the coverage one, but score 1 if the health worker can tell you the drop-out rate for his HU. Discuss the importance and reasons for drop-outs.	
39	Does the HU monitor vaccine wastage?	Discuss the reasons for wastage and any ways it might be reduced. Discuss whether the health worker knows how much the vaccine wastage is and how it can be calculated.	

Standard questions to assess the quality of the monitoring system *(cont'd...)*

Question		This question should be designed to find out:	Weight (from 1 to 3)
Evidence of using data for action component (HU)			
40	Is there a mechanism in place to track defaulters or vaccine doses that are due?	Check how the HU can know when a child should return for a vaccine dose (e.g. DTP, Hib, HepB, polio, measles or yellow fever vaccine dose).	
41	Is there a map showing the catchment area, including the outreach villages?	This ideally shows strategy type.	
42	Are areas of low access identified and is there evidence of actions taken to deal with this?	If there is low access (evidenced by low BCG or DTP1 coverage), how does it relate to the effectiveness of the three strategies (fixed site, outreach and/or mobile teams).	
43	Have reasons for any high drop-out been identified; are there plans/actions to deal with this?	Are there any managerial practices that can be changed?	
44	Have actions been taken on the last feedback from the district?		
45	Is there interaction with the community regarding immunization? Ask for information on "what" and "when"?	Are health staff actively involved in any community committees or meetings on health, investigations of outbreaks or any rumours of AEFIs, etc?	

Annex D:

Child immunization card exercise (example for 20 infants)

A set of 20 cards should be prepared according to the histories described below (child 1–20). Each card represents a child arriving at the HU on the day of the evaluation. The health worker examines a card, determines what vaccinations should be given, and makes the appropriate marks/recordings on the provided sample copy of the register/tally sheet. The vaccinator can also write down the date that the child should return for his/her next vaccination. The dates should correspond to the dates of the HU's planned vaccination sessions. If "OPV0" has to be included, discuss this preliminary and fill in the child immunization cards accordingly.

Example child A – due for DTP2, OPV2.
BCG, DTP1, OPV1 given.
Child old enough for OPV2/DTP2 vaccination.

Example Child B – not due for any vaccination.
BCG, DTP1, OPV1, DTP2, OPV2, DTP3, OPV3 given.
Child too young to receive measles vaccination yet.

Child	History
Child 1	due for DTP3, OPV3 BCG, DTP1, OPV1, DTP2, OPV2 given Child old enough for OPV3/DTP3 vaccination
Child 2	due for BCG Child born two days ago
Child 3	due for DTP2, OPV2 BCG, DTP1, OPV1 given Child old enough for OPV2/DTP2 vaccination
Child 4	not due for any vaccination BCG, DTP1, OPV1 given on schedule, OPV2/DTP2 given only two weeks ago Child old enough for OPV3/DTP3
Child 5	due for BCG, DTP1, OPV1 No vaccinations given Child old enough for OPV1/DTP1 vaccination
Child 6	due for measles BCG, DTP1, OPV1, DTP2, OPV2, DTP3, OPV3 given Child old enough for measles vaccination
Child 7	due for BCG, DTP1, OPV1 No vaccinations given Child old enough for OPV1/DTP1 vaccination

Child	History
Child 8	due for DTP1, OPV1 BCG given at birth Child old enough for OPV1/DTP1 vaccination
Child 9	due for measles BCG, DTP1, OPV1 given on schedule, DP2/OPV2 given just two weeks ago Child old enough for measles vaccination
Child 10	due for DTP3, OPV3 BCG, DTP1, OPV1, DTP2, OPV2 Child old enough for OPV3/DTP3 vaccination
Child 11	due for BCG No vaccinations Child born 2 weeks ago
Child 12	due for BCG, DTP1, OPV1 No vaccinations Child old enough for OPV2/DTP2 vaccination
Child 13	due for DTP1, OPV1 BCG at birth Child old enough for OPV1/DTP1 vaccination
Child 14	due for DTP3, OPV3 BCG, DTP1, OPV1, DTP2, OPV2 given Child old enough for OPV3/DTP3 vaccination
Child 15	due for DTP1, OPV1 BCG given late Child old enough for OPV1/DTP1 vaccination
Child 16	due for DTP3, OPV3, measles BCG late, DTP1, OPV1 late, DTP2, OPV2 late Child old enough for measles vaccination
Child 17	due for measles BCG, DTP1, OPV1, DTP2, OPV2, DTP3, OPV3 given Child old enough for measles vaccination
Child 18	due for DTP3, OPV3, measles BCG, DTP1, OPV1, DTP2, OPV2 given Child old enough for measles vaccination
Child 19	due for DTP2, OPV2 BCG, DTP1, OPV1 given late Child old enough for OPV3/DTP3 vaccination
Child 20	due for DTP2, OPV2 BCG, DTP1, OPV1 given Child old enough for OPV2/DTP2 vaccination

Relevant totals (for children 1–20) are:
BCG = 6; DTP1 = 6; DTP2 = 4; DTP3 = 5, measles = 5.

Annex E:
Sampling of health units

A classical procedure is described below. It allows a random selection of HUs with a probability proportional to the size (estimated by the number of immunizations given during the previous year), using systematic sampling. The tool used to assist in the randomization is a random-number table.

1) Obtain the list of all HUs providing immunization services. This list is then the *sampling frame* from which the sample is to be selected.

2) A *sampling interval* is then determined. The sampling interval is a number used to systematically select HUs from the sampling frame. To determine the sampling interval, take the total (all HUs) cumulative number of vaccinations (in this example DTP3) divided by the number of HUs you want to sample (say 6 in the following example).

In practice, make a table listing all the HUs in the district, and make a cumulative total of their DTP3 vaccinations.

List of all health units with their respective DTP3 vaccination numbers, and cumulative DTP3 totals

HU name	DTP3	Cumulative DTP3
Bennet	85 245	85 245
Dundee	45 124	130 369 (This is 85 245+45 124)
Jamestown	36 875	167 244 (This is 130 369+36 875)
Nyeri	96 185	263 429
Pokot	76 359	339 788
Rossem	77 125	416 913
Travert	22 654	439 567
Unison	57 692	497 259
Waverly	57 265	554 524
Natoye	22 115	576 639
Erpent	10 847	587 486
Tuki	5 000	592 486
District total	**592 486**	

If there were a total of 592 486 doses of DTP3 given among 12 HUs available for sampling, the sampling interval would be: 592 486 / 6 = 98 748 (which has five digits). (Six is the number of HUs to be sampled.)

To select the first HU, firstly you choose a random number between one and the sampling interval.

Step 1: Choose a direction (right, left, up or down) in which you will read the numbers from the table.

Step 2: Select a starting point: close your eyes, and touch the random number table with a pointed object. Open your eyes. The digit closest to the point where you touched the table is the starting point. Check that the starting point will give a number which is going to be less than or equal to the sampling interval. If not, start again before going on to Step 3.

Step 3: Read the number of digits required (determined by the sampling interval) in the direction chosen in step 1. Because each individual digit in the table is random, the sequence(s) of digits can be used across spaces between the five-digit numbers. The number you end up with is your random number.

For example, let us say you decided to read numbers to the right, and you identified your starting point as the number 3 in row 01, column 8 (see the table of random numbers in this Annex). If the sampling interval had four digits, then your random number would be "3861". The numbers "6" and "1" come from row 01, column 9.

NOTE: Remember that the random number selected must be equal to or smaller than the sampling interval. If it is not, then another random number must be selected. You can decide (before selecting your starting point) a direction to go to choose it (right, left, up or down from the first selected digit).

In our example, column 3, row 07 of the random number table gave the number 92780. The first selected HU will be **Dundee**, as it is the first HU where the cumulative population listed for that HU will equal or exceed the random number.

Step 4: Identify the second HU by adding the sampling interval to the random number. The cumulative population listed for that HU will equal or exceed the number you calculate. Repeat for subsequent HUs. In our example, these will be:

92 780	+	98 748	= 191 528	**Nyeri** selected
191 528	+	98 748	= 290 276	**Pokot** selected
290 276	+	98 748	= 389 023	**Rossem** selected
389 023	+	98 748	= 487 771	**Unison** selected
487 771	+	98 748	= 586 519	**Erpent** selected

Random numbers table

	Column									
Row	0	1	2	3	4	5	6	7	8	9
01	88008	13730	06504	37113	62248	04709	17481	77450	46438	61538
02	01309	13263	70850	11487	68136	06265	36402	06164	35106	77350
03	45896	59490	98462	11032	78613	78744	13478	72648	98769	28262
04	50107	24914	99266	23640	76977	31340	43878	23128	03536	01590
05	71163	52034	03287	86680	68794	94323	95879	75529	27370	68228
06	76445	87636	23392	01883	27880	09235	55886	37532	46542	01416
07	84130	99937	86667	92780	69283	73995	00941	65606	28855	86125
08	00642	10003	08917	74937	57338	62498	08681	28890	60738	81521
09	64478	94624	82914	00608	43587	95212	92406	63366	06609	77263
10	02379	83441	90151	14081	28858	68580	66009	17687	49511	37211
11	32525	44670	57715	38888	28199	80522	06532	48322	57247	46333
12	01976	16524	32784	48037	78933	50031	64123	83437	09474	73179
13	67952	41501	45383	78897	86627	07376	07061	40959	84155	88644
14	38473	83533	39754	90640	98083	39201	94259	87599	50787	75352
15	91079	93691	11606	49357	55363	98324	30250	20794	83946	08887
16	72830	10186	08121	28055	95788	03739	65182	68713	63290	57801
17	40947	75518	59323	64104	24926	85715	67332	49282	66781	92989
18	44088	70765	40826	74118	62567	75996	68126	88239	57143	06455
19	19154	29851	16968	66744	77786	82301	99585	23995	15725	64404
20	13206	90988	34929	14992	07902	23622	11858	84718	22186	35386
21	24102	13822	56106	13672	31473	75329	45731	47361	47713	99678
22	59863	62284	24742	21956	95299	24066	60121	78636	61805	39904
23	57389	70298	05173	48492	68455	77552	87048	16953	45811	22267
24	63741	76077	44579	66289	88263	54780	76661	90479	79388	15317
25	17417	56413	35733	27600	06266	76218	42258	35198	26953	08714
26	85797	58089	91501	34154	96277	83412	70244	58791	64774	75699
27	65145	97885	44847	37158	54385	38978	20127	40639	80977	73093
28	24436	65453	37073	81946	36871	97212	59592	85998	34897	97593
29	20891	03289	98203	05888	49306	88383	56912	12792	04498	20095
30	81253	41034	09730	53271	92515	08932	25983	69674	72824	04456
31	64337	64052	30113	05069	54535	01881	16357	72140	00903	45029
32	35929	76261	43784	19406	26714	96021	33162	30303	81940	91598
33	34525	54453	43516	48537	60593	11822	89695	80143	80351	33822
34	27506	45413	42176	94190	29987	90828	72361	29342	72406	44942
35	92413	00212	35474	22456	76958	85857	85692	75341	32682	00546
36	76304	57063	70591	06343	38828	15904	79837	46307	40836	69182
37	17680	92757	40299	98105	67139	01436	68094	78222	61283	40512
38	43281	36931	26091	42028	62718	38898	64356	19740	77068	78392
39	30647	40659	23679	04204	67628	81109	73155	68299	62768	58409
40	26840	42152	80242	57640	19189	47061	44640	52069	98038	49113

Annex F:
Data quality self-assessment workshop schedule

Location: _____

Dates: _____

Day 1

Session 1: Introduction and overview

09.00 Opening of workshop
MOH–WHO representatives (national–regional)
09.10 Introductions
09.20 Review of workshop objectives and DQS overview
10.00 Global/regional perspectives – 3 options proposed:
What is data used for at regional level?
The GAVI alliance and the need for improving data quality
The RED approach
10.45 Coffee

Session 2: Monitoring tools

11.00 Brainstorming on monitoring tools (card game)
13.00 Lunch
14.00 Review of country monitoring tools
15.00 Coffee
15.15 Designing QQs (group work)
16.15 Group feedback

Day 2:

Session 3: Finalizing the questions and weighting for the DQS

9.00 QQs revision and weighting

10.30 Coffee

10.45 Plenary session & group presentations and feedback

Session 4: Supportive supervision

11.45 Introduction to supportive supervision

12.00 Organizing a supervision of monitoring practices (group work)

13.00 Lunch

Session 5: Site selection and other options

14.00 Sampling strategies

15.00 Coffee

15.15 DQS options:
- Levels to be assessed
- Site selection
- Wastage – completeness

Day 3:

Session 6: Accuracy of reported data

09.00 Data accuracy measurement at health facility and district levels

09.30 Group work preparation: collection and analysis at health facility, district and community levels

10.30 Coffee

10.45 Plenary session and feedback

13.00 Lunch

Session 7: Guide for the assessment

14.00 Elaboration of the assessment guide – brainstorming session

15.00 Coffee

15.15 Survey guide continued
Optional: data collation and analysis

16.15 Practical arrangements for the pre-test

Day 4:

AM: Pretest

Session 9: Finalization of the tool

14.30 Feedback

15.30 Revisions of the QQs and the forms

16.30 Assessment in practice

Days 5, 6, 7:

Data collection in the field

Day 8:

09.00 Feedback from the assessment
Data collection, field difficulties and suggestions for improving the assessment

10.30 Coffee

11.00 Data analysis (group work)

13.00 Lunch

14.00 Data analysis and recommendations. Development of practical district materials – or how to integrate DQS into routine practice

15.00 Coffee

15.30 Data analysis and recommendations *(continued)*

Day 9:

09.00 Group presentations

10.30 Coffee

11.00 Recommendations (plenary)

13.00 Lunch

14.00 Data analysis and reporting

15.00 Coffee

15.30 Formal presentation of results

16.30 Closure