

Safer Better Care



**Health
Information
and Quality
Authority**

An tÚdarás Um Fhaisnéis
agus Cáilíocht Sláinte

Guidance on a data quality framework for health and social care

2018



About the Health Information and Quality Authority

The Health Information and Quality Authority (HIQA) is an independent authority established to drive high quality and safe care for people using our health and social care services in Ireland. HIQA's role is to develop standards, inspect and review health and social care services and support informed decisions on how services are delivered.

HIQA aims to safeguard people and improve the safety and quality of health and social care services across its full range of functions.

HIQA's mandate to date extends across a specified range of public, private and voluntary sector services. Reporting to the Minister for Health and the Minister for Children and Youth Affairs, HIQA has statutory responsibility for:

- **Setting Standards for Health and Social Services** – Developing person-centred standards, based on evidence and best international practice, for health and social care services in Ireland.
- **Regulation** – Registering and inspecting designated centres.
- **Monitoring Children's Services** – Monitoring and inspecting children's social services.
- **Monitoring Healthcare Safety and Quality** – Monitoring the safety and quality of health services and investigating as necessary serious concerns about the health and welfare of people who use these services.
- **Health Technology Assessment** – Providing advice that enables the best outcome for people who use our health service and the best use of resources by evaluating the clinical effectiveness and cost-effectiveness of drugs, equipment, diagnostic techniques and health promotion and protection activities.
- **Health Information** – Advising on the efficient and secure collection and sharing of health information, setting standards, evaluating information resources and publishing information about the delivery and performance of Ireland's health and social care services.

Overview of the health information function of HIQA

Health is information-intensive, generating huge volumes of data every day. Health and social care workers spend a significant amount of their time handling information, collecting it, looking for it and storing it. It is therefore very important that information is managed in the most effective way possible in order to ensure a high-quality safe service.

Safe, reliable healthcare depends on access to, and the use of, information that is accurate, valid, timely, relevant, and complete. For example, when giving a patient a drug, a nurse needs to be sure that they are administering the appropriate dose of the correct drug to the right patient and that the patient is not allergic to it. Similarly, lack of up-to-date information can lead to the unnecessary duplication of tests — if critical diagnostic results are missing or overlooked, tests have to be repeated unnecessarily and, at best, appropriate treatment is delayed or at worst not given.

In addition, health information has an important role to play in healthcare planning decisions — where to locate a new service, whether or not to introduce a new national screening programme and decisions on best value for money in health and social care provision.

Under section (8)(1)(k) of the Health Act 2007, the Health Information and Quality Authority (HIQA) has responsibility for setting standards for all aspects of health information and monitoring compliance with those standards.⁽¹⁾ In addition, under section 8(1)(j), HIQA is charged with evaluating the quality of the information available in health and social care and making recommendations in relation to improving its quality and filling in gaps where information is needed but is not currently available.

Information and communications technology (ICT) has a critical role to play in ensuring that information to promote quality and safety in health and social care settings is available when and where it is required. For example, it can generate alerts in the event that a patient is prescribed medication to which they are allergic. Further to this, it can support a much faster, more reliable and safer referral system between the patient's GP and hospitals.

Although there are a number of examples of good practice, the current ICT infrastructure in Ireland's health and social care sector is highly fragmented, with major gaps and silos of information which prevent the safe, effective, transfer of information. This results in people using services being asked to provide the same information on multiple occasions.

In Ireland, information can also be lost, documentation is poor, and there is over-reliance on memory. Equally, those responsible for planning our services experience great difficulty in bringing together information in order to make informed decisions. Variability in practice leads to variability in outcomes and cost of care. As a result of these deficiencies, there is a clear and pressing need to develop a coherent and integrated approach to improving the quality of health information, based on standards and international best practice. A robust health information environment will allow all stakeholders — patients and service users, health professionals, policy makers and the general public — to make choices or decisions based on the best available information.

Through its health information function, HIQA is working to support health and social care organisations in improving the quality of their data to better support the delivery, planning and monitoring of health and social care services.

This *Guidance on a data quality framework for health and social care* aims to provide organisations with the necessary tools to systematically assess, monitor, evaluate and improve data quality, which is a fundamental requirement for a safe and reliable healthcare system.

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Glossary of terms

Audit: a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which the audit criteria are met.

Data and information lifecycle: the stages which data goes through to become information, from the point of data collection through to dissemination of information.

Data dictionary: a descriptive list of names (also called representations or displays), definitions and attributes of data elements to be collected in an information system or database. The purpose of the data dictionary is to standardise definitions and ensure consistency of use.

Data quality dimensions: the quality of data and information can be defined and assessed using the following internationally accepted dimensions:

- relevance
- accuracy and reliability
- timeliness and punctuality
- coherence and comparability
- accessibility and clarity.

Data quality framework: a document which outlines the approaches to systematically assess, document and improve data quality. It includes a data quality strategy, data quality assessment methodology, reporting on data quality and data quality improvement cycle.

Data quality improvement cycle: this component of a data quality framework details a continuous approach that organisations can undertake to improve the quality of their data.

Data quality statement: a statement prepared to accompany all published outputs from a national health and social care data collection which highlights the dimensions of data quality, including strengths and weaknesses, so that potential data users can make informed judgments about fitness for use.

Data quality strategy: a document outlining an organisation's formalised approach to managing and continuously improving the quality of their data. It outlines the organisation's direction and prioritised initiatives for identifying, documenting and ensuring the implementation of data quality practices.

Data user: any stakeholder who uses data held by a health or social care organisation or any information outputs from that organisation.

Key performance indicators: specific and measurable elements of practice that are designed to assess key aspects of structures, processes and outcomes.

National health and social care data collections: national repositories of routinely collected health and social care data, including administrative sources, censuses, surveys and national patient registries in the Republic of Ireland.

Policy: a written statement that clearly indicates the position and values of an organisation on a given subject.

Procedure: a written set of instructions that describe the approved and recommended steps for a particular act or sequence of events.

Quality: quality is defined as 'fitness for purpose' to meet the needs of users. Data and information quality encompasses the dimensions of relevance; accuracy and reliability; timeliness and punctuality; coherence and comparability; and accessibility and clarity, which need to be balanced against one another to meet users' needs.

Statement of purpose: a publicly available document which succinctly captures why an organisation such as a national health and social care data collection exists and clearly outlines its stated objectives.

Part I - Data quality framework overview

1. Introduction

A considerable amount of data is collected on a regular basis about health and social care services in Ireland. It is vital that there is confidence and trust in the quality of this data and information in order to support the provision of safe and efficient health and social care to patients and service users. Accurate, relevant and timely data is essential in order to deliver services and improve health and social care. It can be used to inform decision-making, monitor diseases, organise services, support policy making, conduct quality research and plan for future health and social care needs, both at local and national level. Providers of health and social care services need quality data and information, not only at the point of service delivery but also at the point of decision-making in a format that is user friendly. Efforts to improve systems or processes within health and social care organisations must be driven by reliable data. Decisions are only as good as the information on which they are based. Where reliable data is available, organisations can accurately identify deficiencies, prioritise quality improvement initiatives and objectively assess whether change and improvement have occurred. To ensure that data is 'fit for purpose', health and social care organisations should adopt a systematic approach to assessing, improving and maintaining the quality of their data.

The importance of high-quality health and social care information in improving the safety and quality of patient care has been outlined in a number of key national strategy documents in recent years.^(2,3,4) In particular, the *e-Health Strategy* published in 2013 highlights the importance of access to quality health data sources to drive improvements in the quality and safety of care.⁽⁵⁾ Other developments that show the importance of quality health information include the establishment of the Office of the Chief Information Officer in 2015 and the publication of the Health Service Executive's *Knowledge & Information Strategy*.⁽⁶⁾

Based on international best practice, four key principles relating to health information have been identified which are based on maximising health gain for the individual and the population, specifically:

- health information is used to deliver and monitor safe and high-quality care for everyone
- health information should be of the highest quality and, where appropriate, collected as close as possible to the point of care
- health information should be collected once and used many times
- data collection should be 'fit for purpose' and cost-effective.

This guidance applies to all health and social care organisations, including national data collections, such as the National Cancer Registry of Ireland and the Hospital In-Patient Enquiry Scheme (HIPE). It will facilitate a systematic approach for organisations to assess the quality of the data they produce and will support a consistent approach to managing data quality.

1.1 What is quality?

HIQA uses the term 'fit for purpose' to define quality in line with international standards and best practice. This defines quality in terms of the data users and their needs.

A target for health and social care organisations is to produce data that is sufficiently accurate, timely and consistent to make appropriate and reliable decisions, rather than aiming to produce perfect data.⁽⁷⁾

Quality health and social care is dependent on the access to and use of quality data and information. Data users can have greater confidence in the data that they obtain when a systematic approach is taken to assessing the quality of that data.

The benefits of quality data include:

- facilitation of better informed strategic, national and local planning for health and social care
- provision of safer, better quality care for patients
- better informed national and local policies
- greater contributions to research
- improved population health.

The quality of data can be determined through assessment against a number of key dimensions. Data quality dimensions are 'a set of data quality attributes that represent a single aspect or construct of data quality'.⁽⁸⁾ Numerous dimensions with different interpretations have been identified in the literature to describe data quality. Internationally the most commonly used dimensions include relevance, accuracy, reliability, timeliness, punctuality, coherence, comparability, accessibility and clarity, as detailed in Figure 5.^(9,10,11) HIQA has adopted these dimensions of quality, which are recognised as international best practice in the assessment of data and information quality within the health and social care sector.* These dimensions need to be balanced against one another to meet users' needs.

Quality data and information refers to data and information that are relevant, accurate and reliable, timely and punctual, coherent and comparable, and accessible and clear.

By assessing data quality it is possible to:

- establish a baseline for data quality and identify any areas for improvement
- assess the impact of any changes in practice, policies or procedures on data quality
- report on improvements in data quality.

It is important to recognise that data quality is a relative measure. It is dependent on financial and human resources, and the quality and quantity of data must be balanced against available

* HIQA has updated and revised the dimensions of quality to align with international best practice and to encompass all aspects of the data and information life cycle, as explained in Section 1.3.

resources.⁽¹²⁾ Recognising from the outset that data collection is a resource intensive process will help health and social care organisations to ensure that the amount and quality of data collected is aligned with the information needs of data users.

A **Data quality framework** outlines the approach and provides the tools that can be used by organisations to systematically assess, document and improve data quality. The components of a data quality framework include the following:

- data quality strategy
- data quality assessment methodology
- reporting on data quality
- data quality improvement cycle.

Through developing and implementing a data quality framework, organisations can strive to ensure that the use of their data is optimised to achieve the best value for money and provide the greatest benefit to users in order to maximise health gain. The framework outlined in Figure 2 comprises a detailed data quality assessment tool which will support organisations in assessing and improving the quality of data and information through assessment against a set of clearly defined criteria.

1.2 Purpose and scope

The purpose of this document is to provide guidance to health and social care organisations on how to develop a data quality framework, in order to systematically assess, monitor, evaluate and improve the quality of their data and information (see Figure 2).

This *Guidance on a data quality framework for health and social care* applies to all health and social care organisations, including national data collections and other organisations whose remit involves the collection, processing, use or interpretation of data or information and whose responsibility it is to ensure the quality of that data or information.

The scope of this data quality framework is broad and covers the quality of both the data that is collected by organisations and information produced by organisations (such as statistics, indicators and analytical reports) using this data. This encompasses the entire data and information lifecycle (see Section 1.3).

1.3 Data and information lifecycle

The data and information lifecycle refers to the stages which data goes through to become information, from the point of data collection through to dissemination of information. The data quality framework, as detailed in Figure 2, encapsulates each stage of the data and information lifecycle.

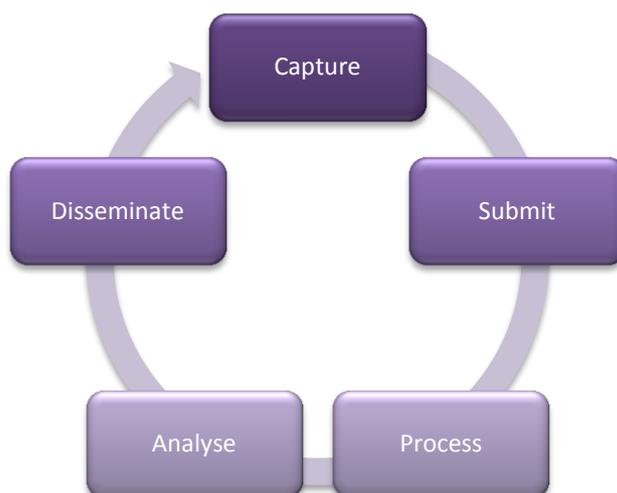
The stages of the lifecycle are:

- Capture — The point at which data enters an organisation either through data collection or acquisition from another organisation, for example, from a healthcare provider.
- Submission — The form and mechanisms by which data is submitted to an organisation, supported through the use of standards, submission specifications and tools.
- Processing — Following submission of data, the data is verified and cleaned prior to it being used. In some cases data is transformed and aggregated for analyses.
- Analysis — Following completion of the processing stage, data is analysed and may undergo statistical analyses.
- Dissemination — Information produced is made available for data users. This stage may not be part of the lifecycle for some organisations and, therefore, the data or information is retained and stored within the organisation.^(13,14)

This lifecycle is adapted from both the Generic Statistical Business Process Model (GSBPM) and CIHI's Information Quality Framework and focuses only on the quality management aspect of data and information^(13,15) and not aspects in relation to the retention, storage and destruction of data and information. (These are covered within other information governance guidance published by HIQA).⁽¹⁶⁾

The degree of applicability of a particular dimension of data quality at a particular stage of the lifecycle may vary from one organisation to another. It is recommended that health and social care organisations carefully map out at what stage along the lifecycle a particular dimension of data quality should be applied in order to ensure that opportunities to assess data quality are not missed.

Figure 1. The data and information lifecycle



2. Methodology for development of guidance

This guidance was developed in line with HIQA's guidance development process. In 2017, HIQA published *Information management standards for national health and social care data collections*, the purpose of which is to provide a roadmap to improve the quality of national health data and information, which will ultimately contribute to the delivery of safer, more reliable health and social care for service users and patients.⁽¹⁶⁾ Data quality is specifically addressed in Standard 6 under the theme Use of Information. In this standard, it is recommended that national data collections develop a data quality framework to assist them in systematically assessing, monitoring, evaluating and improving the quality of their data.

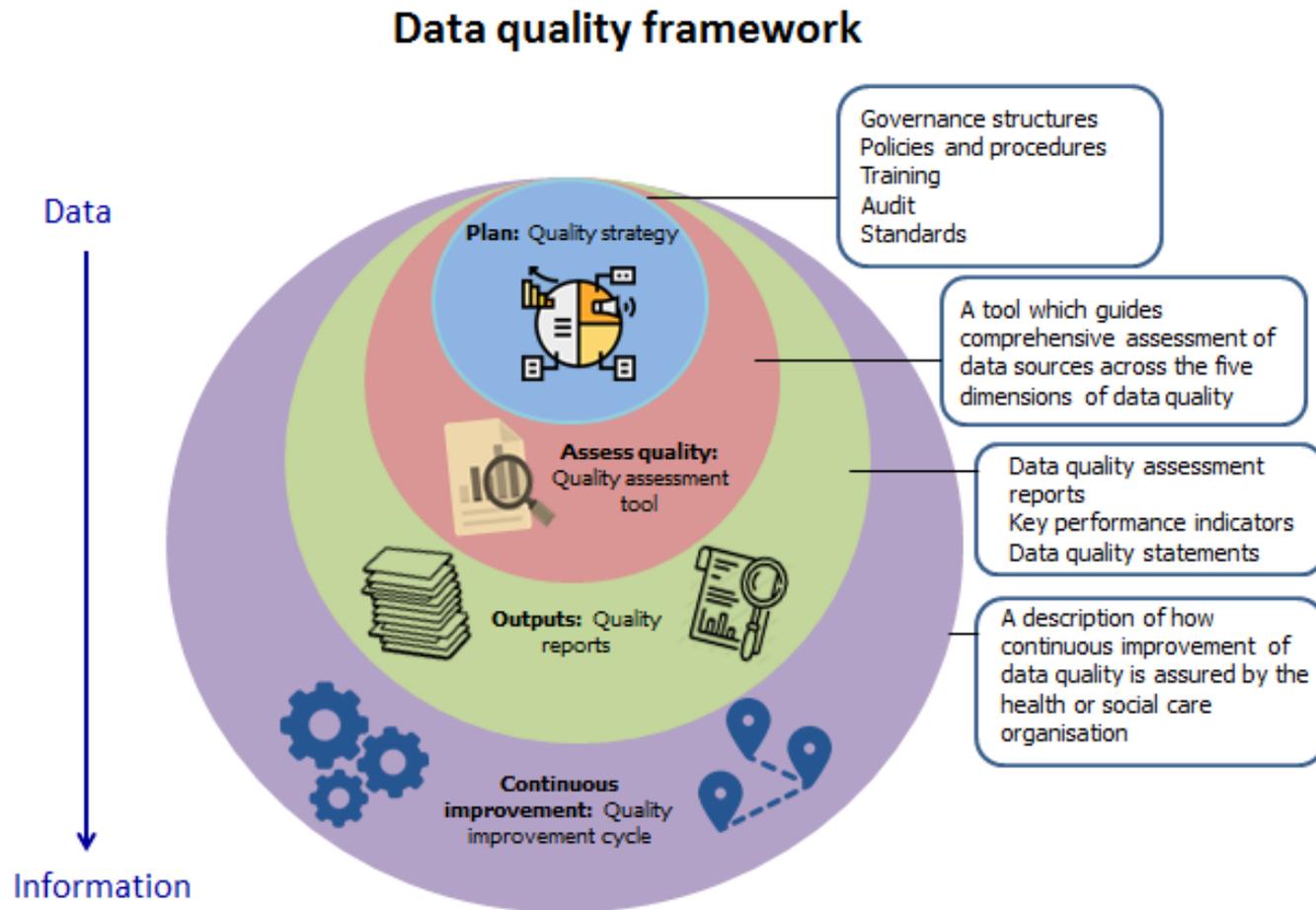
The steps in the development of this guidance are outlined here:

- **Review of international evidence** — in line with guidance development process, HIQA undertook a detailed review of the international literature, the findings of which are published as a *Background paper to support guidance for a data quality framework for health and social care* on the HIQA website. A brief summary of this international evidence is detailed in Appendix 1.
- **Expert Working Group** — an Expert Working Group was convened to provide advice on the development of the guidance. Membership of this group is listed in Appendix 2.
- **Specialist expert advice** — specialist expert advice was sought from CIHI, who have a data quality framework in place for a number of years, and a member of CIHI's data quality team took part in the first meeting of the Working Group.
- **Targeted consultation** — a targeted consultation was carried out in relation to the draft guidance. The feedback from the targeted consultation was analysed, considered and used to inform the finalised guidance.

Parts of this guidance have been adapted with permission from the Canadian Institute for Health Information's (CIHI) Information Quality Framework.⁽¹³⁾

CIHI retains the copyright to its Information Quality Framework.

Figure 2. Key components of a data quality framework[†]



[†] This framework captures the complete data and information lifecycle.

3. Key components of a data quality framework

In order to assess, document and improve data quality in a standardised way, health and social care organisations should have a data quality framework in place which will provide them with the appropriate tools and resources to guide improvements in data quality.

This section describes how health and social care organisations can develop a data quality framework based on international best practice. The framework aims to provide organisations with an overarching structure to guide the strategic assessment of data quality across their organisation. The following section provides further detail of the components that may be included in a data quality framework.

This guidance provides the overarching structure and tools to enable organisations to develop a data quality framework for all of the quality management practices of that organisation and to systematically assess, document and improve data quality.

A data quality framework comprises a number of different components, including:

1. **A Data Quality Strategy** — an organisation's formalised approach to address data quality which sets out the activities that an organisation needs to undertake in order to strengthen their approach to the collection, handling, use and dissemination of data and information.
2. **A Data Quality Assessment Tool** — a set of criteria to comprehensively assess data sources across the five dimensions of quality, as detailed in Part II of this guidance.
3. **Reporting on data quality** — data quality reports can include internal or external data quality assessment reports, reporting on key performance indicators or metrics and producing 'data quality statements'.
4. **A data quality improvement cycle** — a description of how continuous improvement of data quality is assured by the health or social care organisation. It encompasses the processes and methodologies applied by organisations as part of their data quality improvement initiatives.

Further detail on these individual components is provided in sections 3.1 to 3.4

3.1 Data Quality Strategy

Attaining high-quality data does not occur by chance. It requires that organisations have a clear understanding of the challenges involved in achieving this outcome and that a strategy is developed and implemented to guide this process. A data quality strategy can be defined as “a cluster of decisions centred on organisational data quality goals that determine the data processes to improve, solutions to implement, and people to engage”.⁽¹⁷⁾ A data quality strategy should provide a roadmap of how a health or social care organisation manages and continuously improves the quality of their data. It formalises the approaches for identifying, documenting and ensuring the implementation of data quality practices.⁽¹⁸⁾ A data quality strategy can be a standalone document or can be incorporated within an overall information management strategy. Key components to be included in a data quality strategy are provided in the Templates section of this guidance (Section 6).

Decisions within the health and social care setting are only as good as the information on which they are based. Health and social care organisations have a responsibility to take the time and give the necessary commitment to ensure that high-quality data is established and maintained. This section provides details of the elements that can be included in a data quality strategy.

Information on the following may be included as part of a data quality strategy:

- governance, leadership and management structures
- policies and procedures
- training, education and development programme
- data quality audit
- standards.

Figure 3. Components of a data quality strategy



3.1.1 Governance arrangements in relation to data quality

A data quality strategy should, firstly clearly outline the governance arrangements in place in relation to data quality. Formalised governance arrangements for an organisation ensure that there are clear lines of accountability and responsibility at individual, team and organisational level and are key to the successful delivery of a data quality strategy.⁽¹⁶⁾ It is not necessary for an organisation to have separate governance structures for data quality; however, data quality should be built in as an intrinsic part of the existing governance structures. A well-governed and managed service also monitors its performance so that it can ensure high-quality data is produced consistently.

In relation to governance leadership and management, the data quality strategy should include information on:

- the governance and organisational structure, including management of risk and a description of how data quality fits into these structures
- the individual with overall executive responsibility for data quality
- all roles, responsibilities and lines of accountability in relation to data quality
- strategic and operational plans in respect of data quality
- formalised agreements with data providers to ensure data quality.

3.1.2 Data quality policies and procedures

Health and social care organisations should strive to develop and implement clear policies and procedures which detail the processes an organisation should have in place to manage data quality, determined by the direction outlined in the organisation's data quality strategy. Data quality policies are written statements outlining an organisation's values in relation to the quality of their data, while data quality procedures describe the steps needed to achieve good quality data. Policies and procedures should address each dimension of data quality: relevance; accuracy and reliability; timeliness and punctuality; coherence and comparability; accessibility and clarity. Furthermore, a clear process should be in place to monitor adherence to data quality policies and procedures within an organisation.

3.1.3 Training, education and development programme in relation to data quality

A skilled and competent workforce is essential in order to successfully implement a data quality strategy aimed at producing high quality data and information. In order to improve and maintain data quality, it is important that an ongoing training, education and development programme is in place which focuses specifically on data quality. This programme should be informed by the findings of a training needs analysis. Furthermore, effective recruitment and workforce planning ensures that staff have the necessary skills and competencies to fulfil the duties required of them within their role in relation to data quality.

3.1.4 Data quality audits

Specific reference should be made within a data quality strategy to the procedures in place for conducting data quality audits. Health and social care organisations should conduct data quality audits, which review the quality of the organisation's data against the five dimensions of quality, with a view to identifying any issues or risks with that data. Data quality audits can be carried out internally or externally and should be undertaken on a regular basis. The initial audit can be used as a benchmark for assessing improvements in data quality over time. A quality improvement action plan should be developed and implemented based on the findings of the data quality audit.

3.1.5 Standards for data quality

Data standards support a more consistent approach to the collection and management of health and social care data. Adhering to standards facilitates better data quality and makes comparing information easier through supporting data sharing and interoperability. Some organisations are mandated to comply with specific standards, while others may choose to use standards to support best practice. The most commonly used standards include data dictionaries and terminology standards.

A data dictionary is a collection of names, definitions and attributes about data elements that are being used or captured in a database, information system, or as part of a research project. It describes the meanings and purposes of data elements within the context of a project and provides guidance on interpretation, accepted meanings and representation.

A data dictionary underpins data quality and helps to support consistency in the collection of data across organisations. A data dictionary provides a clear and standardised summary of all data items captured by the health or social care organisation and removes the possibility for ambiguity, misinterpretations and differing interpretations of the same variable.⁽¹²⁾ Section 6.3 contains a data dictionary template and explanatory notes.

Where standards such as a data dictionary are not in place within health and social care organisations, any planned update to a data system should consider the inclusion of a data dictionary and other standards to support improvements in data quality.

3.2 Data quality assessment tool

A data quality assessment tool has been developed based on the five key dimensions of quality, as detailed in Figure 5. This tool provides a detailed set of criteria that organisations can use to comprehensively assess its data sources across all five dimensions of quality, as detailed in Part II of this guidance.

3.3 Reporting on data quality

Following a detailed assessment of the quality of the organisations data sources, using the data quality assessment tool, the next step is to report on the findings of that assessment. Reporting on data quality can include internal or external data quality assessment reports, reporting on key performance indicators (KPIs), and the production of data quality statements, as detailed below. It is important in communicating to a data user how 'fit for purpose' the data is. Reporting on data quality can be undertaken internally (within the organisation) or externally (published).

3.3.1 Data quality assessment reports

A data quality assessment report should include details on data quality assessments conducted to identify the strengths and weaknesses of the organisation's data. The report should describe the quality of the data according to the dimensions that the health or social care organisation has used to demonstrate its 'fitness for purpose', which may include relevance; accuracy and reliability; timeliness and punctuality; coherence and comparability; and accessibility and clarity. Data quality assessment reports should be presented using a standardised reporting structure to facilitate comparability.⁽⁷⁾ For example, the Central Statistics Office regularly produce quality reports for their social surveys.

3.3.2 Key performance indicators

Data quality key performance indicators (KPIs) are specific and measurable elements of practice that health and social care organisations can use to characterise the quality of data or information and report performance.⁽⁷⁾ KPIs are designed to assess key aspects of structures, processes and outcomes of data quality. When reporting on data quality, it is important to establish and measure specific indicators in relation to each of the five dimensions of data quality.

3.3.3 Data quality statements

A data quality statement is a statement prepared to accompany each significant published output from the health or social care organisation. It should be based on the findings of the data quality assessment undertaken and should highlight the strengths and weaknesses of the data, assessed using the five dimensions of data quality.

Including a data quality statement with all published outputs provides information about the quality of the data in each output. It allows data users to interpret the data and information and make informed judgements about whether it meets their needs.

The content of the data quality statement will vary depending on the data and information being published, but is likely to include:

- an overview of the data collection and its remit

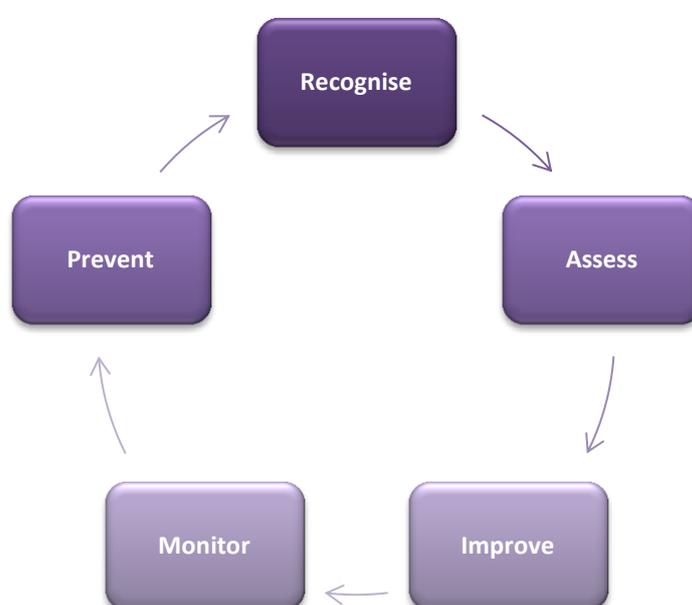
- a description of the data source
- a summary of the issues identified with the data
- an overview of the quality of the data under each of the dimensions of data quality.⁽¹⁹⁾

A proposed template for a data quality statement is included in Templates section (Section 6.2).

3.4 Data quality improvement cycle

A data quality improvement cycle, which is outlined in Figure 4, details a continuous approach that health and social care organisations can undertake to improve the quality of their data. This iterative approach consists of a number of stages of analysing and assessing data from the point of collection or acquisition through to dissemination and use. Organisations should strive to ensure that they maintain a continuous cycle of data quality improvement.

Figure 4. Data quality improvement cycle



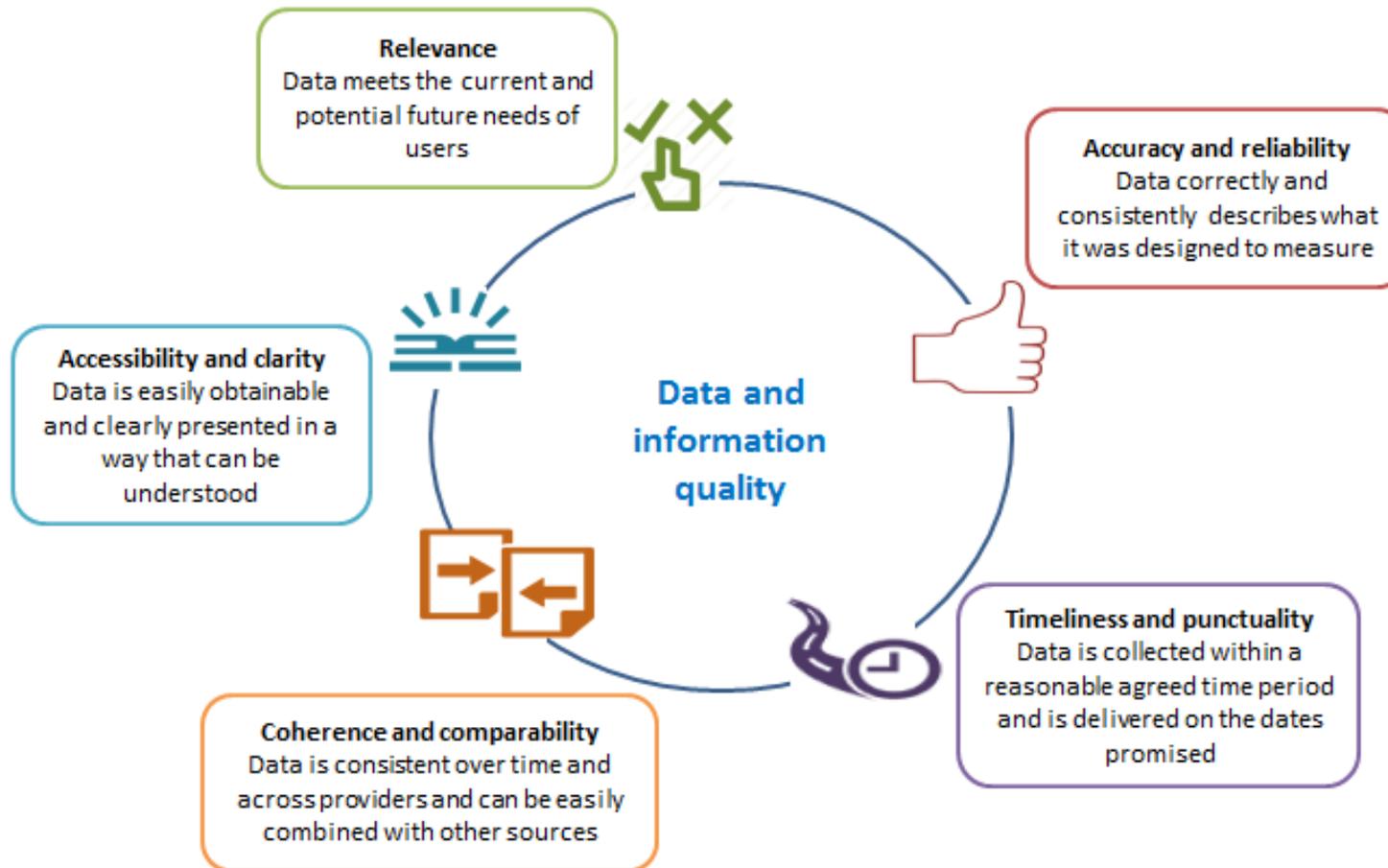
The data quality improvement cycle encompasses the following stages:

- **Recognise** – an organisations approach to actively identifying issues with their data, which need to be addressed as part of a quality improvement process.
- **Assess** – the planning and preparation of the process that an organisation must undertake to address any data quality issues identified.
- **Improve** – the implementation of quality improvement processes which an organisation has established to address identified data quality issues.
- **Monitor** – the process that an organisation undertakes to assess whether the data quality improvement cycle has resulted in improvements in data quality. This stage includes maintenance of processes which have resulted in improvements in data quality, in order to prevent future issues of the same nature.
- **Prevent** – implementation of a strategic approach to embedding a continuous data quality improvement cycle, to ensure that data quality issues are recognised and managed appropriately. ⁽²⁰⁾

4. Dimensions of quality

The quality of data can be defined and assessed using the following internationally accepted dimensions, which are outlined in Figure 5.

Figure 5: Five dimensions of quality



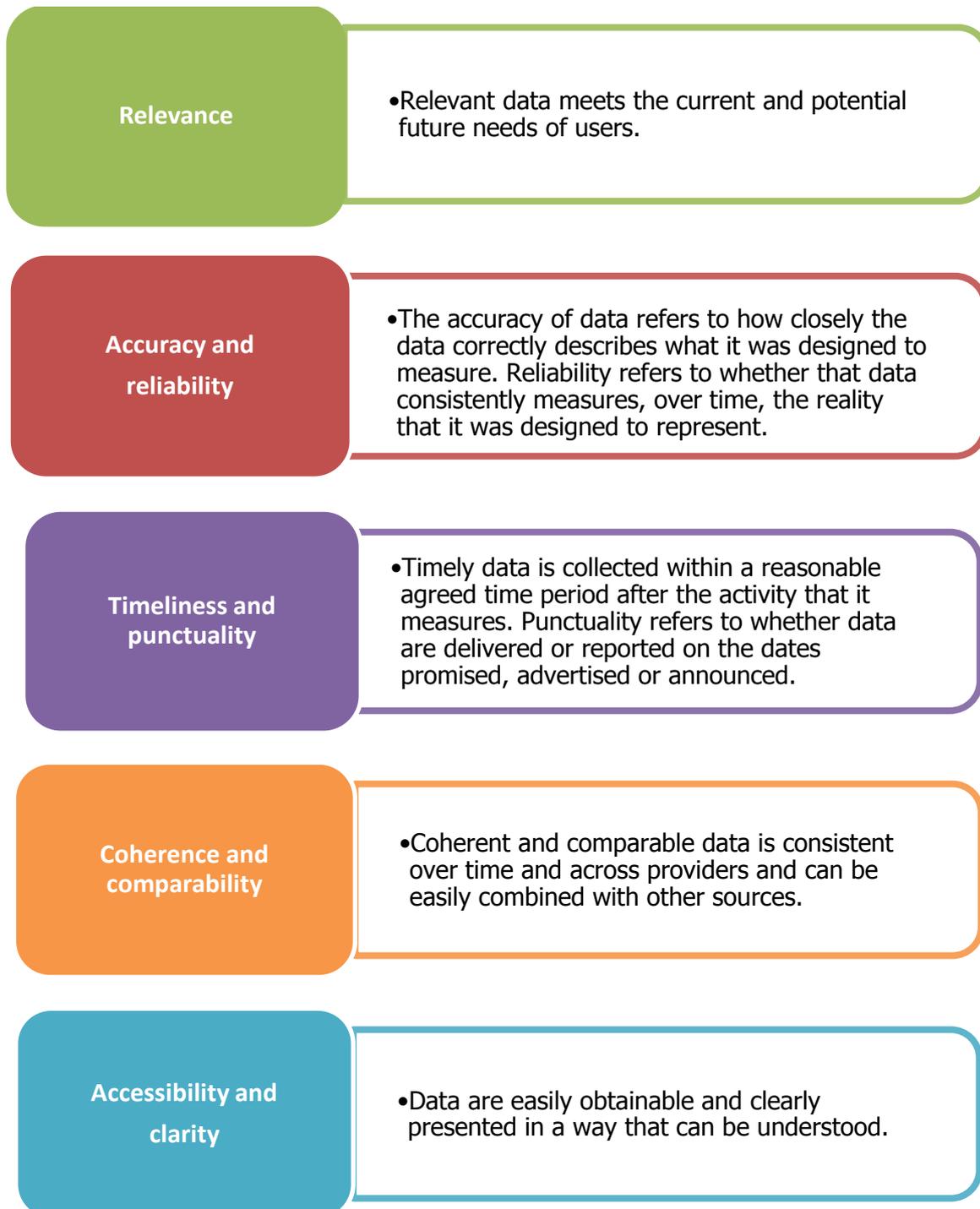
Part II - Data quality assessment tool for health and social care[‡]

[‡] An interactive version of this data quality assessment tool is also available.

5. Data quality assessment tool

This data quality assessment tool provides a detailed set of criteria that organisations can use to comprehensively assess its data sources across all five dimensions of quality, as detailed in Figure 6.

Figure 6. Dimensions of data quality



The data quality assessment tool was developed in line with international standards and best practice and can be used by health and social care organisations to determine the fitness for purpose of any given dataset.

Organisations should assess the quality of their data under each of the five dimensions of data quality as outlined in Figure 5.

It is important to note that the dimensions are not necessarily equally weighted across all organisations as the importance of each dimension may vary depending on the data source and context.

The dimensions of data quality are not mutually exclusive. Trade-offs between dimensions may be required at times throughout the data and information lifecycle. While the data quality framework focuses on the management of the quality of data, as previously noted, assessments against the dimensions of data quality can be undertaken at different stages throughout the lifecycle. The data and information lifecycle refers to the stages that data goes through from collection to dissemination, as detailed in Figure 1.

The data quality assessment tool described in this section draws strongly from the CIHI's Data Quality Framework, CIHI's Information Quality Framework, CIHI's Data Source Assessment Tool, CIHI's Information Quality Plan, the European Statistical System Quality Assurance Framework and the United Nations Statistics Division National Quality Assurance Framework.^(9,10,11,13,21,22)

5.1 Structure of the data quality assessment tool

The data quality assessment tool has been developed to meet the needs of a broad range of health and social care organisations. The tool comprises of five sections, each focusing on one key dimension of data quality, that is, relevance; accuracy and reliability; timeliness and punctuality; coherence and comparability; and accessibility and clarity.

Table 1. Structure of the data quality assessment tool

Introduction to the dimension	An explanation of the dimension of data quality and the importance of assessing data quality under that dimension.
The quality characteristics of that dimension	A description of the key quality characteristics, as defined by international best practice, that provide context for organisations on how data quality can be assessed to determine if it is 'fit for purpose'. Each characteristic is accompanied by a description which provides further explanation and clarity of understanding of the key characteristics.
The assessment tool	The tool is made up of one or more characteristics. Each characteristic is made up of a set of criteria, presented as key questions, which enable organisations to assess the degree of quality of their data. Each criteria is further explained by an accompanying details section, explaining in basic terms the practical measures that organisations must undertake in order to assess data quality. Organisations can report on the quality of their data by responding "yes/no/partially/not applicable".
Examples of assessment of that dimension	Examples of how national data collections in Ireland currently assess the quality of their data under that dimension.

The characteristics and criteria included in the data quality assessment tool serve as a guide to organisations to assist in the assessment of data quality. They are not an exhaustive list and can be amended by organisations as necessary.

Data quality assessment tool

5.2 Relevance

Relevance

- Relevant data meets the current and potential future needs of users.

Health and social care organisations, including national data collections, should aim to ensure that their data meets the current and potential future needs of data users. In order for data to be relevant to those using it, it must shed light on the issues most important to data users and be relevant to the way an organisation does business at all times.

Managing relevance requires that organisations remain aligned with the information needs of data users as they evolve.⁽¹⁰⁾ This can be challenging for organisations for a number of reasons, such as conflicting needs of data users and budget constraints.⁽²³⁾ The extent to which data meets the needs of data users must be defined by individual organisations and will not be specified in this guidance. However, organisations can strive to put measures in place to assist in maintaining the relevance of data for its users. Engaging with stakeholders on an ongoing basis will allow organisations to remain aware of the changing needs and priorities of data users, which is vital to ensuring the continued relevance of the organisation's data.⁽²⁴⁾ User satisfaction should also be monitored on a regular basis and systematically followed up.⁽¹⁰⁾

The quality characteristics of relevance are outlined in Table 2.

Table 2. The quality characteristics of relevance

Characteristic	Description
Release and use of the data	This refers to the way in which an organisation's data is released and used. It concerns the frequency of use of that data. It should be noted that, where data is not used regularly, it may be due to reasons other than it not being useful, for example, difficulty for the user in accessing the data.
Value of the data	This refers to the extent to which the data successfully serves the needs of data users. If the data does not meet the needs of the data user, it can become irrelevant.
Adaptability of the data source	This refers to the extent to which the data is adaptable and flexible enough to meet the current and future needs of data users. If the data is not flexible in meeting the current and future needs of data users, it can become irrelevant.

In order to assess the quality of data in relation to relevance, the assessment tool outlined in Table 3 can be used.

Table 3. Data quality assessment tool — relevance

Relevance			
Characteristic	Criteria	Details	Assessment
Release and use of the data	Are regular assessments carried out to determine whether all of the data that is being collected is being used?	Undertake regular reviews of data usage, for example, assessment of usage metrics such as the number of times a data set was viewed, the number of times the data was downloaded and the number of times requests were received for access to the data.	Yes or no
	Has a list of key users and their use of the data been compiled, including unmet user needs?	Compile a list of data users. Describe the known uses of the data, for example, service planning or development of funding models, to assess prevalence and incidence of diseases.	Yes, no, or partially
Value of the data	Are data users consulted to establish if the data available assists them in achieving their objectives?	Establish that the content of the data available is sufficient to assist the organisation in achieving its objectives, by conducting an assessment of data user needs.	Yes or no
	Are quality improvement plans in place to address required improvements in the data in order to ensure the data remains relevant to users?	A quality improvement plan is in place to ensure data is relevant to user needs. Detail actions that have been identified to improve relevance of data, for example, engagement with data users, and the impact that the	Yes, no, or partially

Adaptability of the data source		implementation of these actions has had in ensuring that data remains relevant to user needs.	
	Are procedures in place to gather information on the potential future needs of data users?	Mechanisms are undertaken, for example, surveys, to gather information on the potential future needs of data users and such needs have been identified and implemented and their effectiveness measured and reported on.	Yes, no, or partially
	Are data user needs prioritised as a result of consultation undertaken with data users about how the data relates to their needs?	Consult with data users about their data requirements and develop prioritisation criteria to facilitate implementation of changes required.	Yes or no

Examples of the assessment of relevance within health and social care organisations in Ireland:

- Consulting, and ongoing communication, with data users and other key stakeholders:
 - the National Perinatal Epidemiology Centre (NPEC) convenes regular meetings of the Perinatal Mortality Group, an advisory group of stakeholders and data users, to assess the relevance of data being collected
 - in relation to BreastCheck, the National Screening Service (NSS) consults with data users and subsequently develop new reports based on the evolving needs of data users, ensuring that the National Breast Screening Programme is fit for use.
- Value of the data:
 - the Health Protection Surveillance Centre (HPSC) consults with key stakeholders in defining and reviewing surveillance data collected to ensure it meets the needs of the infectious disease surveillance system(s).
- Release and use of the data:
 - the Health Research Board (HRB) convenes advisory committees for its disability and drug-related deaths information systems on a regular basis to consider the relevance of reports being produced in relation to service planning.

5.3 Accuracy and reliability

Accuracy and reliability

- The accuracy of data refers to how closely the data correctly describes what it was designed to measure. Reliability refers to whether that data consistently measures, over time, the reality that it was designed to represent.

Health and social care organisations, including national data collections, should have processes in place which allow them to produce and disseminate data which accurately and reliably portrays reality.

For example, accurate and reliable data on the incidence of infectious diseases is vital when planning public health interventions such as vaccination programmes.

Measuring accuracy and reliability enables organisations to quantify the degree to which data correctly and consistently reflects the situation that it was designed to measure. The degree of accuracy of data has clear implications for how useful and meaningful the data will be for interpretation and further analysis.⁽²³⁾

It should be noted that completeness of data is a key component of accuracy.

The accuracy and reliability of data is dependent upon the degree to which individual records received contain complete, valid information. Where data is complete, all of the items required to measure the intended activity or event will be present.⁽²⁵⁾ Thus, the more complete the dataset is, the more likely the data is to be accurate.

If organisations are to quantify the accuracy of their data, the degree of difference between the estimate and the true value of the data will need to be calculated.⁽²⁴⁾ Where inaccuracies are identified in the data, it should be acknowledged and addressed where possible.

The quality characteristics of accuracy and reliability are outlined in Table 4.

Table 4. The quality characteristics of accuracy and reliability

Characteristic	Description
Coverage	<p>The degree to which the data available to data users covers the population or event of interest. It is critical to understand the level of coverage of a population in order to make a statement about that population.</p> <p>Coverage can be assessed by defining the population in question and determining and monitoring coverage rates. Any limitations to the data as a result of coverage issues should be clearly explained.</p>
Data capture	The procedures that are in place to ensure that the data is captured in a

and collection	<p>usable format and can be prepared for submission.</p> <p>This is assessed by identifying what measures are in place to ensure that relationships with data providers are positive and that suitable processes are in place to facilitate efficient and effective data flows.</p>
Data processing	<p>The transformation of data from the form in which it is received into another form that facilitates analysis. Processing can include validation and correction of the data.</p> <p>Assessment involves checking if processing has been documented in detail and if the processed data can be differentiated clearly from the original data received.</p>
Completeness and validity	<p>The degree to which individual variables are present within a data set. Incomplete and invalid data within a dataset impacts upon the fitness for use of that dataset.</p> <p>Assessment of completeness and validity is done by calculating and monitoring rates of valid, invalid, missing and outlier values.</p>
Revisions to data	<p>The extent to which the data is subject to revision or correction following new information or correction of errors in processing or estimation of data and the time frame in which revisions are produced.</p>

In order to assess the quality of data in relation to accuracy and reliability, the assessment tool outlined in Table 5 can be used.

Table 5. Data quality assessment tool — accuracy and reliability

Accuracy and reliability			
Characteristic	Criteria	Details	Assessment
Coverage	Are details of the reference population explicitly stated in all information releases and is the coverage of the population quantified?	<p>State if the reference population is documented and if coverage has been quantified. Where this has not occurred, provide details.</p> <p>The reference population is the population for which information should be available.</p>	Yes, no, or partially
	Are significant coverage issues that may impact analysis and interpretation of data documented and made	Provide details of any significant issues in relation to coverage that have the potential to impact on data users' interpretation.	Yes, no, or not applicable

	available to users?	<p>Consider the impact of any identified coverage issues in terms of their impact at different levels of reporting.</p> <p>If coverage issues are not documented, detail why this is the case.</p>	
	Are processes in place to identify and handle duplicate and potential duplicate records within the data?	<p>Describe the processes that are in place to identify duplicates and calculate the duplication rate to give an indication of its occurrence. Provide details of how duplicates are removed once identified.</p> <p>If measures are not undertaken to identify and remove duplicates, explain why this is the case and provide an estimate of the number of duplicates that remain in the data.</p>	Yes, no, or partially
Data capture and collection	Are issues with the quality of data submitted, that have the potential to impact significantly on analysis and interpretation of that data, addressed and documented for users of the data?	Provide details of identified data quality issues, including the action undertaken to resolve the issue, the time frame to resolve the issue and any potential impact that such issues have on interpretation and analysis of the data.	Yes, no, or not applicable
Data processing	Are data validation processes applied consistently and are the processes documented for data users?	Provide details of the types of validation checks undertaken, for example, checks on the structure and integrity of the data, checks for missing data, checks that the data conforms to data source specifications and checks for any unusual data, that is, outliers.	Yes, no, or partially
Completeness and validity	Are rates of valid, invalid, missing and outlier	Provide a data profile for data elements which include	Yes, no, or partially

Revisions to data	values documented and updated routinely and reported with each data release?	valid, invalid and missing value rates.	
	Are revisions or corrections made to the data regularly analysed to ensure effective statistical use of same?	Provide details of the reasons for, timing of, and nature of revisions. Clearly identify data as preliminary or revised.	Yes or no

Examples of the assessment of accuracy and reliability within health and social care organisations in Ireland:

- Data validation:
 - the National Screening Service (NSS) validates its cancer screening programme registers against the population census to ascertain completeness of the registers
 - the Computerised Infectious Disease Reporting System (CIDR) contains a series of post data-entry validation reports to enable users to identify and resolve gaps and discrepancies in data.
- Completeness and validity:
 - to ensure completeness of data for the HRB's National Drug-related Deaths Index, data extracted from the Coroners' files are matched with Hospital In-Patient Enquiry data, data from the Central Treatment List and the General Mortality Register. This process of matching and merging works to eliminate duplicates, which are removed prior to analysis and reporting
 - the National Cancer Registry publishes a review on completeness and validity of their data on their website (www.ncri.ie).⁽²⁶⁾

5.4 Timeliness and punctuality

Timeliness and punctuality

- Timely data is collected within a reasonable agreed time period after the activity that it measures. Punctuality refers to whether data are delivered or reported on the dates promised, advertised or announced.

Health and social care organisations, including national data collections, should strive to minimise any delay in making their data available to data users and all other stakeholders. For example, it is vital that notification of infectious disease is received in a timely manner, both to ensure the prompt identification of outbreaks and to facilitate management of cases without delay.

The timeliness of data refers to the length of time between the occurrence of an event and the release of the data describing that event. Indicators relating to timeliness detail how quickly after the reference date the actual data becomes available to users.⁽²⁰⁾ If data is to be punctual, organisations must ensure that data is released on the date that it was promised, advertised or announced.⁽²³⁾ When planning and managing timeliness and punctuality of data, consideration should be given to trade-offs between this and other dimensions of data quality, such as accuracy. Where maintaining the timeliness and punctuality of data becomes challenging, organisations may wish to look at the benefit to data users of releasing preliminary data while giving due consideration to the accuracy of that preliminary data.⁽²⁰⁾

It is important to be aware of European/international release standards in relation to timeliness of data, where they exist. For example, EU member states, including Ireland, are required under EU legislation to report information on specified infectious diseases to the European Centre for Disease Prevention and Control (ECDC)(ecdc.europa.eu). Furthermore, when planning data release dates, organisations should take into account data user requirements as much as possible to ensure that data can be most beneficial to those who wish to use it.⁽¹⁰⁾

The quality characteristics of timeliness and punctuality are outlined in Table 6.

Table 6. The quality characteristics of timeliness and punctuality

Characteristic	Description
Submission timeliness	This refers to whether the data is submitted on time by providers. This is a critical element for achieving timely and punctual release of data.
Processing timeliness	This refers to whether the data, once received from data providers, is processed as efficiently as possible. This is critical in supporting timely and punctual release of data.

<p>Release timeliness and punctuality</p>	<p>This refers to whether the data was released on time and how current the data is at the time of release. The length of time between its reference date and the date that the data is released should be short enough to ensure that the data remains relevant for the purpose it was intended.</p> <p>This can be assessed by determining if the data was released on time, in line with the planned release date.</p>
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In order to assess the quality of data in relation to timeliness and punctuality, the assessment tool outlined in Table 7 can be used.

Table 7. Data quality assessment tool — timeliness and punctuality

<h2 style="text-align: center;">Timeliness</h2>			
Characteristic	Criteria	Details	Assessment
<p>Submission timeliness</p>	<p>Are procedures in place to ensure the effective and timely submission of data from providers?</p>	<p>Ensure that data providers are aware of the submission dates, for example, through submission calendars or automatic reminders sent for organisations.</p>	<p>Yes or no</p>
	<p>Are agreements in place with data providers which detail planned dates for submission of data?</p>	<p>Ensure formalised agreements have been put in place between data providers and the organisation to which data is being submitted that clearly set out the date by which data must be submitted.</p>	<p>Yes or no</p>
	<p>Are follow-up procedures in place to ensure timely receipt of data, including procedures to address necessary improvements?</p>	<p>Identify mechanisms to improve timeliness of data submissions, for example, indicators to measure timeliness, or stakeholder engagement activity to explore data submission issues.</p> <p>Evaluate the impact that the chosen mechanism has had on the timeliness of data submissions.</p>	<p>Yes or no</p>

<p>Processing timeliness</p>	<p>Are data processing activities regularly and systematically reviewed to improve timeliness and has an associated action plan been developed and implemented?</p>	<p>Describe the review process, systems used and the timeframe for reviews, including the date of the last review undertaken.</p> <p>Provide details of why reviews are not undertaken regularly, where applicable.</p> <p>Provide details of any improvements in timeliness of data processing that have occurred as a result of the review process.</p>	<p>Yes or no</p>
<p>Release timeliness and punctuality</p>	<p>Has a data release policy and procedures document, which includes targets for timeliness, been developed, published and implemented? Does the policy describe revisions for key outputs that are subject to scheduled revisions?</p>	<p>Confirm whether or not a publicly available policy exists which clearly identifies when data is to be released. Indicate if the policy includes details of planned revisions of data.</p>	<p>Yes, no, or partially</p>
	<p>Do planned releases occur within a specified period of time from the end of the reference period?</p>	<p>Ensure that all planned data releases, as well as updates to data, indicate the following:</p> <ul style="list-style-type: none"> ▪ the planned release date ▪ the actual date the data was released ▪ the reference period for release of the data ▪ time elapsed between end of reference period and release date. 	<p>Yes or no</p>
	<p>In the event of delays affecting a planned release, are delays and causes documented and made available to data users?</p>	<p>Ensure that planned data releases indicate the following:</p> <ul style="list-style-type: none"> ▪ if there was a delay in releasing the data ▪ if data users were notified of any delays 	<p>Yes, no, or not applicable</p>

		<ul style="list-style-type: none"> ▪ the method by which data users were kept informed. 	
	Is an up-to-date release calendar publicly available?	<p>Confirm that a release calendar is in place which details the dates on which data is to be released. The calendar should be developed following consultation with data users.</p> <p>Establish that procedures are in place to regularly monitor and evaluate the punctuality of data releases, as per the release calendar.</p>	Yes or no

Examples of the assessment of timeliness and punctuality within health and social care organisations in Ireland:

- Release timeliness:
 - the HSE requires that the HRB's National Psychiatric In-Patient Reporting System (NPIRS) shares data with the HSE on a quarterly basis to facilitate reporting on key performance indicators (KPIs) in line with the National Service Plan.
- Submission timeliness:
 - the Healthcare Pricing Office publishes an annual schedule of dates to ensure that monthly submission of HIPE data from acute hospitals occurs in a timely manner.
- Release punctuality:
 - the Health Protection Surveillance Centre has developed internal KPIs in relation to the punctuality of publishing weekly reports on notifiable infectious diseases and outbreaks on the HPSC website
 - the Central Statistics Office publishes a release calendar outlining dates for publication of their statistical reports.

5.5 Coherence and comparability

Coherence and comparability

- Coherent and comparable data is consistent over time and across providers and can be easily combined with other sources.

Coherence of data refers to the extent to which data is logically consistent in terms of definition and measurement and can be reliably combined in different ways for different uses.⁽²⁴⁾ Comparability of data or information is the ability to compare data on the same characteristic between different points in time, geographically or statistically.⁽²⁷⁾

Health and social care organisations, including national data collections, can work to ensure that their data is coherent through the use of international standard concepts and classifications, for example, ICD-10 or SNOMED-CT. All organisations should strive to publish a data dictionary in order to ensure consistency in data collection and to enable data users to accurately use and interpret data.⁽¹⁶⁾

Coherent and comparable data should be comparable over time and across regions, produced using common standards and methods and have the potential to be combined with other data sources.⁽¹¹⁾ Coherence is an important component of data quality as it provides an indication to data users of whether the data can be usefully compared with other sources to enable compilation and comparison.⁽²³⁾

The quality characteristics of coherence and comparability are outlined in Table 8.

Table 8. The quality characteristics of coherence and comparability

Characteristic	Description
Standardisation	This refers to the degree to which data is collected using common definitions or standards. Collecting data in this way ensures that data is comparable and can be easily analysed.
Coherence	This refers to the degree to which it is possible to combine and make use of related data from different sources. Where data is coherent, data users can combine data sources, allowing them to report on something in greater detail.
Historical comparability	This refers to how the consistent use of definitions, standards and methods facilitates comparison of data over time. Data and statistics should be comparable over a reasonable period of time.

Regional comparability	This refers to the degree to which the data allows for reasonable comparisons within and across regions and countries. Where this level of comparability is possible, it facilitates more informed decision making and management of systems while driving improvements in the quality of the data.
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In order to assess the quality of data in relation to coherence and comparability, the assessment tool outlined in Table 9 can be used.

Table 9. Data quality assessment tool — coherence and comparability

Coherence and comparability			
Characteristic	Criteria	Details	Assessment
Standardisation	Is data collected in line with national and international standards and classifications?	Detail what standards and classifications have been applied to the collection of data and any variations used. Where standards and classifications are not applied in the collection of data, explain why.	Yes, no, or partially
	Are metadata clearly described and made available to data users?	Employ a data dictionary, which is a descriptive list of names, definitions and attributes of data elements to be collected in an information system or database.	Yes or no
Coherence	Is aggregated data compared with other sources of data, for example, administrative data, that provide the same or similar information on the same phenomenon? Are divergences identified and clearly explained to data users?	Identify the type of comparison undertaken and any differences in data sources that were identified as a result of the comparison. Where aggregate data have not been compared with data from another source, explain why.	Yes or no

Historical comparability	Are historical changes/trends in the data documented and publicly available for data users?	Describe any changes which have occurred in the data over time, for example, data definitions, methodology, processing methods and the means by which data is captured and submitted by providers. Where changes in data over time are not formally documented and available to data users, explain why.	Yes, no, or not applicable
	Are any changes in the data/trends that can potentially have a significant impact on interpretation and analysis of data, that is, changes to key elements of the data set, documented and available for data users?	Provide details of any changes to key elements of the data set, explaining the trend in changes. Where changes to key elements within the data set have not been documented, explain why.	Yes, no, or not applicable
Regional comparability	Is the impact of any identified differences in data across regions documented?	Describe the limitations to the analysis and interpretation of the data that have emerged as a result of regional differences.	Yes, no, or not applicable

Examples of the assessment of coherence and comparability within health and social care organisations in Ireland:

- Historical comparability:
 - the HRB's National Psychiatric In-patient Reporting System (NPIRS) has been recording in-patient admissions to and discharges from psychiatric settings since the 1960s. The use of standard classifications, for example, on diagnosis using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10), ensure that data can be compared over time.
- Standardisation:
 - in relation to the CIDR system, data providers apply standard case definitions when notifying infectious diseases to the HPSC. These definitions are based mainly on standardised European case definitions (or Irish case definitions if the former are

unavailable), enabling national and international comparisons to be made in disease incidence rates

- the Healthcare Pricing Office supports the standardisation of data by publishing a HIPE data dictionary annually. It provides standard definitions for variables with the objective of ensuring that consistency and data quality are maintained[§]
- the Healthcare Pricing Office publishes Irish Coding Standards annually for use with HIPE data. These Irish Coding Standards detail any variation from the Australian Coding Standards used in the coding of HIPE data with the Australian modification of ICD-10-AM/ACHI/ACS.
- Comparability:
 - the National Perinatal Epidemiology Centre (NPEC) recognises that stillbirth and perinatal rates are calculated differently by various countries and institutions; therefore, NPEC routinely reports rates based on two different definitions of stillbirth in order to facilitate comparability
 - EUROCAT data from national collections adheres to EU EUROCAT standards, ensuring that their data is comparable across the EU.

[§] The Office of the Chief Information Officer (OoCIO) in the HSE, in conjunction with key stakeholders, is currently developing a National Health and Social Care Data Dictionary.

5.6 Accessibility and clarity

Accessibility and clarity

- Data are easily obtainable and clearly presented in a way that can be understood.

The accessibility of data refers to the ease with which data users are able to identify, obtain and use data and information from health or social care organisations.⁽²⁴⁾ Organisations should strive to ensure that the use of their data and information is optimised, in line with legislation, to provide the greatest benefit to users. Accessibility also includes the suitability of the form or medium through which the information can be accessed.⁽²⁰⁾ Clarity refers to the degree to which metadata and other information are provided so that users are able to accurately interpret the data and information.⁽²⁴⁾ Through the publication of the Open Data Strategy 2017-2022, the Irish government is striving to establish an environment where data held by public bodies is available and easily accessible online for reuse and redistribution, supporting transparency, greater use of data and improvements in the quality of data available.⁽²⁸⁾

Health and social care organisations can assist in making their data as clear and accessible as possible through the publication of a data quality statement with each published output. This will provide data users with information about the quality of the data in each output and allows them to make informed judgements about whether the data meets their needs. A template for a data quality statement is available in Section 6.2.

Accessible and clear data is easily identified, obtained and understood. Health and social care organisations, including national data collections, should work to ensure that data is presented in a clear and understandable way so the data can be used effectively.⁽¹¹⁾

The quality characteristics of accessibility and clarity are outlined in Table 10.

Table 10. The quality characteristics of accessibility and clarity

Characteristic	Description
Accessibility	<p>This refers to the ease with which data can be identified, obtained and used. Awareness that the data exists is a key component of data quality. The suitability of the format of the data should be considered in terms of ease of use for data users.</p> <p>Accessibility of data can be assessed by establishing whether the data is available in a standardised format for each data release.</p>
Interpretability	<p>This refers to the degree to which users are provided with the required documentation and metadata to assist them in understanding the data.</p>

	Interpretability can be assessed by establishing whether or not the necessary documentation is up to date and available to data users. This includes documentation to accompany preliminary and revised data.
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In order to assess the quality of data in relation to accessibility and clarity, the assessment tool outlined in Table 11 can be used.

Table 11. Data quality assessment tool — accessibility and clarity

Accessibility and clarity			
Characteristic	Criteria	Details	Assessment
Accessibility	Are data available to users in a form that facilitates proper interpretation and meaningful comparisons?	<p>Facilitate interpretation and comparison of data by making a publication catalogue or list of publications available to data users.</p> <p>Disclose policies and procedures detailing how data users can access and request data.</p> <p>Put in place a user support service to assist data users and other stakeholders to obtain and ask questions about data.</p>	Yes or no
	Is ICT effectively used to disseminate data and information?	<p>Ensure that data users can navigate the website in a way that allows them to easily access data and metadata.</p> <p>Ensure tools and resources are available to support the needs of data users, including web-based tools to facilitate analysis and manipulation of data.</p>	Yes or no
Interpretability	Are supporting documents, for example, metadata, publicly	Documentation to accompany data outputs should include details of	Yes, no, or partially

	<p>available to facilitate clarity of interpretation for data users?</p>	<p>the following: information on key concepts, scope, data sources, compilation, methods and statistical techniques.</p> <p>Publish a data quality statement for all data outputs that details the quality of the data as assessed under the five dimensions of data quality.</p> <p>Identify and publish any known issues in relation to data quality to facilitate the data user to assess if the data is of sufficient quality to be relevant to their needs.</p>	
	<p>Does a revision policy exist which covers all data and is it available to data users?</p>	<p>State if a revision policy exists.</p> <p>Provide details of the content of the revision policy, for example, reasons for undertaking a revision, schedule of revisions and the nature of the revisions covered.</p> <p>Describe the impact of the assessment, the changes that occurred and any future plans that are in place as a result, to reduce the need for a revision.</p>	<p>Yes, no, or partially</p>

Examples of the assessment of accessibility and clarity within health and social care organisations in Ireland:

- Accessibility:
 - having tools in place to facilitate access to data, including the availability of an interactive open data portal, such as that on the NCRI website, which enables data users to securely access and use data
 - the CSO Statbank is an online portal, which includes inbuilt search options to enable

data users to generate statistics to meet their individual needs

- the HRB allows data users to access interactive tables from the National Drug Treatment Reporting System within their National Drugs Library, facilitating access to data and creating a platform for data users to generate their own queries
- Health Atlas Ireland enables controlled access to a suite of datasets collected by other parties including demography (census etc.); hospital activity; prescribing; mortality; human resources; service location; along with a range of mapping functions.

6. Templates to support data quality

6.1 Data Quality Strategy template

A data quality strategy describes the direction for data quality improvement for an organisation. The strategy should prioritise activities that aim to strengthen the organisation's approach to the management of data. A template that shows what might be included in a data quality strategy is outlined below.

Section heading	Description
Purpose and scope	<p>This section should include a description of the purpose of the data quality strategy, for example, to provide an overarching framework to ensure that the quality of data within and distributed by the organisation is of the highest quality. This section should also contain information on who the strategy applies to, such as all staff in the organisation that record, collate or handle data as part of their professional remit. ^(18,29,30)</p>
Governance	<p>High-quality, safe care relies on access to and use of good quality information, which is supported by effective governance, leadership and management structures.</p> <p>This section should include:</p> <ul style="list-style-type: none"> ▪ details of the governance and organisational structure ▪ details of the organisation's main function and why good quality data is important to ensuring the success of this ▪ details on the principles that the organisation has established and adheres to with respect to data quality. <p>Other areas that should be covered in this section are:</p> <ul style="list-style-type: none"> ▪ Duties and responsibilities — Provide information on each staff member's role in relation to data management, including information regarding responsibility for data security, risk, data quality processing, improvement and reporting, systems maintenance and any other area in relation to data management within the organisation. ▪ Training requirements — This section should detail the organisation's commitment to ensuring high data quality through the provision of appropriate training to staff who have defined roles and responsibilities in relation to data quality.
Standards,	The use of standards, classifications and terminologies supports

classifications and terminologies	comparability and consistency of information. This section should include details of the standards which the organisation adheres to in relation to data quality. Some organisations may be mandated to adhere to specific standards, while others may use standards as a means of adhering to best practice. Examples include ICD-10 and SNOMED-CT.
Policies and procedures	<p>Policies and procedures in relation to data quality clearly outline the organisations view in relation to data quality, while procedures detail the process in place to support the achievement of good quality data throughout the data and information lifecycle.</p> <p>Such policies should address how the organisation collects, processes, validates, stores and disseminates data. Policies detailing workforce training and development in relation to data quality should also be available.</p>
Data quality assurance	This section should detail how the organisation is assured that their data is of good quality. Information on the audit process, reporting against key performance indicators and addressing risk may be detailed here. Where reports or data quality improvement plans exist, links to these documents should be provided.

6.2 Data Quality Statement template

What is a data quality statement?

A data quality statement is a statement prepared to accompany each published output from the national data collection that highlights the dimensions of data quality, including strengths and weaknesses of the data in each output. It allows data users to interpret the data and information and make informed judgments about whether the data meets their needs. The content of the data quality statement will vary depending on the data and information being published. The following is a guide of what can be included in a data quality statement.

What does a data quality statement look like?

1. Purpose of the data quality statement.
2. Overview of the data collection and its remit.
3. Data source description, for example, coverage, time frame, classifications and standards used.
4. Summary of key issues identified with data, for example, any limitations identified with the data.
5. Overview of the quality of the data under each of the dimensions of data quality.

Dimensions of data quality	Description
Relevance	Relevant data meets the current and potential future needs of users.
Accuracy and reliability	The accuracy of data refers to how closely the data correctly describes what it was designed to measure. Reliability refers to whether that data consistently measures, over time, the reality that it was designed to represent.
Timeliness and punctuality	Timely data is collected within a reasonable agreed time period after the activity that it measures. Punctuality refers to whether data are delivered or reported on the dates promised, advertised or announced.
Coherence and comparability	Coherent and comparable data is consistent over time and across providers and can be easily combined with other sources.
Accessibility and clarity	Data are easily obtainable and clearly presented in a way that can be understood.

6.3 Data dictionary template

What is a data dictionary?

A data dictionary is a descriptive list of names (also called representations or displays), definitions and attributes of data elements to be collected in an information system or database. A data dictionary standardises definitions and ensures they are used consistently.

Why is it important?

A data dictionary is a tool to aid in the standardisation of data definitions. It ensures consistency in data collection and enables data users to accurately use and interpret data. The absence of a data dictionary can restrict data quality within and across organisations, making it difficult to standardise and compare data.

Proposed data dictionary structure

Data dictionary structure	Explanation of term
Data set	This relates to the group of data elements to which a particular data element belongs. For example, name, address and date of birth are part of a demographic data set.
Data element name	This is the name of the data element. The name should explain clearly what it refers to.
Data element ID number	This is a reference number for the data element.
Definition	The definition should clearly explain what is meant by the data element.
Context	This should explain the context in which the data element is collected.
Data type	Refers to the type of data that is recorded for each data element. It could be numeric, alphanumeric or a coded value.
Field length maximum	The maximum number of characters to be entered.
Instructions for answering field	This section provides instructions for the person filling in the information.
Codes and values	This field should give clear definitions of each of the codes and values that are captured as part of the data element.
Verification rules	This section outlines the ways in which the accuracy of the data element can be verified.
Comments/guidelines	This section provides guidance to the person collecting the data element. For example, steps to take if the data element is a required field and the value is unknown.
Related data elements	Related data means any other data elements that are linked to or closely related to the particular data element.

Appendices

Appendix 1 – Summary of international evidence to support this guidance

To inform the development of this guidance, HIQA has developed a *Background paper to support guidance for a Data Quality Framework for health and social care*. The objective of this background paper is to review national and international experience and best practice with regard to data quality frameworks. It also looked at quality assurance frameworks from statistical bodies which cover similar dimensions of data quality. The countries reviewed were Canada, Australia, South Africa and the UK, while quality assurance frameworks used in the EU, Organisation for Economic Co-operation and Development (OECD) and United Nations (UN) were also considered. Table 12 details the frameworks that were reviewed in detail.

Table 12. International frameworks reviewed to support guidance for a data and information quality framework for health and social care

CIHI's Information Quality Framework /Data Quality Framework ^(9,13)
Statistics Canada Quality Assurance Framework, Third Edition 2017 ⁽²⁴⁾
ACT Health Data Quality Framework ⁽²⁰⁾
ABS Data Quality Framework ⁽²³⁾
Quality Assurance Framework of the European Statistical System ⁽¹⁰⁾
United Nations Statistics Division, Guidelines for a Template for a National Quality Assurance Framework (NQAF) ⁽¹¹⁾
Quality framework and Guidelines for OECD statistical activities ⁽³¹⁾
GS1 Australia Healthcare Data Quality Framework Version 1.0 ⁽³²⁾
South African Statistical Quality Assessment Framework (SASQAF) ⁽²⁷⁾
NHS Digital Data Quality Assurance Strategy 2015-2020 ⁽³³⁾

Each of the countries reviewed have implemented a data or information quality framework to provide an appropriate, standardised method for assessing, documenting and improving data quality. All of the frameworks included in this report provide a definition for data quality and a means of assessing data quality to ensure it is 'fit for purpose'. To contrast and compare the frameworks, the background paper focuses on the following aspects of each framework:

- the dimensions of data quality used
- the components of the framework
- how the framework is used in practice.

Data quality dimensions — international best practice

All of the international data quality frameworks reviewed use specific dimensions or metrics to assess and define data quality. While all frameworks define a set of dimensions of data quality, there is no general agreement on which exact set defines data quality. There is no single accepted definition of data quality; this may be due to the varying focuses of the data quality frameworks. The frameworks have various functions, and the types of data being considered can vary widely.⁽³⁰⁾ While there are differences in the dimensions of data quality used, there is also discrepancies in the definitions of each dimension due to the contextual nature of the definitions.⁽³⁴⁾ While some dimensions are consistent across most of the frameworks, others are not consistently used.

CIHI recently updated its dimensions of data quality to align to the dimensions used by the United Nations. These dimensions are also used by the European Statistical System, Eurostat and Statistics Canada, and they closely align to those used by the Irish Central Statistics Office Standard Reports on Methods and Quality.⁽³⁵⁾ These dimensions are:

- relevance
- accuracy and reliability
- timeliness and punctuality
- coherence and comparability
- accessibility and clarity.

Components of a data quality framework

Common components of the frameworks reviewed include clear definitions of data quality and its dimensions, data quality assessment tools, different methods of reporting on data quality and data quality cycles, as described below. Other components include data quality policies, data quality strategies and different principles and guidelines to accompany the dimensions of data quality.⁽²⁴⁾

Three of the key components of data quality frameworks are discussed below:

- **Data quality assessment tools** — CIHI's 2017 Data Source Assessment Tool provides a set of criteria that allow for data source quality assessment across the five

dimensions of data quality, allowing for appropriate determination of a given set of data's fitness for use. The ACT Health Data Quality Assessment Tool divides the dimensions of data quality into characteristics that are used systematically to assess the fitness for purpose of the data. Data quality assessment tools such as those used by CIHI and ACT Health enable each organisation, data users and data providers to assess the quality of the data and thus determine its fitness for use.^(20,21)

- **Reporting on data quality** — Reporting on data quality is another important component of a data quality framework. Reporting on data quality can be used internally to communicate to the organisation or the data user how 'fit for purpose' the data is. This can include internal or external reports on the assessment of the data quality, documentation that is provided to data users to allow them to decide if the data is fit for their intended use, metadata documentation and reporting on key performance indicators.
- **Data quality cycles** — Data quality cycles are used by many of the frameworks. The CIHI 2009 Data Quality Framework uses a data quality work cycle that has planning, implementing and assessing steps.⁽⁹⁾ ACT Health use a data quality improvement cycle that has recognise, assess, improve, monitor and prevent steps.⁽²⁰⁾ GS1 uses a data quality management system which describes four main types of activities that should be considered as part of an organisation's approach. These types of activities are plan, document, execute and control.⁽³²⁾

How data quality frameworks are used in practice

Many of the frameworks have been developed by organisations for their own specific use. For example, CIHI's Data Quality Framework has been developed for use in all its data holdings, Statistics Canada's quality assurance framework has been developed for quality management in the organisation and the ACT Health Data Quality Framework was developed to improve the quality of data created and managed by ACT Health. Other frameworks have been developed in a more open and flexible manner to be used by a wider group of stakeholders. For example, the Australian Bureau of Statistics Data Quality Framework is designed for a wide range of users, including government and statistical agencies, and the European Statistical System Quality Assurance Framework and the United Nations Statistics Division National Quality Assurance Framework were both developed for general use by statistical agencies at a European and national level.^(10,11,20,23,24)

Appendix 2 – Expert Working Group membership

HIQA would like to thank all of the individuals and organisations who provided their time, advice and information to support the development of this *Guidance on a data quality framework for health and social care*. The membership of the Expert Working Group is as follows:

Name	Title	Organisation
Alan Cahill	Senior Statistician	Department of Health
Sarah Craig	Head of National Health Information Systems	Health Research Board
Marina Cronin	Head of Quality and Development	National Office of Clinical Audit
Paul Crowley	Head of Social Analysis Division	Central Statistics Office
Jacqui Curley	Coding Manager	Healthcare Pricing Office, HSE
Linda Drummond	Manager - National Perinatal Epidemiology Centre	National Perinatal Epidemiology Centre
Cathy Duggan	Health Information Research Officer	Health Information and Quality Authority
Fiona Dwane	Data Integration Manager	National Cancer Registry Ireland
Eugene Farrell	Head of Information Services	Office of Chief Information Officer, HSE
Margaret Fitzgerald	Senior Surveillance Scientist	Health Protection Surveillance Centre, HSE
Rachel Flynn (Chairperson)	Director of Health Information	Health Information and Quality Authority
Barbara Foley	Health Information Manager	Health Information and Quality Authority
Aoife Healy	Health Information Research Officer	Health Information and Quality Authority
Ciara Heavin	Co-Director Health Information Systems Research Centre	Health Information Systems Research Centre, UCC
Paula Kavanagh	Joint Chair of the Health Informatics Society of Ireland	Health Informatics Society of Ireland - Nurses & Midwives Group
Fionnola Kelly	Biostatistician	National Office of Clinical Audit
Paul McCartney	Business Manager Operations/ Head of Schemes	Primary Care Reimbursement Service, HSE

Therese Mooney	Head of Programme Evaluation Unit	National Screening Service, HSE
Tracy O'Carroll	Health Information Manager External Datasets	Health Information and Quality Authority
Declan Patton	Senior Lecturer / Director of Nursing & Midwifery Research	Royal College of Surgeons in Ireland
Gerardine Sayers	Specialist in Public Health Medicine	Health and Wellbeing Directorate, HSE
Christine Smyth	Data Protection Advisor	Primary Care Reimbursement Service, HSE

Appendix 3 — Glossary of abbreviations

Abbreviation	Explanation
ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
CHO	Community Healthcare Organisation
CIDR	Computerised Infectious Disease Reporting
CIHI	Canadian Institute for Health Information
CSO	Central Statistics Office
DoH	Department of Health
ECDC	European Centre for Disease Prevention and Control
EUROCAT	European Surveillance of Congenital Anomalies
GP	General Practitioner
GSBPM	Generic Statistical Business Process Model
HIPE	Hospital In-Patient Enquiry system
HISI	Health Informatics Society of Ireland
HISRC	Health Information Systems Research Centre
HPO	Healthcare Pricing Office
HPSC	Health Protection Surveillance Centre
HRB	Health Research Board
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10 th Revision
ICT	Information and communications technology
KPI	Key performance indicator
NCRI	National Cancer Registry of Ireland
NDTRS	National Drug Treatment Reporting System
NHS	National Health Services (United Kingdom)
NOCA	National Office of Clinical Audit
NPEC	National Perinatal Epidemiology Centre
NPIRS	National Psychiatric In-Patient Reporting System
NPRS	National Perinatal Reporting System
NQAF	National Quality Assurance Framework

NSS	National Screening Service
NWIHP	National Women & Infant's Health Programme
OECD	Organisation for Economic Co-operation and Development
OoCIO	Office of Chief Information Officer
PCRS	Primary Care Reimbursement Service
RCSI	Royal College of Surgeons in Ireland
SASQAF	South African Statistical Quality Assessment Framework
SNOMED-CT	Systematised Nomenclature of Medicine- Clinical Terms
UN	United Nations

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