Data Quality Assessment of National Surveys and Surveillance

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Report by

USAID's Research for Decision Makers (RDM)

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Acronyms

BDHS	Bangladesh Demography and Health Survey
SVRS	Sample Vital Registration System
BMMS	Bangladesh Maternal Mortality Survey
MICS	Multiple Indicators Cluster Survey
DQA	Data Quality Assessment
DQAT	Data Quality Assessment Tool
DQAF	Data Quality Assessment Framework
MOHFW	Ministry of Health and Family Welfare
NIPORT	the National Institute of Population Research and Training
BBS	Bangladesh Bureau of Statistics
MCH	Maternal and Child Health
UIS	UNESCO Institute of Statistics
IRG	Independent Reference Group
NMR	Neonatal Mortality Rate
PNMR	Post-neonatal Mortality Rate
IMR	Infant Mortality Rate
U5MR	Under Five Mortality Rate
TFR	Total Fertility Rate
CPR	Contraceptive Prevalence Rate

1. Introduction

Health data is used for a variety of purposes, including health sector reviews, planning, programme monitoring, quality control, and reporting. Superior decisions on policy can be made when they are based on reliable data. It is essential, therefore, to ensure that the data is of the highest quality. The fourth health sector programme of Bangladesh for 2017–2021 identified 10 key driving forces for the next five years, which included the *'adoption of new technologies to strengthen surveillance, and data quality and information systems to provide a strong evidence base for decision making'* (1). Ministries related to health, therefore, regularly compile data to track progress towards these goals and objectives, to plan for future needs, and to set priorities for the health system. However, poor quality data may result in misleading priorities being set and a subsequent lack of trust among users of the health system.

Ultimately, the goal of a public health system is to improve the health of the population, and this is achieved through the combined efforts of public health authorities within the government (2). Public health agencies have been defined as having three functions – the assessment of health status and requirements, the development of policies to serve the public interest, and an assurance that the necessary services are provided (2, 3). Since data underpins these three functions, public health is inherently a data-driven domain (3). High-quality data is a prerequisite for obtaining better information, superior decision-making, and greater health results in the health of the population (4). Public health data is generated from population-based and institution-based sources. Population-based data is collected through censuses, civil registrations, and surveys of the population. Institution-based data is obtained from individual health records and the administrative records of health institutions (4). The data on health and wellbeing comprises measures of mortality, morbidity, and disability. The levels and distribution of the determinants of health are measured in terms of biomedical, behavioural, socioeconomic and environmental risk factors (5).

All data is subject to limitations on quality, such as missing values, bias, and sampling, measurement and human errors in the collection, entry and computation of data. Quality assessments of data should be conducted to determine the level of confidence that can be placed in the data that is used to evaluate the performance of the health sector and to understand the relative strengths and weaknesses of the data sources (6). It is particularly important to

understand the reliability of estimates for national coverage and other results derived from data. In Bangladesh, during the last two decades, a rapid decline has been observed in mortality and fertility estimates. However, dissimilarities have been discerned in the reported estimates of national surveys and surveillance. Focusing on these dissimilarities, the independent reference group (IRG) of icddr,b has undertaken an initiative to assess the quality of the data on mortality and fertility related indicators collected through national surveys and surveillance.

2. Scope of the Work

Good quality data must be used for reporting indicators for global monitoring. That is why, in general, there should be:

- guidance for the selection of data sources for policymaking.
- an objective assessment of the quality of data provided.
- the same process replicated for different settings.
- an in-depth and a cross-analytical examination of the accuracy and consistency levels of some very sensitive indicators reported by more than one survey.

This study concentrated on the assessment of several mortality and fertility related indicators that were reported by different national surveys and surveillances.

3. Overview of the Survey and Surveillance

Bangladesh is data rich with over 25 health surveys conducted in the last 20 years. Most were national population surveys, with a few assessments of health facilities. National representative sample surveys are routinely carried out by the National Institute of Population Research and Training (NIPORT) of the Ministry of Health and Family Planning (MOHFW) and other government/non-government institutions, including the national statistics office [Bangladesh Bureau of Statistics (BBS)], with or without support from development partners (DPs) (7). For maternal, new-born, and child health, the most widely recognised and used surveys are the Bangladesh demographic and health surveys (BDHS), the Bangladesh maternal mortality surveys (BMMS), the utilisation of essential service delivery (UESD) surveys, and the multiple indicators cluster surveys (MICS). The results of these surveys are usually published at intervals of two to

five years and are considered to be the most reliable sources to provide updates on several vital indicators for intervention and population impact. The reports of the sample vital registration system (SVRS), produced by the BBS, provide national and regional data on population, births and deaths, causes of death, and life expectancy.

4. Data Quality Assessment Process Description

The overall process for assessing data quality involves the following six steps:

4.1 Desk Review

To understand the mechanisms involved in surveys and surveillance, the IRG working team first reviewed the reports of national surveys and surveillance. All the available reports of BDHS (1993–1994 and 2017–18), BMMS (2001, 2010, 2016), SVRS (2000–2019) and MICS (1993–2019), were rigorously examined for survey methodology, findings, and questionnaires. A narrative was prepared for each of these surveys and surveillance for further comparison. The desk review also identified the indicators that were required to be assessed for quality and the surveys and surveillances that produce these indicators.

4.2 Indicator Identification

Following the desk review, seven mortality and fertility related indicators were identified for quality assessment. All indicators for maternal, neonatal, and child mortality were considered. The core fertility indicators included higher-level indicators for tracking trends in total fertility and age-specific fertility rates, as well as indicators that influence fertility and the use of family planning and related services. Based on the availability of these indicators, further data sources were identified. The specific indicators were:

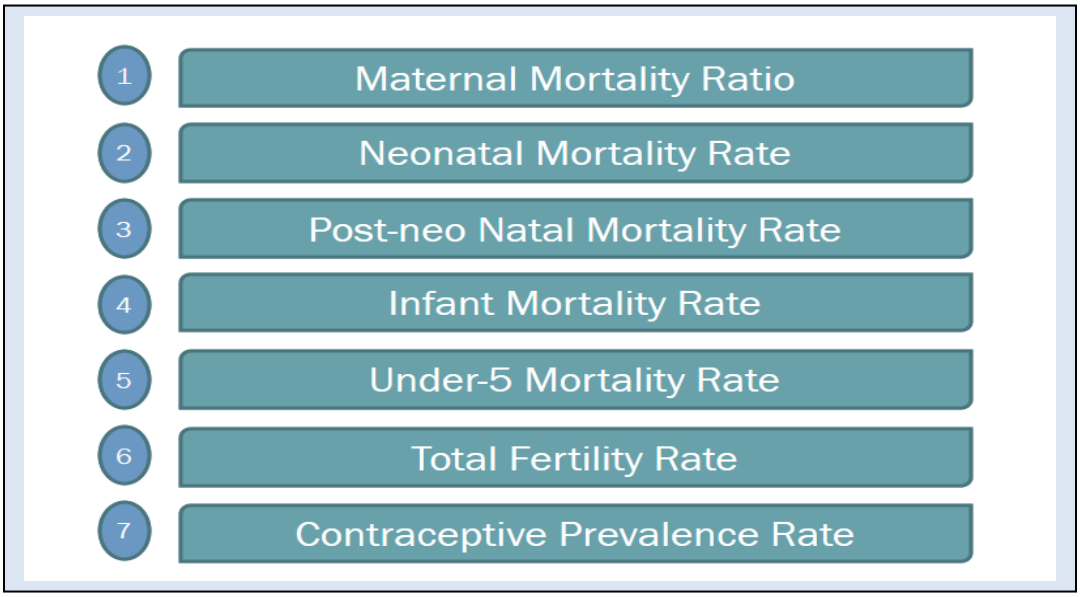

Figure 1. List of indicators

4.3 Data Source Identification

BDHS, BMMS and MICS are the most frequently conducted surveys in Bangladesh to obtain health data, while the most popular surveillance system implemented under the project monitoring the situation of vital statistics of Bangladesh (MSVSB) is SVRS. These four surveys and surveillance were considered for quality assessment.

Bangladesh Demographic and Health Survey (BDHS)

The eighth Bangladesh demographic and health survey (BDHS) report was conducted in 2017 and the first one was carried out in 1993–1994. These surveys provide information on the basic national indicators of social progress, including fertility, childhood mortality, fertility preferences and regulation, maternal and child health, and the nutritional status of mothers and children (8). The survey uses a systematic methodology for identifying births and deaths and estimates for mortality – a detailed flow chart is presented in Figure 2.

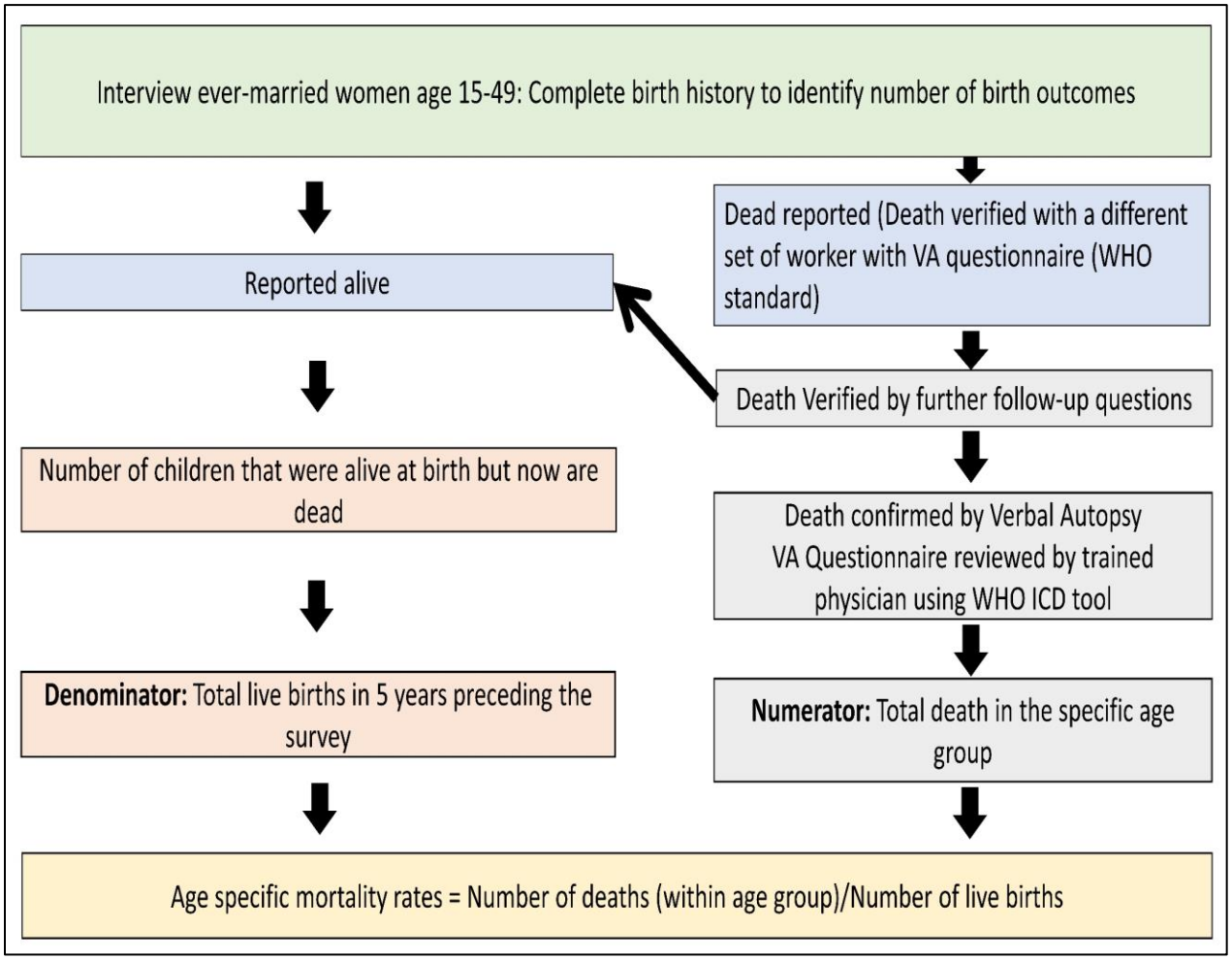

Figure 2. BDHS flow chart for mortality rates

Sample Vital Registration System (SVRS)

SVRS is a continuous data collection system that provides intercensal data on demographic indicators, such as the annual natural growth rate (NGR), crude birth rate (CBR), crude death rate (CDR), total fertility rate (TFR), infant mortality rate (IMR), under five mortality rate (U5MR), and maternal mortality ratio (MMR). The SVRS regularly collects data on births, deaths, marriages, migration, disability, and other key demographic indicators and publishes reports annually(9). The SVRS procedure for estimating mortality rates is shown in Figure 3.

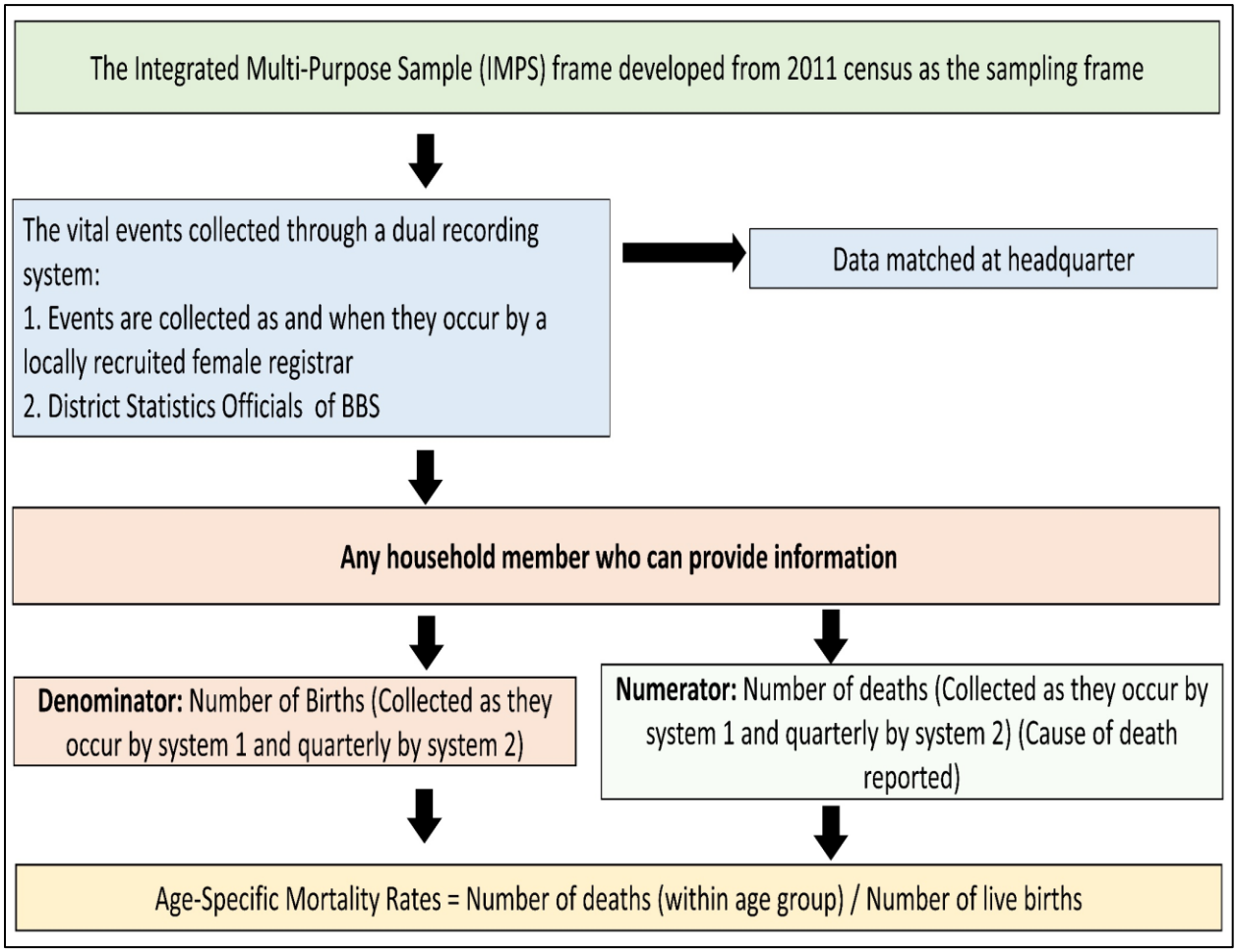

Figure 3. SVRS flow chart for mortality rates

Bangladesh Maternal Mortality and Health Care Survey (BMMS)

BMMS is designed to provide information on the level of maternal mortality, maternal and non-maternal deaths, and the utilisation of maternal health care services in Bangladesh. The BMMS was conducted for the third time in Bangladesh in 2016. This survey provides a comprehensive analysis of the levels and differentials in maternal health parameters for policymakers and programme personnel (10). The BMMS procedure for estimating the identification of death, adult female death for verbal autopsy, and mortality rates is presented in Figure 4.

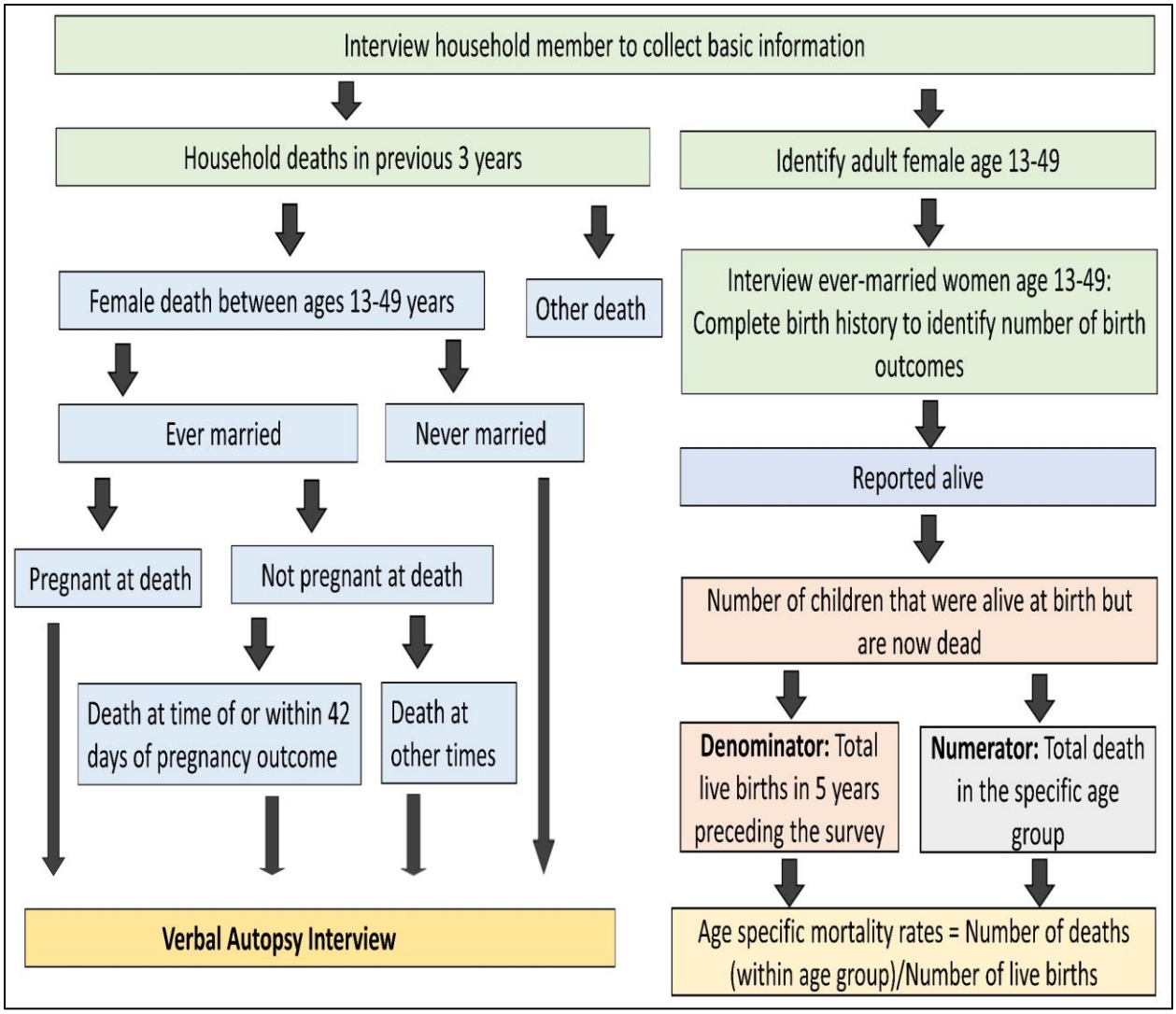

Figure 4. BMMS flow chart for mortality rates

Multiple Indicator Cluster Survey (MICS)

The sixth round of MICS in Bangladesh was conducted in 2019. The survey provides detailed information and analysis regarding children and women of Bangladesh with indicators on health, nutrition, water and sanitation, education, protection, HIV, and access to information and communication technology (ICT) (11). The flow chart of the MICS mortality estimates is presented in Figure 5.

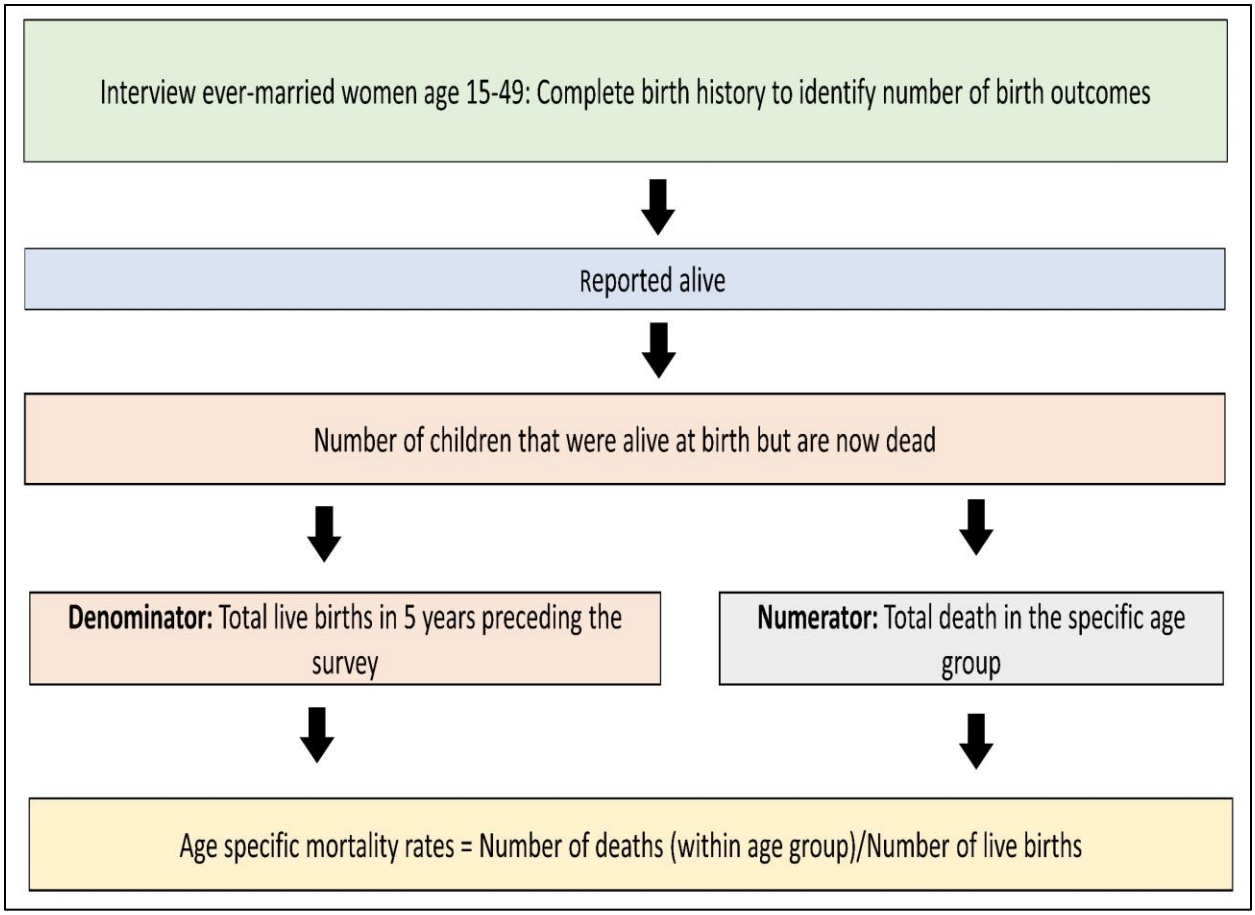

Figure 5. MICS flow chart for mortality rates

4.4 Data Quality Assessment Tool Development

Several frameworks are available to assess data quality and to guide the process in different sectors. Some existing frameworks are as follow:

- **UN statistics:** a quality assurance framework (SQAF).
- **Measure evaluation:** a menu of tools for data quality assessment and review.
- **FAO statistics:** a quality assurance framework (SQAF).
- **International Monetary Fund (IMF):** a data quality assessment framework (DQAF) for national accounts statistics.
- **UNESCO Institute of Statistics (UIS):** a data quality assessment framework for education (Ed-DQAF).

- **World Health Organization:** a data quality assurance framework (DQAF) for the global data production process on health expenditure.

The existing assessment framework and tools for health data have not been adequately quantified and developed to provide an objective analysis. Most of these frameworks are developed for subjective assessment. However, the framework developed by the UIS for assessing data quality in education is more reliable than the other frameworks.

To check the quality of the survey data based on the set criteria, a data quality assessment tool (DQAT) was developed in line with UIS education (Ed-DQAF) (12). The Ed-DQAF tool was revisited (1) to focus specifically on health data and (2) to ensure that evidence for assessment could be realistically identified for each of the selected data quality items. Each of the different survey and surveillance data sources, identified for the specific indicators, was assessed using the DQAT.

4.4.1 DQAT and Code of Practice

The DQAT was structured under a list of principles and subcomponents that constituted the 'UIS code of practice for education statistics produced and disseminated through survey data systems'. It is based on the UN fundamental principles of official statistics but strictly concentrates on household survey data. It provides further guidance to the structures to produce appropriate and reliable data that adhere to internationally recognised professional and scientific standards.

The code of practice is comprised of six principles and 12 subcomponents that cover the survey-specific indicators and the statistical production processes and outputs. Each of the subcomponents is divided into a set of 38 quality assessment items to form the DQAT matrix that provides guidance on how to implement the UIS code of practice.

4.4.2 DQAT Matrix

A matrix is also a working tool for evidence-based assessment where comments, evidence, brief notes, and recommendations for improvement are recorded in a collaborative process to summarise the analysis and facilitate the compilation of the DQA report. It provides a framework to further understand each of the 38 quality items through brief additional explanations and concrete guidance on how to indicate scores.

4.4.3 Scoring Guidelines

Using the DQAT matrix, however, does not result in a single numerical measure (or index) for data quality. Instead, the matrix provides the individual score for each item to determine the nature of the data quality of that item. The matrix is useful for providing a well-developed set of questions that prompt the user to consider certain key attributes of data quality. It does not provide a judgment, but rather serves as a developmental and diagnostic tool. Each scoring level in the DQAT is applied as follows:

- Level 4: meets quality standards.
- Level 3: room for improvement (acceptable statistics).
- Level 2: questionable statistics.
- Level 1: poor statistics.

In some cases, only three scoring options are provided (in reference to items 23–24; 28; 30; 33; 35–37). For these items, level 3 is not available (no guidance is given for that level). This is the case in which scoring a 2 or 3 would have no impact on the suggested recommendation. The exceptions are items 1, 20, 26–27, and 31, where level 2 is not provided.

In other situations, only two scoring options are provided (e.g. items 3–19 and 38). For these items, levels 3 and 2 are not available. These items are exceptions and the limited scoring options provided are the only ones available, based on the nature of these items.

The scoring should be the result of a global well-argued consensus among the members of the group.

Items scored at levels 1 or 2 should be used to propose recommendations and should be regarded as the priority areas for improvement in the quality of the data. The score obtained by a survey data source can be quantified as a percentage of the available maximum score and based on this pseudo-quantification the quality of survey data can be compared.

4.4.4 Completing the DQAT Matrix

The following steps are considered when completing the matrix:

- work through each item and use the evidence to score each item. Should evidence not be provided, then isolate it for further investigation.

- use the notes in the column with the heading 'Brief additional explanation' for further clarification about each item.
- review the item and then assess which level of scoring closely approximates the status of the assessed quality item.
- use the associated column ('Score') to record the level agreed upon among the group members.
- complete the evidence column with information collected during the evidence gathering phase.
- in the comment column, additional information can be provided to further clarify the score or explain the evidence.

4.5 Interview

After finalising the assessment tool, a data owner/focal person was identified for an interview to score different data sources according to the following dimensions of data quality:

- **relevance –** the extent to which the answers provide an insight into the question put to the individual user.
- **sound methodology –** classification systems are documented and are consistent with international standards and good practices.
- **accuracy and reliability –** they measure what they are intended to measure and repeated measurements using the same procedures provide the same results.
- **periodicity and timeliness –** they are up-to-date and available on time.
- **consistency –** they are consistent or reconcilable over a reasonable period with other surveys and data sources.
- **accessibility and clarity –** they are presented clearly and understandably, with an adequate method of dissemination, and prompt and knowledgeable technical support for users.

One member from the assessment group and at least one member from the agency of data source worked through the excel sheet with all the components and subcomponents of quality dimension. The group assigned a score ranging from 4 (if the attribute met international quality standards and practices) to 1 (if the statistics produced did not comply with international practices and were, therefore, considered poor) to the respective subcomponents.

5. Findings

5.1 Differences related to methodological aspects among different surveys

The IRG team reviewed the differences among BDHS, SVRS, BMMS, and MICS in key aspects related to methodology, birth, death and identification of stillbirths, data collection, and measures for quality assurance. Table 1 shows the key differences among the four surveys and surveillance.

Table 1. Key differences among BDHS, SVRS, BMMS and MICS

	BDHS	SVRS	BMMS	MICS
Sample Size	20,250 Households	2,98,810 Households	306,961 Households	64,400 Households
Method of Data Collection	Through household visits by trained data collectors	The SVRS used Dual Recording System: System 1: Local register of each primary sampling unit (PSU) collect data as and when events occur and then send the filled-in schedule to headquarters. System 2: Supervisors from the Upazila statistical offices collect retrospective data from the PSU on births and deaths on quarterly basis	Through household visits by trained data collectors	Trained data collector visits the selected household and collects data using tablet computers running the Windows 10 operating system
Birth, Death and Stillbirth Identification	Full birth history collected, and information obtained from the mother herself Follow-up questions to verify births, and deaths, stillbirths	Events (births, stillbirths, and deaths) in a particular year were collected by the local registrar. Events reported by any member of the households Only one question to identify events	Full birth history collected, and information obtained from the mother herself Follow-up questions to verify births, and deaths, stillbirths	Information about the full birth history was collected from ever-married women through a women's questionnaire No question to identify stillbirths
Data Quality Assurance	Data reviewed and edited by respective supervisors on the spot (within three	The filled-in schedules obtained from both the systems coded and matched at headquarters and re-	Data reviewed and edited by respective supervisors on the spot (within three days) and edited. If	Team supervisors oversee day-to-day operations and troubleshoots. If any problem is

	days) and edited. If there is any concern, the same data collector revisited the households within the three days	investigated where needed	there is any concern, the same data collector revisited the households within the three days	detected, the data collector is instructed to revisit the households within the shortest time
Adjustments for Missing Vital Events	No adjustments required	Adjustment is done following the Chandra Sekar and Deming formula to account for missed vital events (births and deaths) by both systems	No adjustments required	No adjustments required
Verification of Deaths	Once the data collectors identified the deaths, their respective supervisors visited the households and collected information on the causes of death using the verbal autopsy questionnaire. Thus, every reported death was verified	Re-investigation is done only when there is a mismatch in recording of two systems	Once the data collectors identified the deaths, their respective supervisors visited the households and collected information on the causes of death using the verbal autopsy questionnaire. Thus, every reported death was verified	Collected information was spot-checked by the team supervisors and the interviewer sent back to gather missing information

5.2 DQAT Scores for different indicators under the surveys

The key findings of the data quality assessment exercise are summarised under the six principles. The scores of all subcomponents under each component (principle) are aggregated to achieve the total achieved score under each component. This total is divided by the total available score to produce a percentage by which the referred component complies with international practices for quality statistics. Each of the components or principles provides a single percentage.

The percentage scores of each of the components are presented in a spider chart to demonstrate the quantitative view of the data quality – that is, how much the given principle meets the international quality standards.

Principle 1: Relevance

The data relates to health needs and the process involves consulting with the data users on how the statistics cover relevant information in the subject field.

For BDHS, BMMS and MICS data, a structured and periodic process of consultation (e.g., users' advisory committee or working groups) takes place with policy departments/ministries and other principal users of data, which include academia, the press, and/or other private sector representatives, to review the usefulness of the existing statistics and to identify emerging data requirements. SVRS did not maintain this broad cross-sectional consultation with data users and, as a result, obtained fewer scores in terms of relevance compared with the other surveys. A spider chart to compare the surveys and surveillance under principle 1 is presented in Figure 6(a).

Principle 2: Sound Methodology

The components considered under principle 2 are:

i. classification systems used are broadly consistent with internationally accepted standards, guidelines, or good practices.
ii. the concepts and definitions used are in accord with internationally accepted statistical frameworks.

The concepts and definitions used in BDHS, BMMS and MICS follow international standards and they obtained full scores under this principle. Some definitions and data collection methods of SVRS differed from the other surveys. The data collection process and questions asked to gather information to calculate MMR, NMR, and PNMR in SVRS differed slightly from the international standard. In Figure 6(b), the percentage score of SVRS is 90%, where others score 100%.

Principle 3: Accuracy and Reliability

Principle 3 determined whether source data and statistical techniques were sound and statistical outputs sufficiently portrayed reality. This dimension covered three elements:

i. health data is adequate for compiling health statistics.

ii. survey data is assessed and validated.

iii. the statistical techniques employed conform to sound statistical procedures and are documented.

The procedure for sample selection for all national surveys and surveillance is sound and reflects population characteristics. BDHS, BMMS, and MICS all accurately report health statistics for macro administrative region (division) and area of residence (urban/rural). But MICS obtained higher score than other surveys because of inclusion of disability status following international survey data collection standards. The SVRS obtained fewer scores than the other surveys in terms of accuracy and reliability (Figure 6(c)). This was due to the rigour maintained in the other surveys in terms of quality control measures and data collection.

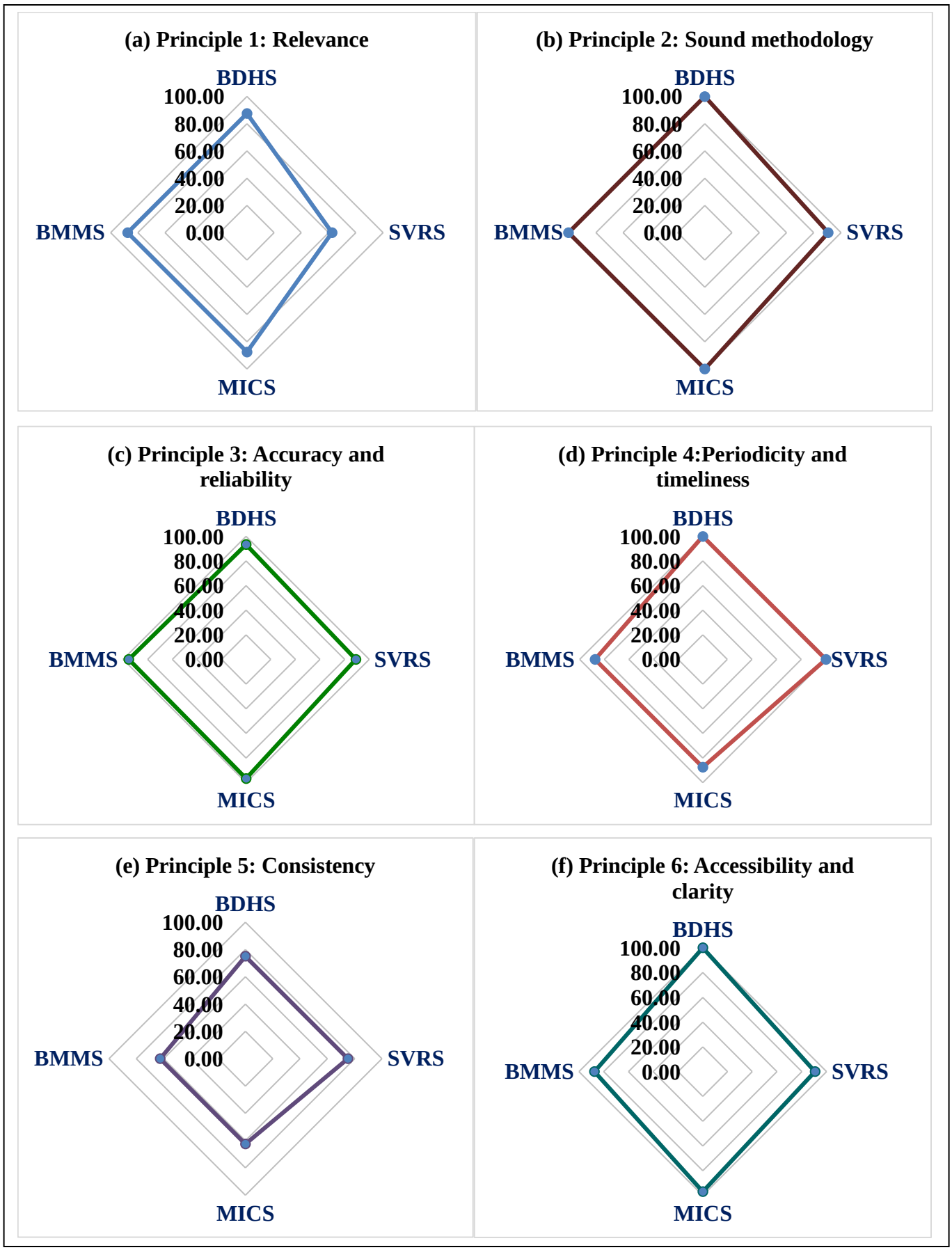

Figure 6. Principle level score comparison

Principle 4: Periodicity and Timeliness

survey, data is collected regularly, according to a planned schedule, and is disseminated on time are the elements under principle 4 to assess data quality. Since BDHS and SVRS carried out repeated or periodic data collection (e.g. once every three to five years), both obtained equal scores in this context. However, the data collection of BMMS and MICS is not carried out at regular frequencies. Figure 6(d) shows that the performance of BMMS and MICS was inferior to BDHS and SVRS under principle 4.

Principle 5: Consistency

The subcomponents under principle 5 to evaluate the quality are statistics that are consistent within the dataset, over time, and with other major datasets. For BDHS and SVRS, three or more rounds of time series and comparable survey data are available, but for BMMS and MICS time series data is not available for more than two rounds.

Health statistics from the household survey include sufficiently similar concepts and definitions to allow for a comparison with data from other sources, all surveys, and surveillance score level 2.

The score comparison among the different sources that considered consistency is presented in Figure 6(e). BDHS and SVRS performed better than BMMS and MICS in this regard.

Principle 6: Accessibility and Clarity

Data quality was assessed under principle 6 by the following elements:

i. statistics are presented clearly and understandably, and methods of dissemination are adequate.
ii. up-to-date and pertinent metadata is made available.
iii. prompt and knowledgeable assistance and support is available to users.

Only BDHS and MICS maintain a website to disseminate survey data and mechanisms are in place to respond to the user's request within 48 hours. For BMMS and SVRS, mechanisms are in place to respond to users' requests but they are not implemented in a case-by-case manner. All these points are reflected in the percentage score in terms of accessibility and clarity (Figure 6(f)).

BDHS obtained the highest score, followed by MICS. BMMS obtained the lowest score under principle 6.

A combined spider chart of six principles to assess quality for all surveys and surveillance is presented in Figure 7. In terms of relevance, sound methodology, accuracy, and reliability, BDHS, BMMS and MICS performed better than SVRS. BDHS and SVRS performed the same in terms of periodicity and timeliness. All surveys and surveillance obtained a score of less than 80% under principle 5 compared with the other principles.

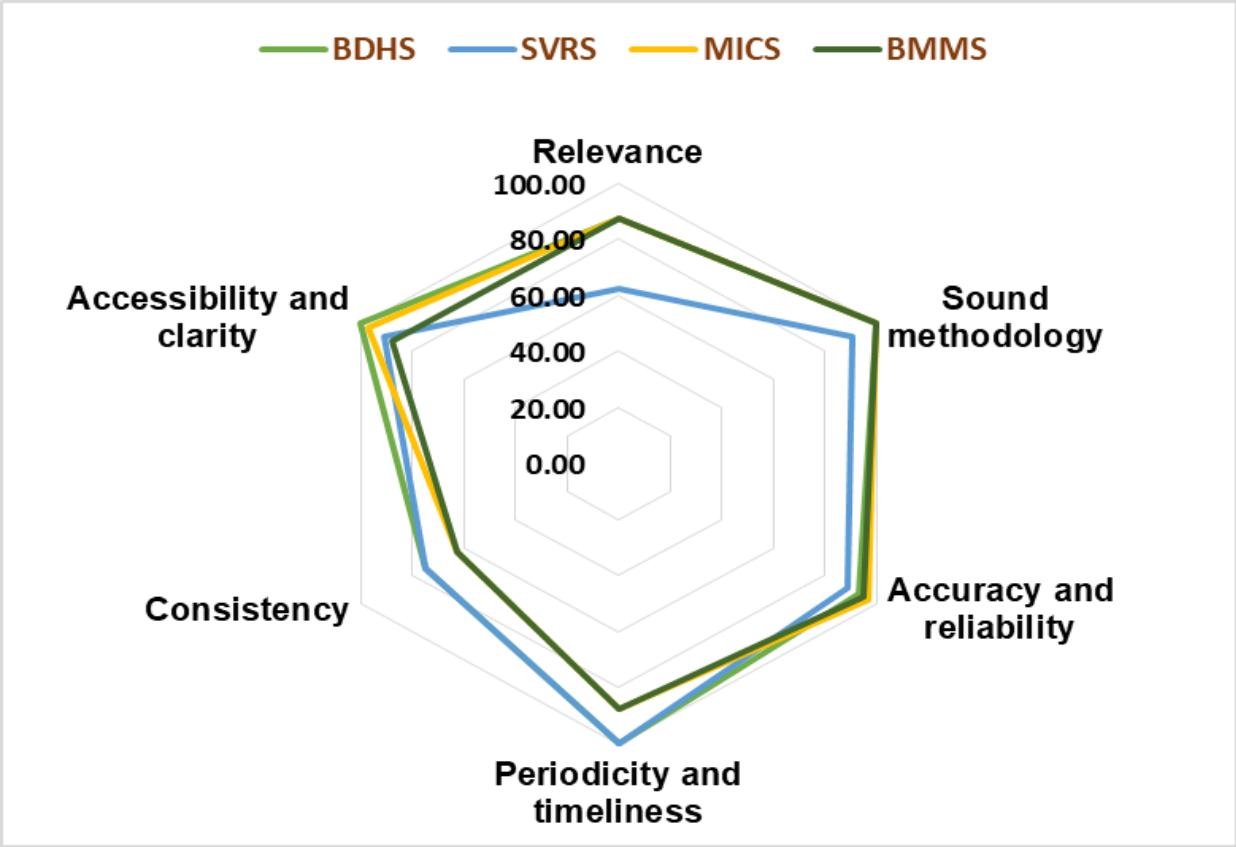

Figure 7. Spider chart of principle level score comparison

Indicator level Consistency Analysis

The difference in estimates of Under-five Mortality Rate (U5MR)

BDHS 2017–2018 estimated U5MR with five years of recall, implying that the mortality estimates were applicable for 2015. Therefore, the BDHS 2017–2018 estimates are comparable with SVRS

2015. Table 2 shows that the U5MR, infant mortality rate (IMR), and neonatal mortality rate (NMR) reported in SVRS 2015 and BDHS 2017–2018 are different.

Table 2. Key differences between BDHS, SVRS childhood mortality estimates

	SVRS-2015	BDHS-2017 (Estimated for 2015)
Neonatal Mortality Rate (NMR)	**20**	**30**
Post-neonatal Mortality Rate (PNMR)	9	8
Infant Mortality Rate (IMR)	29	38
1–4 years Child Mortality Rate (1–4 MR)	7	7
Under-5 Mortality Rate (U5MR)	36	45

However, the PNMR and 1–4 years child mortality rates reported in these two surveys are quite similar. This means that the observed differences in U5MR and IMR are due to the difference in NMR (20 per 1,000 live births in SVRS 2015 and 30 per 1,000 live births in BDHS 2017–2018). Since 1997, the NMR estimates of SVRS have been consistently lower than those of BDHS (Figure 8).

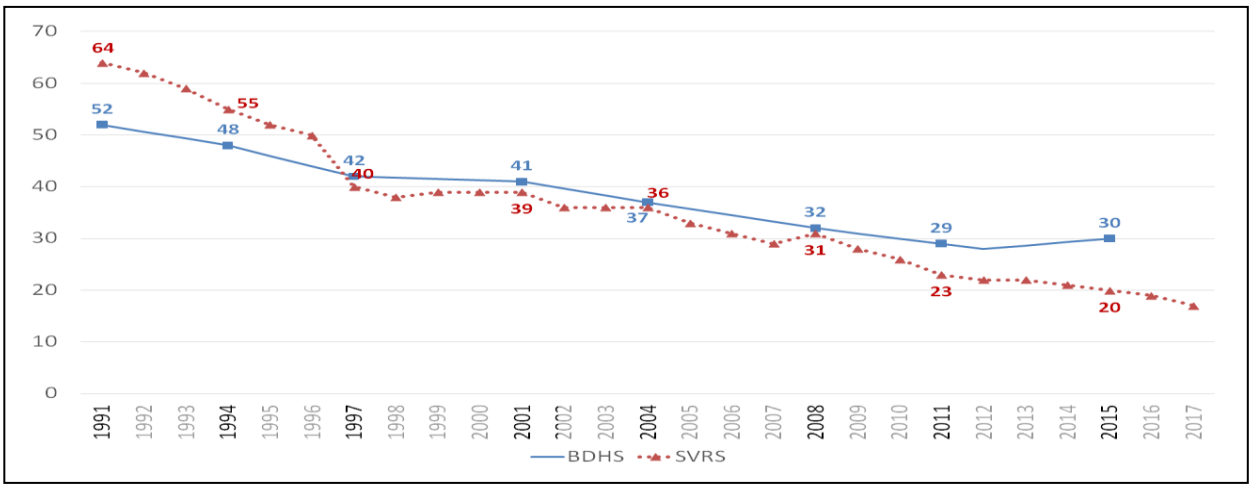

Figure 8. Differences in Neonatal Mortality in BDHS and SVRS

Comparison of NMR reported in BDHS 2017 and SVRS 2015 with other national and sub-national estimates

The NMR reported in SVRS 2015 is lower than all other national and sub-national estimates of NMR for the same period. A national level NMR estimate is available from BDHS 2017–2018 and BMMS 2016. Sub-national NMR estimates are available from Mirzapur Health and Demographic Surveillance (Mirzapur HDSS) and Baliakandi, and Faridpur Health and Demographic Surveillance (Faridpur HDSS). Mirzapur and Baliakandi upazilas of Faridpur districts are in central Bangladesh and these two surveillance sites have better health services and communication networks compared with the national level. Therefore, NMR is expected to be lower in these regions compared with NMR estimates for the entire country. However, the NMR estimate from SVRS–2015 is notably lower than all national and sub-national estimates of NMR available from other data sources (Figure 9).

More recent estimates of under-five and neonatal mortality rates from two sources of data, namely SVRS 2018 and MICS 2019, were also examined (Table 3). It should be noted that both SVRS 2018 and MICS 2019 are implemented by the Bangladesh Bureau of Statistics. The findings show that under-five mortality, infant mortality, and neonatal mortality rates from SVRS 2018 are much lower than the MICS 2019 estimates. The difference between MICS and SVRS was like the difference between the SVRS 2015 and BDHS 2017–2018 mortality estimates.

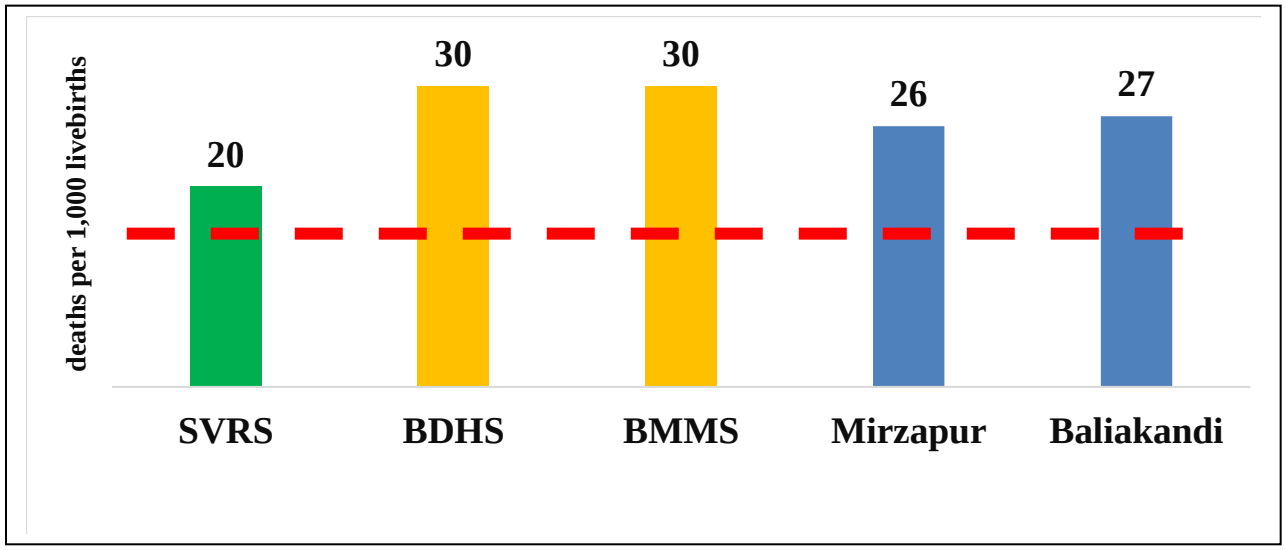

Figure 9. NMR in Bangladesh in 2015: national and sub-national estimates from different sources

Two events are required to estimate U5MR and NMR – deaths as numerators and births as denominators. Theoretically, the data collection team can overcount or undercount both births and deaths. However, for any survey/surveillance, the main concern is about undercounting births and deaths.

If SVRS 2015 NMR of 20 per 1,000 live births (= 0.02) is 'TRUE', then BDHS 2017–2018 has either over-reported deaths and/or under-reported births

i. **Over-reported deaths:** this is highly unlikely because a supervisor visited every reported death, and an hour-long verbal autopsy was conducted.

ii. **Under-reported births:** To match a 20 per 1,000 NMR (SVRS 2015), the BDHS 2017–2018 estimate of 30 per 1,000 requires 1,500 live births. This implies that BDHS 2017–2018 missed one-third of the total births. It should be noted that BDHS 2017–2018 reported higher TFR (2.3) than SVRS 2015 (2.1). If BDHS 2017–2018 has undercounted one-third of the 'true births', then the true TFR will be even higher than that reported by BDHS, which does not seem possible.

Table 3. Childhood Mortality Estimates from SVRS 2018 and MICS 2019

	SVRS-2018	MICS-2019
Neonatal Mortality Rate (NMR)	**16**	**26**
Post-neonatal Mortality Rate (PNMR)	6	8
Infant Mortality Rate (IMR)	22	34
Under-5 Mortality Rate (U5MR)	29	40

If BDHS 2017–2018 NMR of 30 per 1,000 live births (= 0.03) is 'TRUE', then SVRS 2015 has either under-reported deaths and/or over-reported births

i. **Under-reported deaths:** SVRS has missed 10 neonatal deaths per 1,000 live births. Based on the methodology that SVRS adopts to identify neonatal deaths, it is a plausible explanation.

ii. **Over-reported births:** this is unlikely. Rather, it is likely that SVRS under-reported births and, consequently, under-reported infant deaths.

Comparison of TFR rates of high priority division

The reporting of childhood deaths is linked to the reporting of births. If a survey misses births (under-estimation), then the deaths will be automatically under-reported. The following information indicates that SVRS may be under-reporting births:

According to SVRS –

- Chattogram reached TFR 2.0 (below the replacement level fertility rate) in 2009 with a contraceptive prevalence rate (CPR) of 49% (Figure 10).
- Sylhet reached TFR 2.2 (replacement level fertility) in 2011 with a CPR of 39% (Figure 11).

If the SVRS data is correct, the special efforts made in the Sylhet and Chattogram divisions with family planning programmes in the last seven to eight years were not justified.

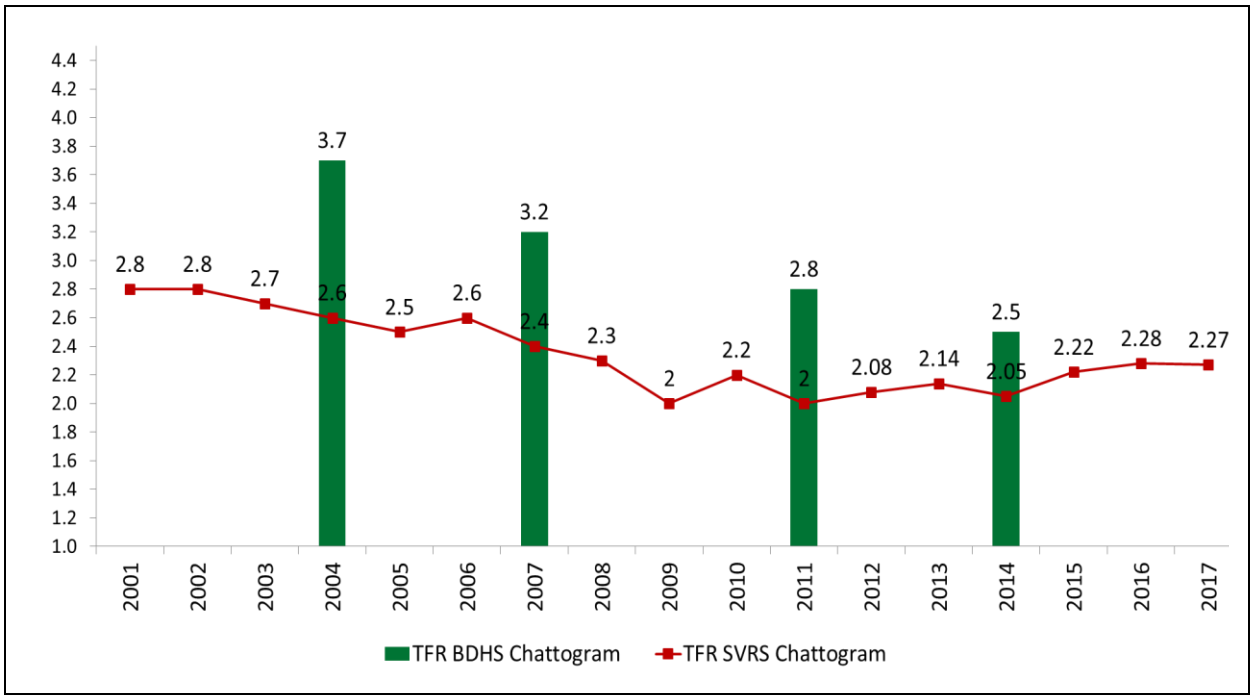

Figure 10. Chattogram Division TFR of BDHS and SVRS

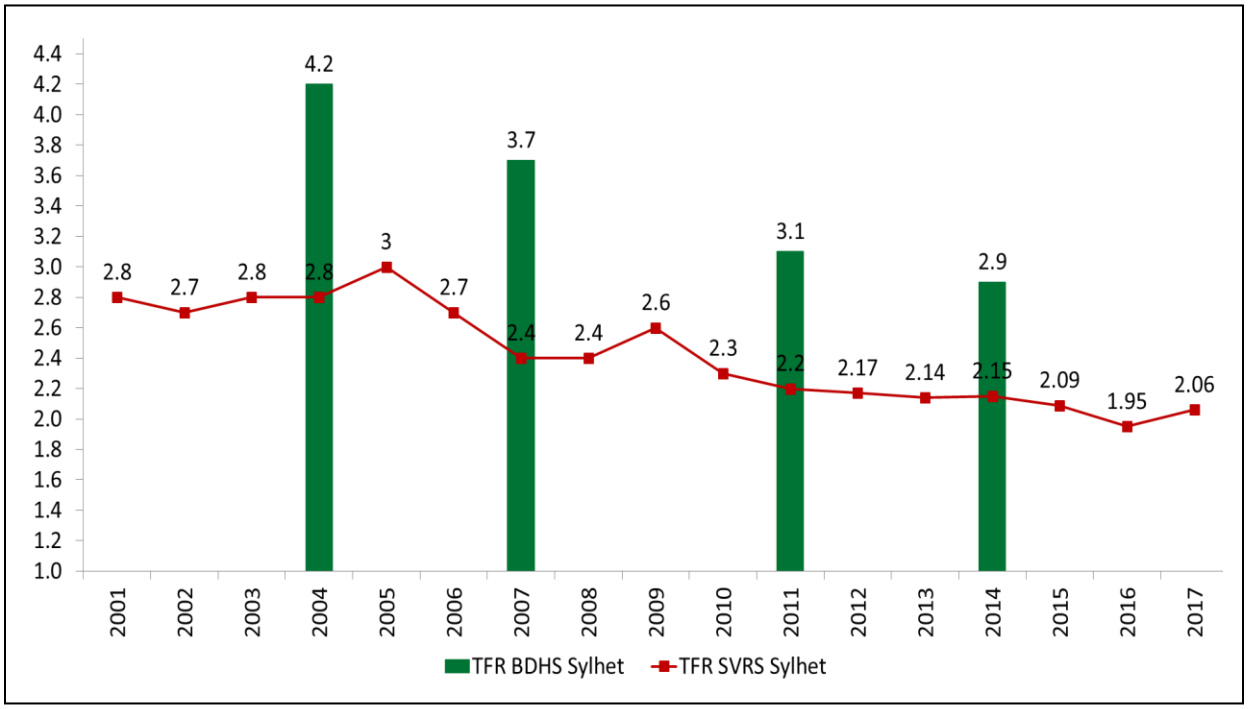

Figure 11. Sylhet Division TFR of BDHS and SVRS

It is highly unlikely that the Sylhet and Chattogram divisions reached the replacement fertility rates with such low CPR levels. The TFR and CPR rates in other countries were also examined, and no country showed that a CPR below 50% could result in TRF being below the replacement level of fertility (Table 4).

Table 4. TFR and CPR, Example of 6 countries

Country	TFR	CPR	Year
India	2.3	53.5	2016
Indonesia	2.3	60.9	2017
Nepal	2.1	52.6	2016
Sri Lanka	2.1	61.7	2016
Iran	1.8	77.4	2010
Turkey	2.1	73.5	2013

Adjusting score for Principle 5: Consistency

The indicator analysis for accuracy and consistency indicates that the likely reason for inconsistency among the estimates from different data sources was due to the SVRS data. Therefore, the score for BDHS, BMMS and MICS was adjusted under principle 5 to provide an equal score (level 4) for consistency. The comparison among the surveys and surveillance with the score adjusted under principle 5 is presented in Figure 12.

The combined spider chart, following adjustment, is presented in Figure 13. The figure shows that the BDHS performed better under all principles than the other surveys and surveillance.

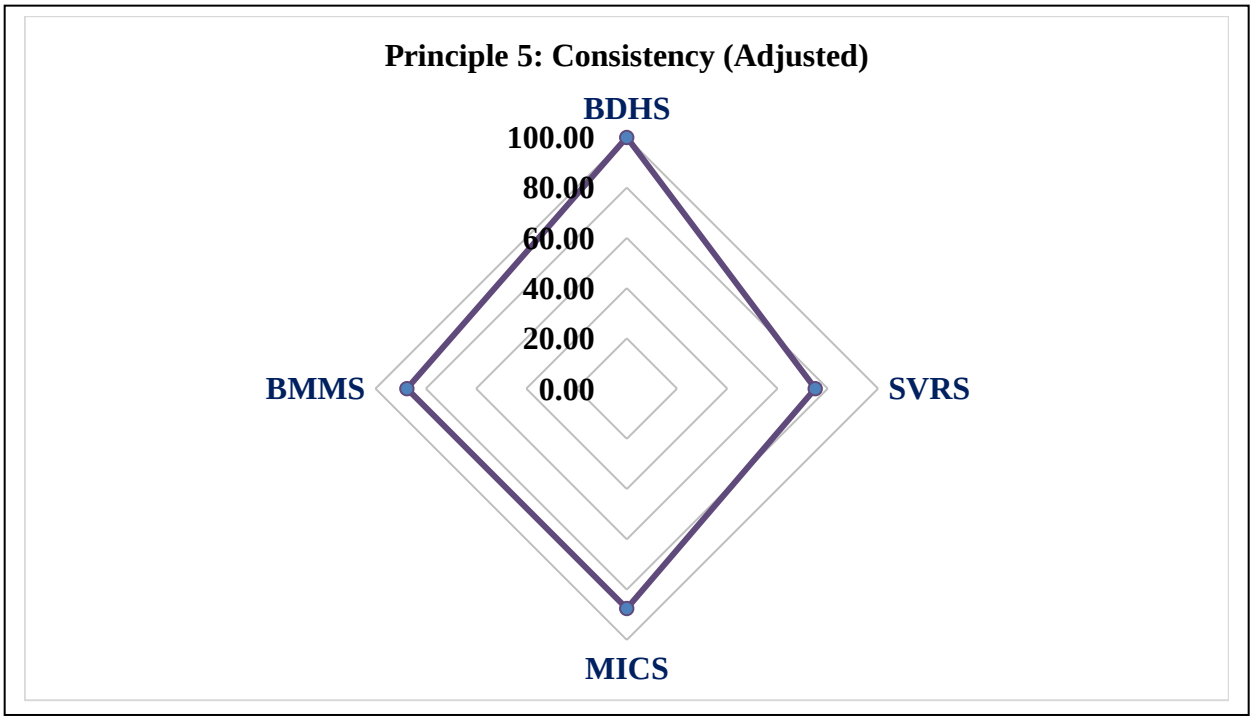

Figure 12. Adjusted score comparison under principle 5

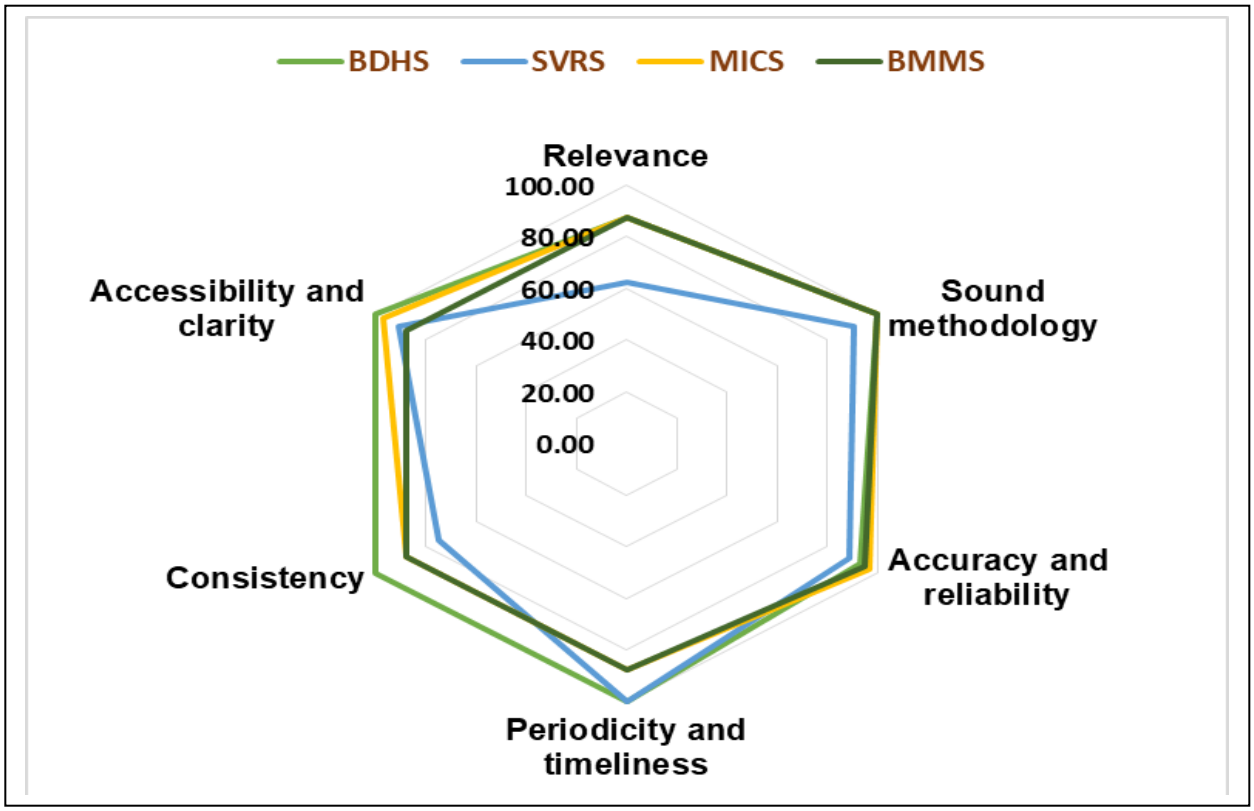

Figure 13. Adjusted spider chart of principle level score comparison

Indicator Level Score Comparison

Indicator level scores were compared based on the following:

- data is collected in a manner that allows for classification and the calculation of indicators in accordance with international standards.
- population coverage within the sample is complete (covering the appropriate household population).
- consistent within the dataset, over time, and with other major datasets.

These three points are tested with all seven indicators and the score obtained is compared among data sources.

NMR, PNMR, IMR, U5MR, TFR and CPR are reported in all surveys and surveillance. However, only BMMS and SVRS report MMR. BMMS scores better than SVRS for MMR and BDHS, BMMS and MICS score better than SVRS for NMR and PNMR. Overall**,** BDHS performs better than the other surveys and surveillance for all the considered indicators, except MMR.

Table 5. Indicator level score comparison based on three criteria

Indicator	BDHS	SVRS	BMMS	MICS
Maternal Mortality Ratio	–	9	12	-
Neonatal Mortality Rate	12	9	12	12
Post Neonatal Mortality Rate	12	9	12	12
Infant Mortality Rate	12	10	12	12
Under Five Mortality Rate	12	10	12	12
Total Fertility Rate	12	10	12	12
Contraceptive Prevalence Rate	12	10	12	12

6. Recommendation

Following the assessment of data quality and the comparison of scores, this study recommends BMMS as the best data source for MMR. However, BMMS is not conducted in periodic intervals.

For the child mortality indicators, i.e. NMR, PNMR, IMR and U5MR, the recommended data sources are BDHS, BMMS and MICS. Among them, the BDHS data is available at regular intervals and is of assured quality. BMMS and MICS data sources are also reasonably good sources, but the periodicity of the data is an issue.

Considering the principle and indicator level score comparisons, BDHS is more appropriate for reporting TFR and CPR. BMMS and MICS are also recommended for TFR and CPR when periodic and time series data is not required.

This study also recommends possible opportunities for improvement. After assessing the quality of the data for the relevant sources, it is recommended that SVRS review its data collection tools to ensure quality when conducting surveys in the field.

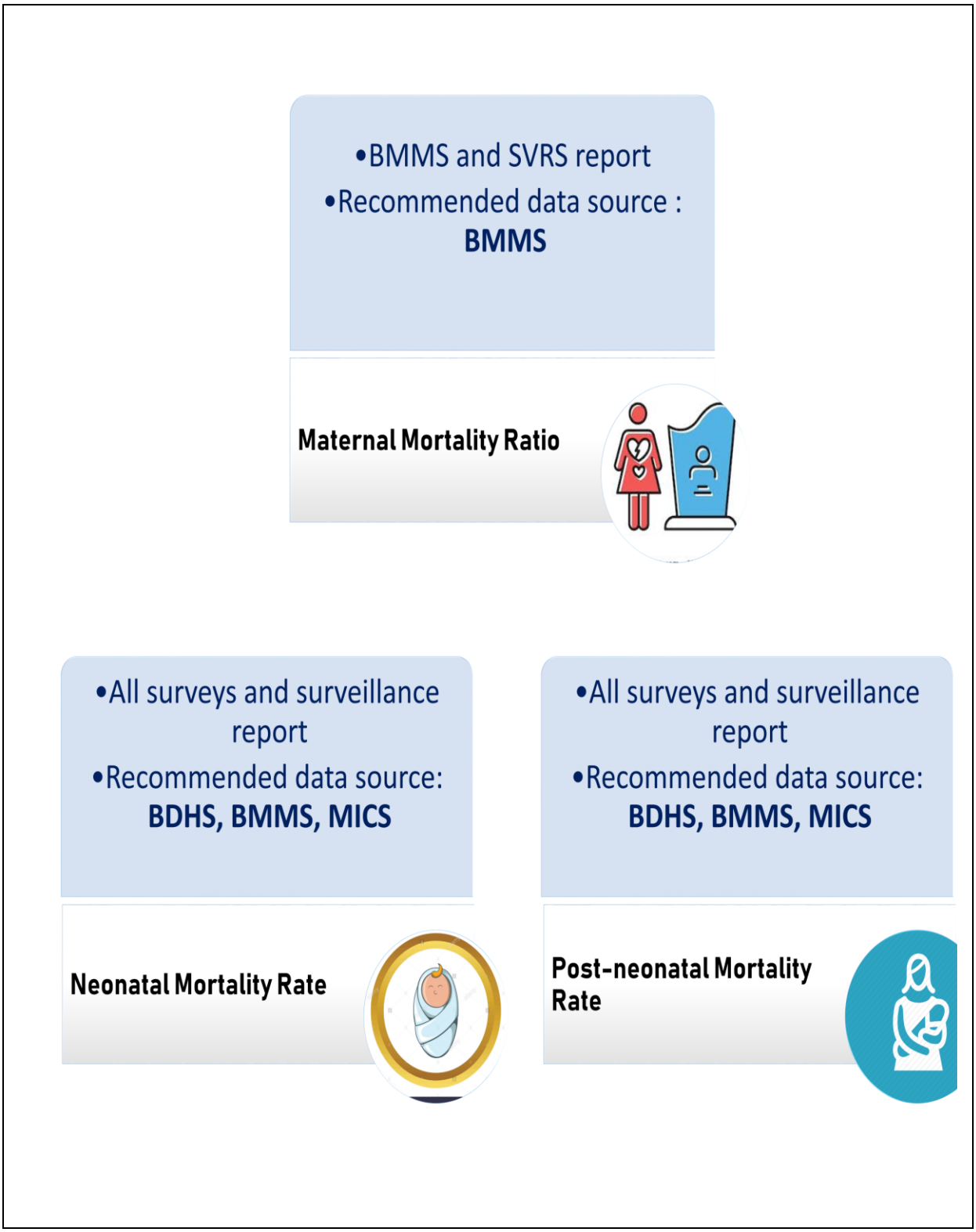

Figure 14. Recommended data source for indicators

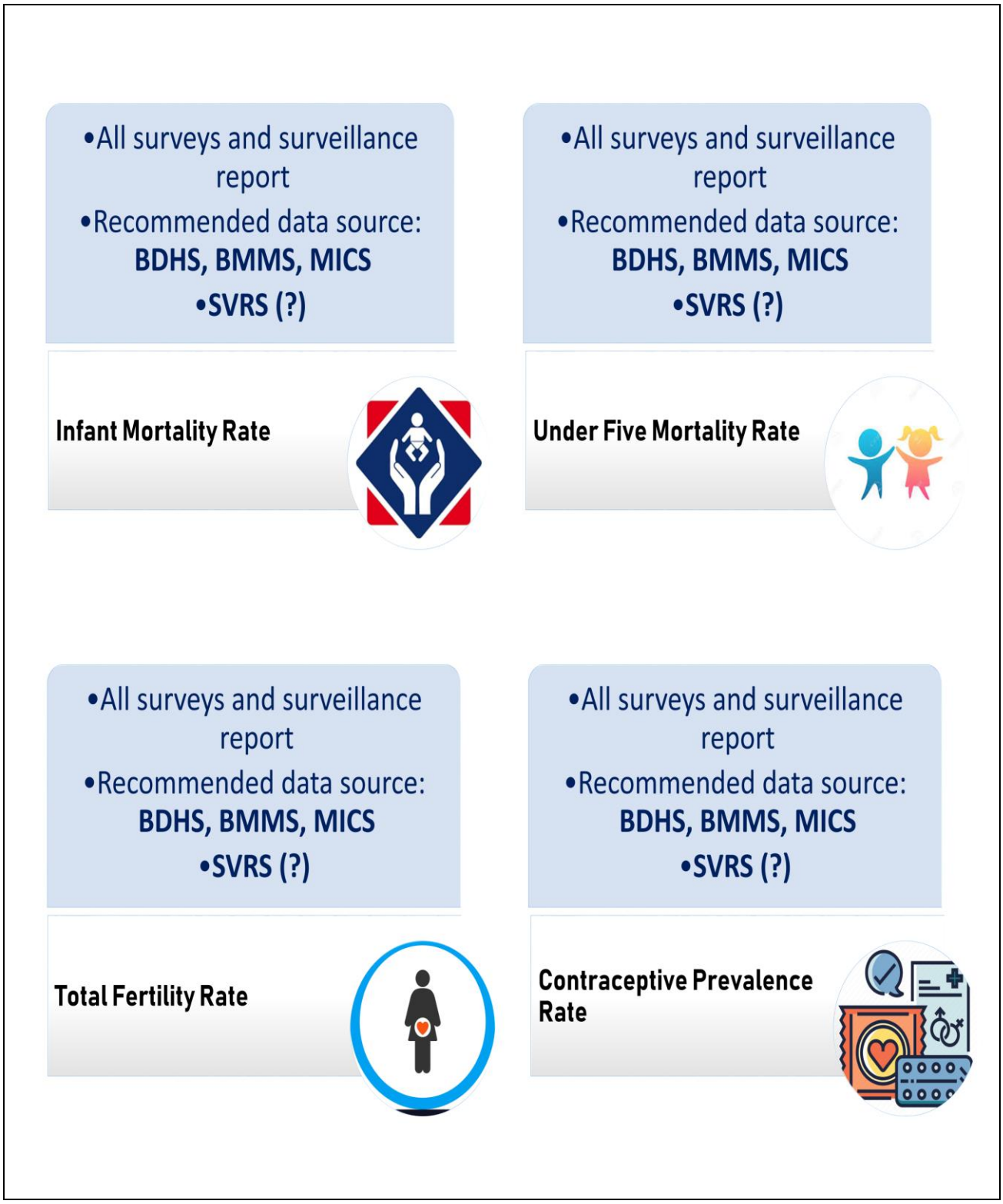

Figure 15. Recommended data source for indicators

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