



5 **IHE Quality, Research and Public Health
Technical Framework Supplement**

10 **Mobile Aggregate Data Exchange
(mADX)**

HL7® FHIR® Release 4

Using FHIR Resources at FMM Level 2

15 **Rev. 1.1 – Trial Implementation**

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25 **Please verify you have the most recent version of this document. See [here](#) for Trial
Implementation and Final Text versions and [here](#) for Public Comment versions.**

Foreword

30 This is a supplement to the IHE Quality, Research and Public Health (QRPH) Technical Framework. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on February 14, 2020 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the QRPH
35 Technical Framework. Comments are invited and may be submitted at http://www.ihe.net/QRPH_Public_Comments.

“Boxed” instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

<i>Amend Section X.X by the following:</i>
--

40 Where the amendment adds text, make the added text **bold underline**. Where the amendment removes text, make the removed text **~~bold strikethrough~~**. When entire new sections are added, introduce with editor’s instructions to “add new text” or similar, which for readability are not bolded or underlined.

45 General information about IHE can be found at www.ihe.net.

Information about the IHE QRPH domain can be found at http://www.ihe.net/IHE_Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at http://www.ihe.net/IHE_Process and <http://www.ihe.net/Profiles>.

50 The current version of the IHE QRPH Technical Framework can be found at http://www.ihe.net/Technical_Frameworks.

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Introduction to this Supplement

Whenever possible, IHE profiles are based on established and stable underlying standards. However, if an IHE domain determines that an emerging standard has high likelihood of industry adoption, and the standard offers significant benefits for the use cases it is attempting to address, the domain may develop IHE profiles based on such a standard. During Trial Implementation, the IHE domain will update and republish the IHE profile as the underlying standard evolves.

Product implementations and site deployments may need to be updated in order for them to remain interoperable and conformant with an updated IHE profile.

This mADX Profile incorporates content from Release 4 of the emerging HL7^{®1} FHIR^{®2} specification. HL7 describes FHIR Change Management and Versioning at <https://www.hl7.org/fhir/versions.html>.

HL7 provides a rating of the maturity of FHIR content based on the FHIR Maturity Model (FMM): level 0 (draft) through N (Normative). See <http://hl7.org/fhir/versions.html#maturity>.

The FMM levels for FHIR content used in this profile are:

FHIR Content (Resources, ValueSets, etc.)	FMM Level
Measure	2
MeasureReport	2

The Mobile Aggregate Data Exchange (mADX) Profile supports interoperable public health reporting of aggregate health data. These most typically take the form of routine reports (weekly, monthly, quarterly etc.) from a health facility to some administrative jurisdiction such as a health district, though there are numerous other use cases such as international reporting and community health worker reporting.

As the motivating context and use cases for this profile are the same as the Aggregate Data Exchange (ADX) Profile, they are not repeated here. The mADX and ADX file are intended to be functionally equivalent.

¹ HL7 is the registered trademark of Health Level Seven International.

² FHIR is the registered trademark of Health Level Seven International.

Difference from existing ADX Profile

The primary purpose of the mADX Profile is to provide an alternative for the exchange and management of the metadata required for routine reporting by replacing the use of SDMX with HL7 FHIR. Metadata data in ADX, or ADX/DSD, is a profile of the SDMX Data Structure Definition (DSD). Challenges in working with it include:

- Scaling limitations as it requires ongoing maintenance of facility and location lists in the ADX/DSD.
- Bandwidth limitations when trying to transfer an ADX/DSD for validation of an ADX. Facility and location lists can be large which complicates deployments in resource constrained settings.
- Management and exchange of code lists for disaggregators.

mADX profiles HL7 FHIR Terminology Services and the HL7 FHIR Measure resource. Additionally this profile makes use of the Mobile Care Services Discovery (mCSD) Profile for facility and location data. The mADX Profile will allow vendors and implementers to utilize the robust ecosystem of tools around HL7 FHIR and promote standards-based routine reporting.

Approach

This specification profiles HL7 FHIR to define a mADX Measure to normatively describe the structure of routine aggregate data reports as a mADX message. The mADX Profile uses the following actors:

- the Content Creators and the Content Consumer for the creation and consumption of mADX messages
- the Content Data Structure Creator and the Content Data Structure Consumer, defined in the ADX Profile, which produce and consume the Measure resources respectively
- the Care Services Update Supplier and the Care Services Update Consumer, defined in the mCSD Profile, for supplying and consuming location data.

The FHIR Measure resource is used in mADX to define the metadata required to validate a mADX message and defined in terms of a HL7 FHIR Terminology Service. The HL7 FHIR Terminology Services are used for the exchange of disaggregators and IHE's Mobile Care Services Discovery (mCSD) is used for the exchange of location metadata. These services may be used by the Content Creator and the Content Consumer to validate the structural metadata of mADX data messages exchanged.

Open Issues and Questions

- 205
1. Are the current validation options sufficient, currently it is only the Content Consumer. Potential to validate on submission of data to the Content Consumer (in which case the Validate Option is only for the Content Consumer and not so much the Content Creator) or as a separate transaction to a Content Data Structure Creator (which could be the same actor as the Content Consumer)?
 2. Is how mADX return errors for validation as an OperationOutcome against the FHIR Terminology Service and Content Services Update Supplier specified in mCSD sufficient? Should the profile describe the potential errors and messages?
 - 210 3. Should the FHIR resource OperationOutcome described in Section 3.58.4.2.3 Expected Actions have its messaging semantics detailed as part of the validation transaction?
 4. For each value set referenced, a FHIRPath needs to be defined. See Section 3.58.4.2.4 Expected Actions Validation Option.
Question in sure the cross-referencing of components and related artifacts are correct.
 - 215 5. Should the mCSD Find Matching Care Services [ITI-90] transaction be used to locate care services or should the mCSD Request for Care Services Updates [ITI-91] transaction be used instead? Should we provide optionality to choose either one, or should we add a discussion in the cross-profile considerations which would suggest that the [ITI-91] transaction can be used in production for caching/performance issues?
 - 220 6. FHIR supports batch use of the Read and Update transactions. Should those transactions be profiled in mADX?
 7. Is there a need to profile async transactions in mADX? This was in scope for ADX, but is Maturity Level 2 in FHIR: <https://www.hl7.org/fhir/async.html>

Closed Issues

- 225
1. How will mADX handle what is covered in Appendix 8D - Formatting of times and time intervals in mADX?
 2. Resolution: mADX does not include ADX to mADX mapping. This may be included in the IHE QRPH Clinical Quality Language for ADX White Paper.
 - 230 3. How are stratification codes handled in the FHIR Terminology Server? E.g., Age 1-4 and Male/Female. In ADX the added Schematron definition handled this issue, how will validation of stratified codes work in mADX?
Resolution: The stratification codes are defined as ValueSets that are referenced in a Measure.relatedArtifact and then linked to the stratifiers. This can be used to validate under the Validate Option. There is no need for the mADX Profile to have the equivalent of the Schematron.
- 235

4. Should the term Data Structure Definition (DSD) be changed? This is an SDMX specific term from ADX that has been borrowed in mADX because we anticipate the FHIR Measure shares a similar role. Changing the term DSD may also necessitate of a change of the actor the Content Data Structure Creator.

240

Resolution: This term should be changed to use Measure, so as not to cause confusion with the ADX Profile.

General Introduction

245 The [IHE Technical Framework General Introduction and Shared Appendices](#) are components shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to these documents where appropriate.

*Update the following appendices to the General Introduction as indicated below. Note that these are **not** appendices to Volume 1.*

250 Appendix A – Actor Summary Definitions

Add the following actors to the IHE Technical Frameworks General Introduction Appendix A:

No new actors are defined in this profile.

255 Appendix B – Transaction Summary Definitions

*Add the following **new or modified** transactions to the IHE Technical Frameworks General Introduction Appendix B:*

260 *<Add any transaction definitions for **new (or modified) transactions** defined specifically for this profile. These will be added to the IHE TF General Introduction Appendix B after publication for trial implementation. Verify that any transactions added here are not already contained in the [IHE General Introduction Appendix B](#).*

265 *<After determining that a suitable transaction does not already exist, please note that the “verb-noun” construction for transaction names is preferred where possible. For additional guidance, see the IHE wiki at http://wiki.ihe.net/index.php/IHE_Profile_Design_Principles_and_Conventions#Transactions.*

New (or modified) Transaction Name and Number	Definition
<Verb-Noun formation (e.g., Send Data [DOM-xx])>	<i>If this is a modified transaction description, add the original description and use bold underline to indicate where the amendment adds text and bold strikethrough where the amendment removes text</i>
Send Aggregate Report (QRPH-58)	This transaction communicates aggregate health data from the Content Creator to the Content Consumer at the end of each reporting cycle.
Retrieve Aggregate Report Definition (QRPH-59)	This transaction obtains the FHIR Measure in order to structure and validate a given FHIR MeasureReport.

Appendix D – Glossary

*Add the following **new** glossary terms to the IHE Technical Frameworks General Introduction Appendix D.*

270

No new Glossary terms.

Glossary Term	Definition

Volume 1 – Profiles

275 **Copyright Licenses**

<i>Add the following to the IHE Technical Frameworks General Introduction Copyright section:</i>
--

NA

280 **Domain-specific additions**

NA

<i>Add new Section X</i>

285

X Mobile Aggregate Data Exchange (mADX) Profile

290 The Mobile Aggregate Data Exchange (mADX) Profile enables interoperable public health reporting of aggregate health data, similar to the Aggregate Data Exchange (ADX) Profile upon which mADX is based. mADX will typically be used to represent routinely reported aggregate data such as the numerators and denominators which can be used in the construction of public health indicators. Please refer to the ADX Profile Section X for more details on the needs for this profile.

295 The central concern of mADX is the reporting of data tuples. These tuples are sets of values which are keyed according to a data element subject, a temporal dimension, and a spatial dimension. An example data tuple is the number of live births recorded in January 2015 at Nyamandhlovu Clinic. These tuples may include one or more additional disaggregating dimensions by specifying a code list.

300 mADX is designed to be an alternative to the current ADX framework. It facilitates the transactions with the use of FHIR for increased interoperability and use of FHIR services, such as those described in Mobile Care Services Discovery (mCSD). Users of the current ADX framework may wish to utilize these FHIR services.

305 mADX defines a Content Data Structure Creator that enables an implementing jurisdiction to formally define the aggregate health data to be exchanged. Metadata for the aggregate data is defined using a profile of the HL7 FHIR Measure resource and uses a HL7 FHIR Terminology service.

mADX defines a Content Data Structure Consumer that consumes a Measure.

The Content Creator and Content Consumer Actors utilize the Measure to construct and validate mADX messages containing aggregate health data in their jurisdiction.

310 The mADX Profile contains few constraints regarding the nature and source of coding systems, and there are liberal extension points intended to allow mADX content to be embedded within different envelopes and its message attributes extended in locally-meaningful ways.

X.1 mADX Actors, Transactions, and Content Modules

315 This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A at http://ihe.net/Technical_Frameworks.

Figure X.1-1 shows the actors directly involved in the mADX Profile and the direction that the content is transmitted. Although the Content Creator and Content Consumer employs the message structure definition files that result from a Content Data Structure Creator, there is not a fully specified message exchange transaction between these actors:

- 320
- Additionally, mADX leverages the Care Services Update Supplier and Care Services Update Consumer Actors from mCSD
 - The Content Data Structure Creator is required to be a compliant FHIR Terminology Service <https://www.hl7.org/fhir/terminology-service.html> and the implementor of a Content Creator or a Content Consumer can leverage the associated FHIR API to support validation workflows
- 325

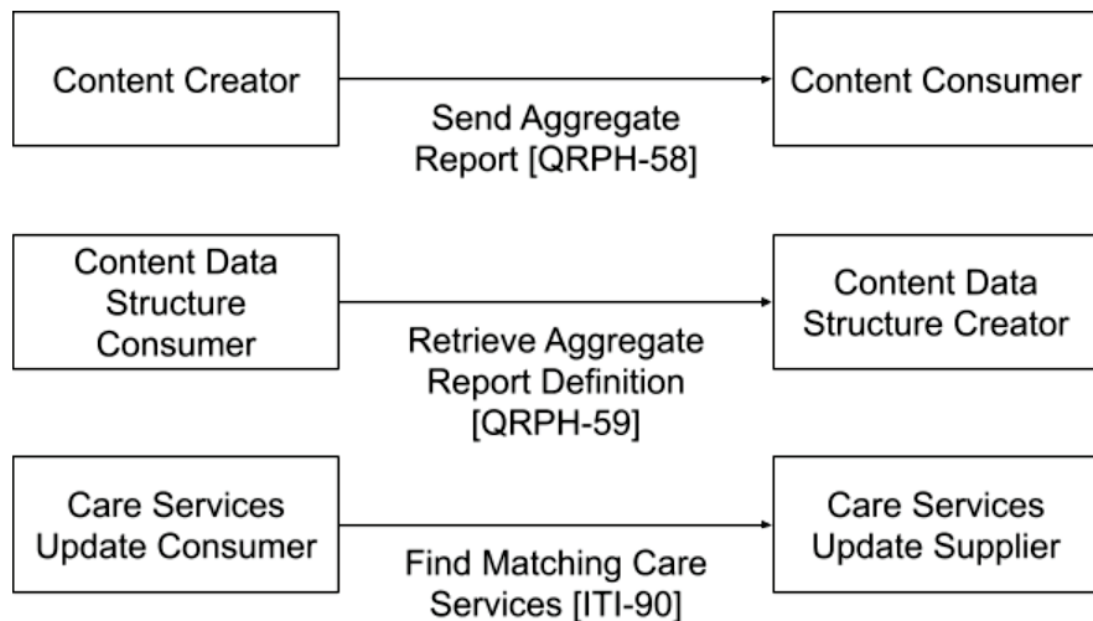


Figure X.1-1: mADX Actor Diagram

- 330 Table X.1-1 lists the content module(s) defined in the mADX Profile. To claim support for this profile, an actor shall support all required content modules (labeled “R”) and may support optional content modules (labeled “O”).

Table X.1-1: mADX Profile - Actors and Content Modules

Actors	Content Modules	Optionality	Reference
Content Data Structure Creator	mADX Measure	R	QRPH TF-3: 8.2-8.3, App. 8A, 8E
Content Data Structure Consumer	mADX Measure	R	QRPH TF-3: 8.2-8.3, App. 8A, 8E
Content Creator	mADX Message	R	QRPH TF-3: App 8G

Actors	Content Modules	Optionality	Reference
Content Consumer	mADX Message	R	QRPH TF-3: App 8G
Care Services Update Supplier	mCSD/ Request for Care Services Updates	R	ITI mCSD: Sec 46.1
Care Services Update Consumer	mCSD/ Request for Care Services Updates	R	ITI mCSD: Sec 46.1

335 X.1.1 Actor Descriptions and Actor Profile Requirements

X.1.1.1 Content Data Structure Creator

The mADX Profile defines the process for a Content Data Structure Creator to develop a mADX Measure which describes the base constraints for a valid mADX data message and any required code sets for disaggregation dimensions of the reported value.

340 Individual jurisdictions may extend the mADX Measure by specifying relevant code sets and additional dimensions of data to satisfy their message exchange use cases.

A Content Data Structure Creator defines a Measure Resource to be exchanged between a Content Creator and Content Consumer. Typically, the Content Data Structure Creator will be an implementing jurisdiction such as a ministry of health, a global non-government organization (NGO) or a donor.

345 A Content Data Structure Creator shall create a normative mADX HL7 FHIR Measure Resource. The HL7 FHIR Measure resource shall reference HL7 FHIR Value Sets from a compliant HL7 FHIR Terminology Service. These HL7 FHIR Values Sets shall include the allowed codes for additional non-spatial disaggregation dimensions.

350 X.1.1.2 Content Data Structure Consumer

A Content Data Structure Consumer consumes a Measure resource produced by a Content Data Structure Creator. The system implementing this actor role will often be a Content Creator, though this grouping is optional. The Measure resource can be used to configure the Content Creator to produce valid content.

- 355
- The Content Data Structure Consumer SHALL retrieve a Measure resource by executing a Retrieve Aggregate Report Definition [QRPH-59] as defined in this profile.
 - The Content Creator or the Content Consumer may act as a Content Data Structure Consumer, view X.3 Required Actor Groupings

X.1.1.3 Content Creator

360 A Content Creator **SHALL** be able to generate an HL7 FHIR Measure that is conformant to mADX and can transmit an mADX message to the Content Consumer. A Content Creator, under

the Validate mADX Option, shall be grouped with a Care Services Update Consumer and a Content Data Structure Consumer.

X.1.1.4 Content Consumer

365 A Content Consumer **SHALL** be able to process a data stream that is conformant to the format defined by the Measure resource produced by the Content Data Structure Creator. What it means to process the XML stream depends on the nature of the processor. For example it might persist the individual data tuples, or it might format them for display or perform further aggregation on the data. A Content Consumer, under the Validate mADX Option, **SHALL** be grouped with a
370 Care Services Update Consumer and a Content Data Structure Consumer.

X.1.1.5 Care Services Update Supplier

The Care Services Update Supplier is defined in the mCSD Profile in Section X.1.

mADX leverages location services from Care Services Update Supplier.

375 The Care Services Update Supplier provides the set of valid spatial dimensions as HL7 FHIR locations and is the source of the location data referenced in an ADX message. The list of valid locations is determined by the implementing jurisdiction.

X.1.1.6 Care Services Update Consumer

The Care Services Update Consumer is defined in the mCSD Profile in Section X.1.

X.2 mADX Actor Options

380 **Table X.2-1: mADX - Actors and Options**

Actor	Option Name	Reference
Content Data Structure Creator	No options defined	--
Content Data Structure Consumer	Validate mADX Message	X.2.1
Content Creator	No options defined	--
Content Consumer	No options defined	--

X.2.1 Validate mADX Message Option

385 The Content Creator or Content Consumer Actors, **SHALL** be grouped with the Content Data Structure Consumer and the mCSD Care Services Updates Consumer if the Validate mADX message Option is used, which includes the Retrieve Indicator Definition [QRPH-59] transaction.

X.3 mADX Required Actor Groupings

There are no Required Actor Groupings defined except in the Validate mADX Message Option where the Content Creator or Content Consumer Actors, **SHALL** be grouped with the Content Data Structure Consumer and the mCSD Care Services Updates Consumer as indicated in X.2.1

X.4 mADX Overview

mADX defines an HL7 FHIR Measure Resource. The Measure Resource defines the metadata needed to validate an mADX message for representing aggregate health data. More information on the characteristics of data being sent in an mADX message is provided in Section X.4 of the ADX Profile.

This profile sets constraints on the mandatory dimensions which shall be in a Measure Resource . Additional data element dimensions may be defined as necessary within the context of use - for example, within a particular country or implementing jurisdiction. Similarly, whereas mADX assumes that code sets and other structural metadata will be shared with Content Creators and Content Consumers under the Validate Message Option as described in X.2.1. These inputs to the mADX message schema definition are conceptually illustrated by Figure X.4-1 in which the Content Creator and Content Consumer are both enacting the Validate mADX Option.

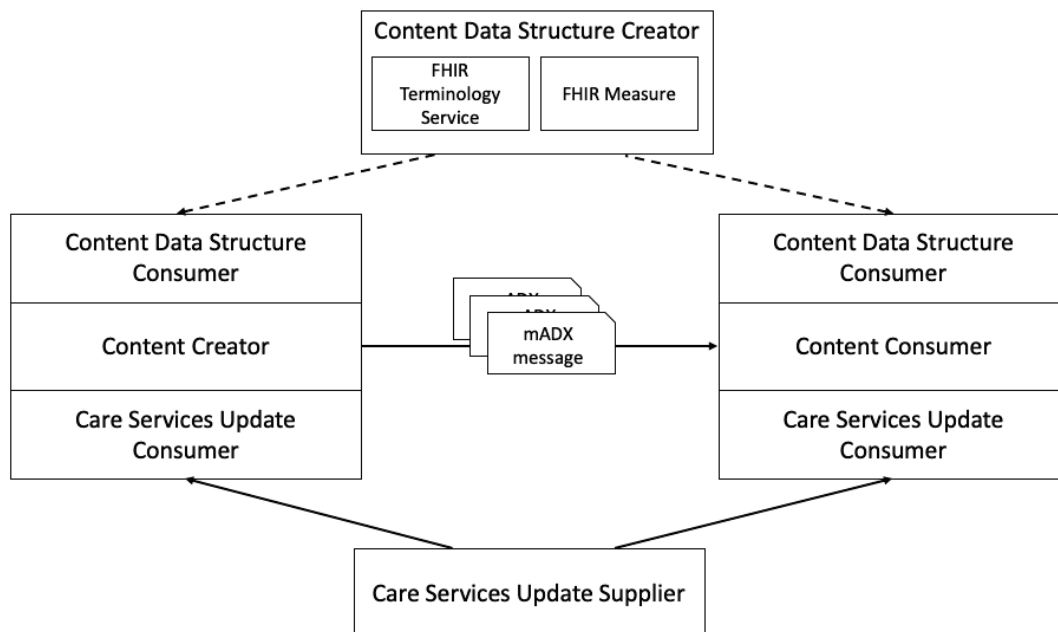


Figure X.4-1: An illustration of mADX Profile inputs and outputs

X.4.1 Concepts

The following concepts are used in this profile:

- Data value: Refer to Section X.4.1 of the ADX Profile.
- 410 • Data Value Set: Section X.4.1 of the ADX Profile. In mADX these should be contained in the mADX message sent by the Content Creator.
- Data element: Refer to Section X.4.1 of the ADX Profile.
- Measure: The FHIR resource by which a formal definition of the structural metadata of a mADX message is created. FHIR Measure is the base data model being profiled in mADX. A Measure MAY contain multiple defined indicators in a group.
- 415 • MeasureReport: The FHIR resource that specifies a given Data Value Set that conforms to its related FHIR Measure.
- Organization Unit: Refer to Section X.4.1 of the ADX Profile. Note that Organization Unit may encompass the mCSD Location
- 420 • Person-centric Health Information (PHI): Is any information that can be used to identify an individual.
- Time: Refer to Section X.4.1 of the ADX Profile.
- Value: Refer to Section X.4.1 of the ADX Profile.

X.4.2 Use Cases

- 425 The use cases that mADX is solving are the same as those defined in Section X.4.2 of the ADX Profile with the exception of the mADX validation use cases described in Sections X.4.2.1 and X.4.2.2 of the mADX Profile.

X.4.2.1 Use Case #1 Validation by Content Creator

- 430 A local hospital in Senegal may be submitting data to the national level Health Management Information System (HMIS) via mADX indicator message. Before submitting the data to the HMIS the hospital system will make several queries to ensure that it has the most up to date versions of the mADX Measure, terminology, and provider lists. This action is similar to the ADX Profile Use Case #2 Reporting health worker data. The hospital system may run these in a loop to validate multiple messages against the same set of resources. After validating all three elements, the hospital system will submit the mADX indicator message to the national HMIS. In 435 this use case the Content Creator and Content Data Structure Consumer are grouped.

In this use case, the local hospital system is acting as the Content Creator and Content Data Structure Consumer, while the national HMIS is the Content Consumer.

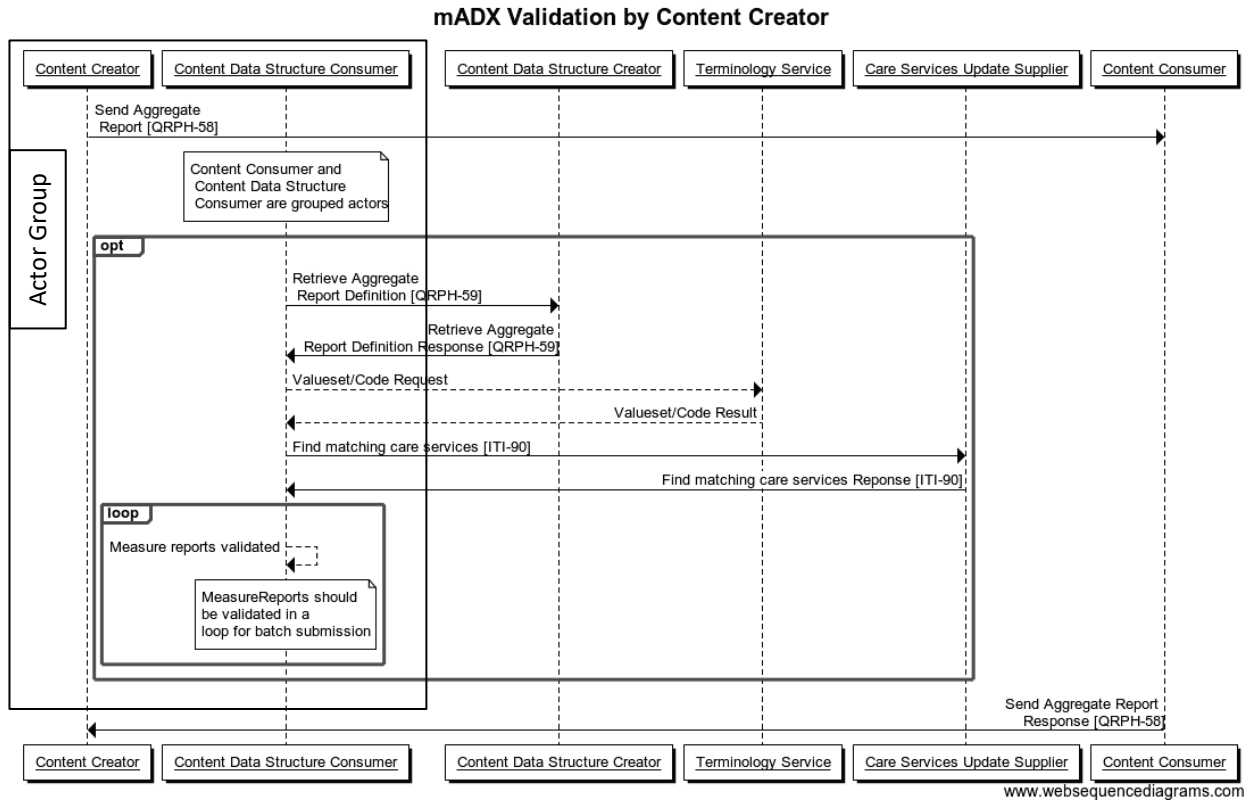


Figure X.4.2.1-1: mADX Validation by Content Creator

440 X.4.2.2 Use Case #2 Validation by Content Consumer

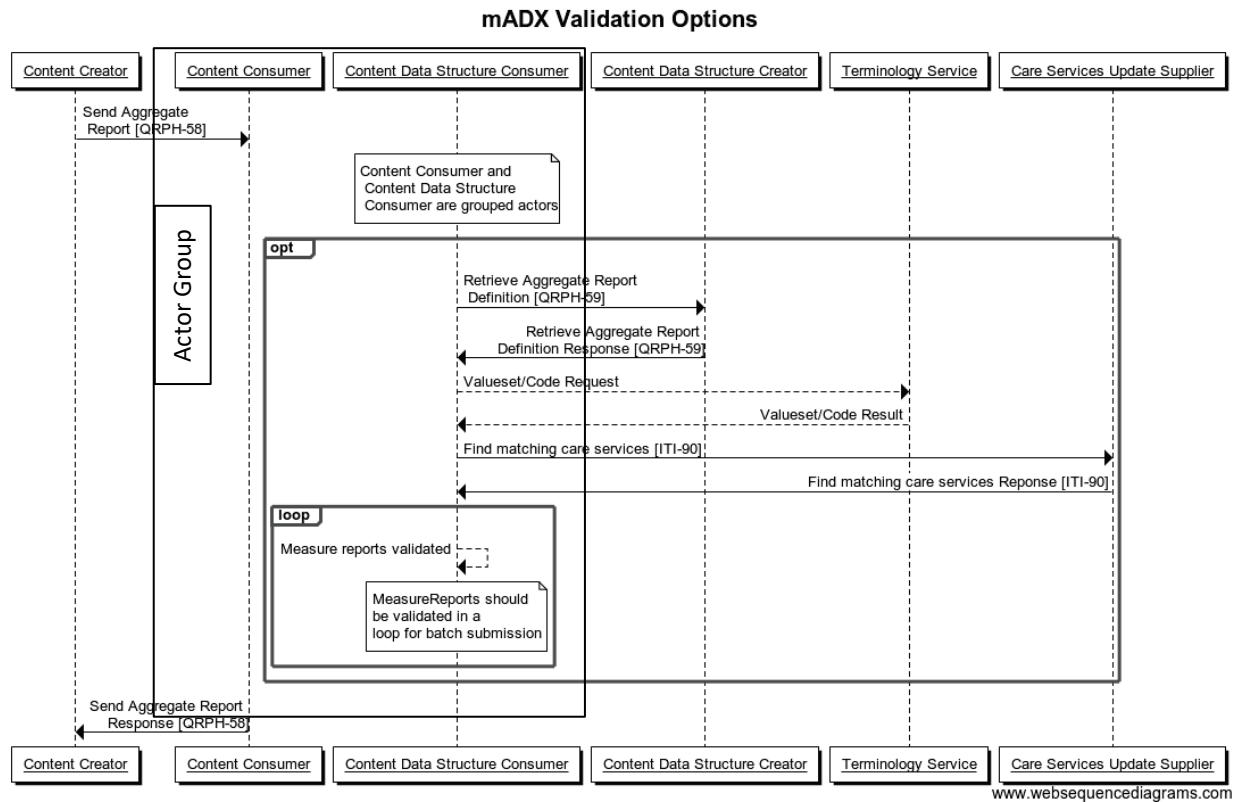


Figure X.4.2.2-1: mADX Validation by Content Consumer

In Tanzania, a state level HMIS has collected a month of data and needs to push it to the national level HMIS. The state HMIS acts a Content Creator to submit an indicator as a MeasureReport to the national level HMIS acting as a Content Consumer.

Upon receipt of the data the national level HMIS will validate the message against the Measure they were created against, the terminology codes against a terminology server, and the location list to ensure that all reporting locations are correctly referenced in the indicator MeasureReport. Like the previous use case , this validation may be done in a loop to validate a batch of resources.

After validation of the message is complete, the national HMIS returns a confirmation.

X.5 mADX Security Considerations

The mADX Profile does not support the exchange of personally identifiable information. Therefore, this profile does not specify security mechanisms, such as the ITI Audit Trail and Node Authentication (ATNA) Profile, that would be required were that the case. Implementers should nevertheless be sensitive to the possibility of approximate personal identification arising from aggregate data derived from small population sets. Transport of such data should be safeguarded according to jurisdictional guidelines.

460 **X.6 mADX Cross Profile Considerations**

X.6.1 Aggregate Data Exchange (ADX)

mADX subsumes the functionality of ADX in a FHIR format and expands it.

X.6.1.1 The Mobile Care Services Discovery (mCSD)

465 The Mobile Care Services Discovery (mCSD) Profile supports RESTful queries for organization units via the FHIR Location resource. Locations are physical care delivery sites such as hospitals, clinics, health outposts, physician offices, labs, pharmacies. Locations also include political administrative area, such as a village district or region. A Location has a unique identifier and may have geographic attributes (address, geocode), contact attributes, and other attributes such as hours of operation. This location data is made available via the Request for
470 Care Services Updates transaction initiated by a Care Services Update Consumer against a Care Services Update Supplier. See ITI TF-2x: Appendix Z.8 for common mobile security considerations.

Under the Validate mADX Option, a Content Creator or a Content Consumer shall be grouped
475 with the Care Services Update Consumer to ensure that it has an updated list of the resources for the reporting locations. The list may be used to validate the reporting locations sending MeasureReports under the validation option described in this profile.

Additionally, a Care Services Update Supplier that contains information on health care practitioners can also be used to generate an mADX message to satisfy Use Case #2 of the ADX
480 Profile in which a district health manager running an aggregate report on staffing levels by location and health care practitioner role.

Appendices to Volume 1

None

Volume 2 – Transactions

Add Section 3.58

3.58 Send Aggregate Report [QRPH-58]

This section corresponds to transaction [QRPH-58] of the IHE QRPH Technical Framework. Transaction [QRPH-58] is used by the Content Creator and Content Consumer Actors to share aggregate health data within a jurisdiction using a FHIR MeasureReport.

3.58.1 Scope

This transaction is used to communicate aggregate health data from the Content Creator to the Content Consumer at the end of each reporting cycle.

3.58.2 Actor Roles

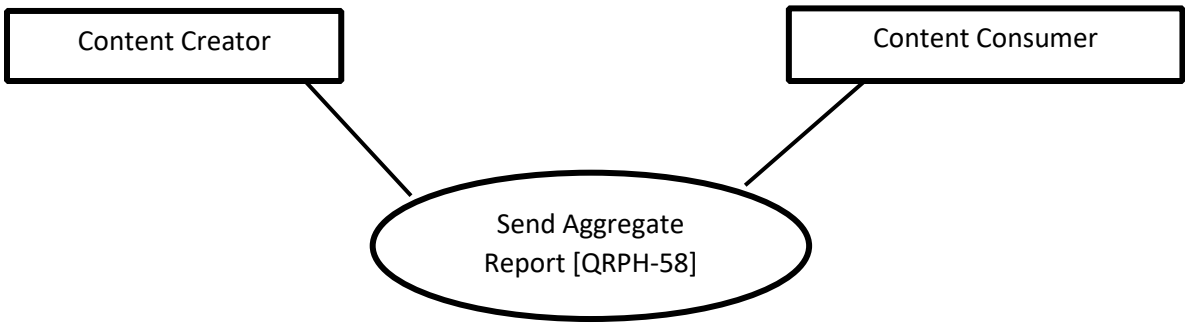


Figure 3.58.2-1: Use Case Diagram

The roles in this transaction are defined in the following table and may be played by the actors shown here:

Table 3.58.2-1: Actor Roles

Actor:	Content Creator
Role:	The Content Creator is responsible for the creation of a mADX message containing aggregate health data conformant to the jurisdiction defined Measure Resource and transmitting this message to a Content Consumer.
Actor:	Content Consumer
Role:	A Content Consumer is responsible for receiving the mADX message containing aggregate health data conformant to the jurisdiction defined Measure Resource from the Content Creator and processing it.

3.58.3 Referenced Standards

- 500 • HL7 FHIR HTTP

3.58.4 Messages

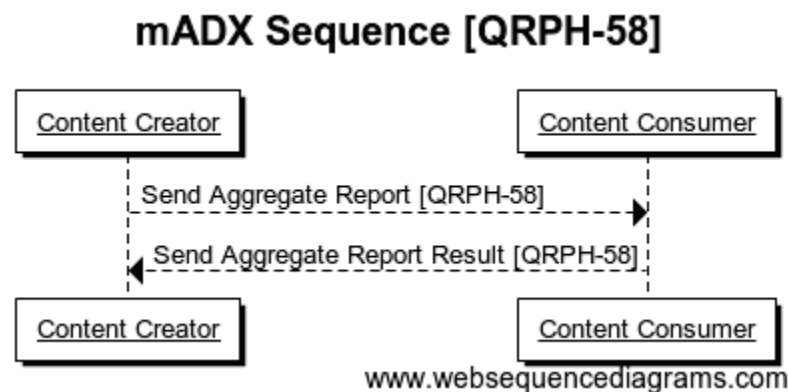


Figure 3.58.4-1: Send Aggregate Report Diagram

3.58.4.1 Send Aggregate Report

- 505 This transaction transmits mADX-conformant messages containing aggregate health data from the Content Creator to the Content Consumer. A Content Consumer implemented at a jurisdiction may receive this transaction from multiple Content Creators.

The Send Aggregate Report is implemented as a FHIR Update Transaction defined in the RESTful API implementation guide: <https://www.hl7.org/fhir/http.html#update>.

510 3.58.4.1.1 Trigger Events

There are a wide variety of implementation and jurisdiction specific events which might trigger a Send Aggregate Report transaction. This might be automated, for example a timeout indicating the end of a routine reporting period, or manually triggered in response to prevailing business logic. The trigger event is implementation specific.

515 3.58.4.1.2 Message Semantics

The Content Creator creates a mADX conformant message containing aggregate health data that meets the requirements of the mADX Measure in their jurisdiction. The Content Creator **MAY** send the message using Send Aggregate Report. The Content Consumer **SHALL** consume the message that meets the requirements of the mADX Measure in their jurisdiction.

- 520 The table below describes the request.

Table 3.58.4.1.2-1: Messaging Semantics for Send Aggregate Report

	Description
URL	The mADX Profile does not prescribe the form of the URL to be advertised by a Content Consumer except that the scheme of the URL SHALL be “https”. The following is a non-exhaustive list of valid examples: - https://hmis.gov.rw/datasets/mADX - https://hmis.gov.rw/routinereports/mADX https://hmis.gov.rw/routinereports
Headers	The Update request SHALL contain a Content-type header identifying the payload - Type:Content-type: application/fhir+xml - Type:Content-type: application/fhir+json The request MAY contain any additional headers. For example, a Content Consumer may require an Authorization header.
	A Content Consumer MAY support additional parameters.
BODY	The body of a mADX Send Aggregate Report request SHALL contain a valid mADX data payload as described in Section 8.2 of this profile

The indicator **SHALL** contain the following elements:

subject

A required location reference

525 period

The start and end of the reporting period

group.coding.code

A required reference for a valid indicator

stratifier.stratum.value

530 A required value for each reported aggregate report

stratifier.stratum.component

An optional value that should be present for each disaggregation dimensioned included in the report

3.58.4.1.3 Expected Actions

535 The Content Consumer **SHALL** process the mADX message received and return the status of the transaction as a Send Aggregate Report Result.

3.58.4.2 Send Aggregate Report Result

This transaction is an acknowledgement of mADX POST Content transaction from the Content Consumer to the Content Creator.

- 540 The Send Aggregate Report Result is implemented as an HTTP response. It can be emitted synchronously in response to the initial Update request, or maybe made available at a later time. The Content Consumer makes no guarantee that either the status URL or the result URL will be available permanently.

3.58.4.2.1 Trigger Events

- 545 A Content Consumer sends a Send Aggregate Report Result after receiving and processing a Send Aggregate Report from the Content Creator. For a synchronous request this will be the HTTP Response of the originating Request. For an asynchronous Request this will be in the HTTP Response of a later request that the Content Creator may make after polling for completion.

550 3.58.4.2.2 Message Semantics

- The Send Aggregate Report Result is implemented as an HTTP Response. The response may include content in the body to provide an implementation and jurisdiction specific informative message on the completed status of the transaction. The response shall contain an HTTP status code. The table below describes the codes which may be produced by the Content Consumer
- 555 which have a specific meaning related to the transaction.

Note that a Content Creator should be prepared to handle additional status codes not particular to the transaction, such as authorization, server or network error codes. HTTP status codes correspond to FHIR HTTP 3.1.0.4.2 Rejecting Updates (<https://www.hl7.org/fhir/http.html#rejecting-updates>).

560 **Table 3.58.4.2.2-1: Send Aggregate Report Result status codes**

HTTP status code	Interpretation
200	Send Aggregate Report Request was successfully processed
202	Send Aggregate Report Request has been accepted for processing, but the processing has not been completed. The request might or might not be eventually acted upon, and may be disallowed when processing occurs.
303	The response to the Send Aggregate Report when the task is complete can be retrieved from another URL. When received in response to a Send Aggregate Report, the client should presume that the server has received the data and should issue a redirect with a separate GET message.
400	Bad Request - message content is badly formed or invalid
401	Not authorized - authorization is required for the interaction that was attempted
404	Not found - resource type is not supported
405	Method not allowed - the resource did not exist prior to the update, and the server does not allow client defined ids
409/412	Conflict - invalid identifier in the message content.
415	Unsupported content-type or media
422	Unprocessable entity - The MeasureReport does not adhere to mADX Profile on the required fields, etc.

HTTP status code	Interpretation
501	The request method is not implemented.

3.58.4.2.3 Expected Actions

A Content Consumer **SHALL** respond with appropriate error codes in the event of receiving an invalid Submit Indicator Report Request according to the FHIR 3.1.0.4.2 *Rejecting Updates*.

- 565 If no other error conditions are encountered, a Content Consumer **SHALL** respond to a Submit Indicator Report Request with a 422 *Unprocessable Entity* and an appropriate OperationOutcome resource if any of the following business rule(s) are violated:
- The Submit Indicator Report Request message does not adhere to the message semantics as defined in Section 3.58.4.2.2 Message Semantics.
- 570 An OperationOutcome resource **SHALL** be generated for each MeasureReport resource submitted in the batch transaction which violates the above business rule(s), in which case the OperationOutcome **SHALL**:
- Use response codes as in Table 3.58.EA-1 for the OperationOutcome.issue.code
 - Provide a FHIRPath identifying the invalid MeasureReport in OperationOutcome.issue.expression
 - Set the value of OperationOutcome.issue.expression to fatal.
- 575

3.58.5 Protocol Requirements

See ITI TF-2x: Appendix Z

3.58.6 Security Considerations

- 580 This profile assumes either implied or explicit data sharing agreements between the data exchange entities, and the envisaged use cases of the Send Aggregate Report [QRPH-58] transaction, which do not include the exchange of PHI. Therefore, this transaction would not typically require security mechanisms that protects PHI, such as the ITI Audit Trail and Node Authentication (ATNA) Profile. Implementers **SHOULD** nevertheless be sensitive to the
- 585 possibility of approximate personal identification arising from aggregate data derived from small population sets. In the instance where a quality measurement entity needs de-identified data, the IHE ITI Handbook on De-identification should be referenced.

- Transport of mADX data **SHOULD** be safeguarded according to jurisdictional guidelines. To protect data integrity these **SHOULD** include encryption of the transport layer and the use of an appropriate mutual authentication mechanism which meets these guidelines.
- 590

Content Consumers should also take adequate account of security considerations related to the generic processing of mADX documents (RFC7303).

3.58.6.1 Security Audit Considerations

There is no specific ATNA security audit event that is associated with this transaction.

595 3.58.6.1.2 Actor Specific Security Considerations

N/A

Add Section 3.59

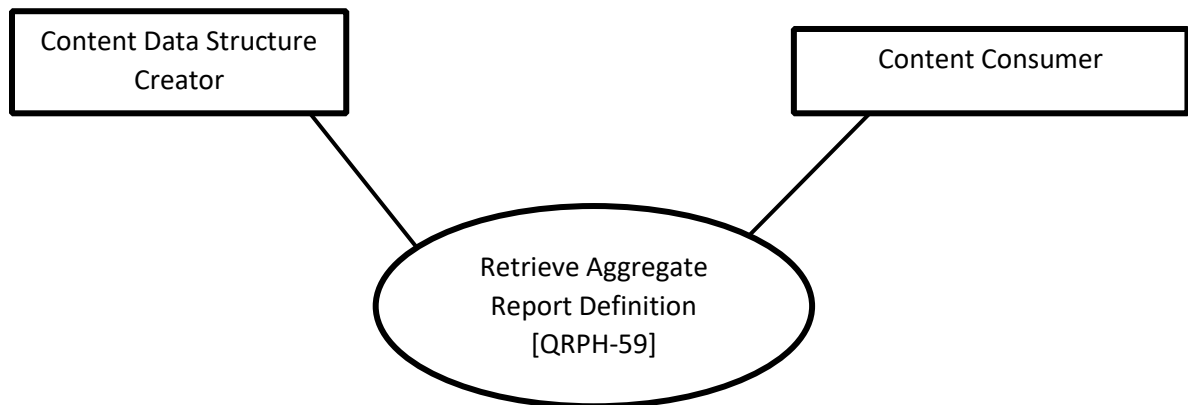
600 3.59 Retrieve Aggregate Report Definition [QRPH-59]

This section corresponds to transaction [QRPH-59] of the IHE QRPH Technical Framework. Transaction [QRPH-59] is an optional transaction used by the Content Creator and Content Consumer Actors to retrieve the defined FHIR Measure. It can be exercised as an optional validation step by implementers.

605 3.59.1 Scope

This transaction is used to obtain the FHIR Measure in order to structure and validate a given FHIR MeasureReport.

3.59.2 Actor Roles



610 **Figure 3.59.2-1: Use Case Diagram**

The roles in this transaction are defined in the following table and may be played by the actors shown here:

Table 3.59.2-1: Actor Roles

Actor:	Content Data Structure Creator
Role:	The Content Data Structure Creator is responsible for the creation of a Measure Resource, which a given mADX message SHALL conform
Actor:	Content Data Structure Consumer
Role:	A Content Consumer is responsible for receiving the Measure Resource and validating its mADX messages.

615 3.59.3 Referenced Standards

- HL7 FHIR HTTP

3.59.4 Messages

Retrieve Aggregate Report Definition [QRPH-59]

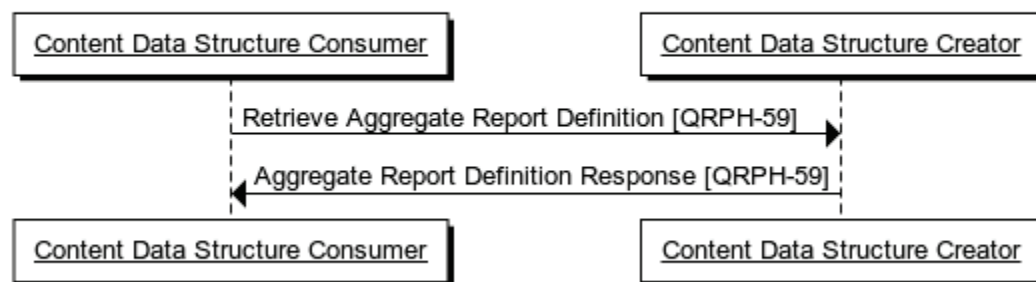


Figure 3.59.4-1: Interaction Diagram

620 3.59.4.1 Retrieve Aggregate Report Definition

This transaction facilitates the Content Consumer requesting a mADX Measure from a Content Data Structure Creation. The Measure MAY be used by the Content Consumer to validate their mADX messages upon receipt.

625 The Retrieve Aggregate Report Definition [QRPH-59] is implemented as a FHIR Read transaction defined in the RESTful API implementation guide:

<https://www.hl7.org/fhir/http.html#read>.

3.59.4.1.1 Trigger Events

A Content Consumer sends a Retrieve Aggregate Report Definition [QRPH-59] as a request for a given Measure from a Content Data Structure Creator.

3.59.4.1.2 Message Semantics

Table 3.59.4.1.2-1: Messaging Semantics for Retrieve Aggregate Report Definition

	Description
URL	The mADX Profile does not prescribe the form of the URL to be advertised by a Content Consumer except that the scheme of the URL SHALL be “https”.
Headers	The Read request SHALL contain a Content-type header identifying the payload Type:Content-type: application/ fhir+xml Type:Content-type: application/fhir+json The request MAY contain any additional headers. For example, a Content Creator may require an Authorization header.
BODY	The body of a mADX Retrieve Data Structure request SHALL contain the ID of the resource.

3.59.4.1.3 Expected Actions

The Content Consumer **SHALL** send a request for a given Measure from the Content Data Structure Creator.

3.59.4.2 Retrieve Aggregate Report Definition Response

This transaction responds to the Content Consumer requesting a mADX Measure from a Content Data Structure Creator. The Measure **SHALL** be used by the Content Consumer to validate their mADX messages upon receipt.

The Retrieve Aggregate Report Definition [QRPH-59] Response is implemented as a FHIR Read transaction defined in the RESTful API implementation guide:
<https://www.hl7.org/fhir/http.html#read>.

An example Measure is provided in Appendix A.2.

3.59.4.2.1 Trigger Events

A Content Data Structure Consumer **SHALL** return an Aggregate Report Definition Response if a Content Consumer has sent a Retrieve Aggregate Report Definition Request.

3.59.4.2.2 Message Semantics

The Content Data Structure Creator **SHALL** conform to HTTPS standards and respond to the Retrieve Aggregate Report Definition Request with the appropriate status code outlined in the table below.

Table 3.59.4.2.2-1: Retrieve Aggregate Report Definition Result status codes

HTTP status code	Interpretation
200	Retrieve Aggregate Report Definition Request was successfully processed
202	Retrieve Aggregate Report Definition Request has been accepted for processing, but the processing has not been completed. The request might or might not be eventually acted upon, and may be disallowed when processing occurs.
303	The response to the Retrieve Aggregate Report Definition Request when the task is complete can be retrieved from another URL. When received in response to a Retrieve Indicator Definition, the client should presume that the server has received the data and should issue a redirect with a separate GET message.
400	Bad Request - message content is badly formed or invalid.
401	Not authorized - authorization is required for the interaction that was attempted.
404	Not found - The referenced Indicator Report/Measure resource was not found.
405	Method not allowed - the resource did not exist prior to the update, and the server does not allow client defined ids.
409/412	Conflict - invalid identifier in the message content.
415	Unsupported content-type or media.
422	Unprocessable entity - The referenced Indicator Report/Measure resource does not adhere to the message semantics of a Retrieve Aggregate Report Definition [QRPH-59] transaction.
501	The request method is not implemented.

The HL7 FHIR Measure response **SHALL** contain the following elements:

title

655 A human friendly name for this Measure.

Version

The business version of this Measure.

url

Where the definition of the Measure, and any updated versions, can be found.

660 publisher

The organization responsible for publishing and maintaining the Measure.

description

A narrative description of the scope of the Measure.

subject.subjectCodableConcept.coding[].code

665 Required to be set to patient, provider from the valueset <https://www.hl7.org/fhir/valueset-subject-type.html>. It will indicate the base resource in which the indicator is intended to run.

group[]

670 There should be a group element for each indicator that can be calculated based on the MDS defined in the Measure. Each group member should have a unique code defined, relative to the Measure.

group[].description

 A narrative description of an indicator.

group[].code.coding[]

675 The "code" should be a unique code distinguishing the indicator within the Measure.

group[].stratifier[]

 Contains the disaggregating value sets needed required for an indicator.

group[].stratifier[].component[]

680 There should be a “component” for each set of disaggregators which is linked to a FHIR ValueSet

group[].stratifier[].component[].code

 A code used to reference this disaggregating valueset. There must be a relatedArtifact (see below) for each disaggregation set which is a reference to a FHIR Valueset

relatedArtifact[]

685 There should be a related artifact for each disaggregation set defined under group[].stratifier[].component[].

relatedArtifact[].label

 The label should match one of the values of group[].stratifier[].component[].code for a disaggregation value set.

690 relatedArtifact[].url

 The URL of a FHIR Valueset that defines the valid values reported in this disaggregation component as cross-referenced by relatedArtifact[].label

relatedArtifact[].type

 Should be set to “depends-on”.

695 **3.59.5.2.3 Expected Actions**

The Content Data Structure Creator **SHALL** return the applicable Measure in the Aggregate Report Definition Response to the Content Consumer.

Appendices to Volume 2

None

700

Volume 2 Namespace Additions

<i>Add the following terms to the IHE General Introduction Appendix G:</i>
--

The QRPH registry of OIDs is located at https://wiki.ihe.net/index.php/QRPH_Registry

705

Volume 2 additions to the QRPH OID Registry are:

None

710

Volume 3 – Content Modules

5 IHE Namespaces, Concept Domains and Vocabularies

Add to Section 5 IHE Namespaces, Concept Domains and Vocabularies

715 5.1 IHE Namespaces

The QRPH registry of OIDs is located at https://wiki.ihe.net/index.php/QRPH_Registry

Additions to the QRPH OID Registry are:

codeSystem	codeSystemName	Description
NA	NA	NA

720 5.2 IHE Concept Domains

NA

5.3 IHE Format Codes and Vocabularies

5.3.1 IHE Format Codes

725 *List in the table below any **new** format codes to be added to the IHE Format Codes wiki page at http://wiki.ihe.net/index.php/IHE_Format_Codes. For public comment, the additions must be listed in the table below. The domain technical committee must ensure any new codes are also added to the wiki page prior to publication for trial implementation.*

Profile	Format Code	Media Type	Template ID
NA	NA	NA	NA

730

5.3.2 IHEActCode Vocabulary

735 List in the table below, any **new** additions to the IHEActCode Vocabulary wiki page at http://wiki.ihe.net/index.php/IHEActCode_Vocabulary. For public comment, the additions must be listed in the table below. The domain technical committee must ensure any new codes are also added to the wiki page prior to publication for trial implementation.

Code	Description
NA	NA

740

5.3.3 IHERoleCode Vocabulary

745 List in the table below any **new** additions to the IHERoleCode Vocabulary wiki page at http://wiki.ihe.net/index.php/IHERoleCode_Vocabulary. For public comment, the additions must be listed in the table below. The domain technical committee must ensure any new codes are also added to the wiki page prior to publication for trial implementation.

Code	Description
NA	NA

6 HL7 V3 CDA Content Modules

NA

750

7 DICOM^{®3} Content Definitions

NA

³ DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

8 mADX Content Modules

This section defines Content Modules for the Aggregate Data Exchange (mADX) Profile.

755 8.1 Overview of mADX process

A Content Data Structure Creator creates mADX-conformant Measure and schema streams. Typically, the mADX Content Data Structure Creator will be an implementing jurisdiction such as a ministry of health, a global non-government organization (NGO) or a donor.

- 760 • A mADX compliant Measure is a profile of the HL7 FHIR Measure, as described in Section 8.2.
- mADX Content data messages can be validated using valuesets from the HL7 FHIR Terminology Service.

765 Content Creators and Content Consumers exchange a data payload that conforms to the mADX compliant resources. A sample mADX compliant data payload is provided in the informative Appendix A.3.

Additional (informative) message constraints for interoperability of mADX data exchange which are outside of the scope of this profile are described in Section 8.4.

8.2 FHIR Measure Report

770 An mADX FHIR Measure Report shall be compliant with the additional constraints defined in Section 8.3 of this profile.

The purpose of profiling the base Measure is to provide guidance regarding which parts of a mADX Measure are fixed by the profile and which parts may be extended to support implementation-specific requirements.

8.3 mADX Message Exchange Constraints

775 There are implicit assumptions regarding the sharing of additional metadata between Content Creators and Content Consumers which are not covered within the scope of the mADX Profile. In order to ensure semantic validity of the exchanged data, the constraints described below shall be specified using processes not defined by this profile:

- 780 • The data elements to be reported for particular Organizational Units. For example, reporting ‘Number of lab Tests performed’ from a health facility which did not perform laboratory tests is not constrained by mADX.

The Value type (real or integer) expected for individual data elements.

- 785 • Which period types are appropriate for which data elements. For an informative sample of period types please see the Aggregate Data Exchange Technical Framework Supplement Appendix 8J – (Informative) Formatting of times and time intervals in ADX.

- Description of age disaggregations shall follow the format described in the ADX Profile (Appendix 8K – Representation of age groups in ADX).

790 The preceding is not an exhaustive list. Other business rules that may affect interoperability may need to be established such as bounds on data values, bounds on date ranges, relationships between different data elements (e.g., the sum of these data elements cannot be greater than the sum of those data elements, etc).

Appendices to Volume 3

Appendix A – FHIR Profile on Terminologies and Sample Messages for the mADX Profile

795 A.1 FHIR Profile on Terminologies

An electronic copy of the file is available at <https://www.hl7.org/FHIR/terminology-service.html>

800 **A.2 Sample mADX Measure (Informative)**

An electronic copy of the file is available on the IHE ftp site at ftp://ftp.ihe.net/TF_Implementation_Material/QRPH/mADX/.

```
{
805   "resourceType": "Measure",
      "id": "madx-hiv-indicators-example",
      "title": "HIV",
      "version": "0.0.0",
      "publisher" : "ohie.org",
810   "description" : "EXAMPLE indicators supporting OpenHIE implementations of
the IHE ADX-HIV content profile",
      "subject" : {
        "coding" : [
          {
815           "system" : "http://hl7.org/fhir/ValueSet/subject-type",
           "code" : "Patient"
          }
        ]
      },
820   "group" : [
      {
        "code" : "QRPH_ADX_ART1_N",
        "description" : "Number of adults and children newly enrolled on
antiretroviral therapy (ART)",
825        "stratifier" : [
          {
            "component" : [
              {
830                "code" : {
                  "coding" : [
                    {
                      "system" : "http://ihe.net/qrph/madx-example-
components",
                      "code" : "AGE_GROUP"
```

```
835         }
        ]
    }
},
{
840     "code" : {
        "coding" : [
            {
                "system" : "http://ihe.net/qrph/adx-example-
components",
845         "code" "SEX"
            }
        ]
    }
}
850 ]
}
]
}
],
855 "relatedArtifact" : [
    {
        "label" : "AGE_GROUP",
        "url" : "http://ihe.net/qrph/adx-hiv-example-age-groups",
        "type" : "depends-on"
860    },
    {
        "label" : "SEX",
        "url" : "http://ihe.net/qrph/adx-hiv-example-sex",
865        "type" : "depends-on"
    }
],
],
```

```
870     "url": "http://ohie.org/Measure/madx-hiv-indicators-example",
      "identifier": [
        {
          "system": "http://ohie.org/Measure/",
          "value": "madx-hiv-indicators-example"
        }
875     ],
      "status": "draft",
      "experimental": true,
      "date": "2019-08-02",
    }
880
```

A.3 Sample mADX message (Informative)

An electronic copy of the file is available on the IHE ftp site at ftp://ftp.ihe.net/TF_Implementation_Material/QRPH/mADX/.

```
885  {
      "resourceType": "MeasureReport",
      "measure": "http://ohie.org/Measure/madx-hiv-indicators-example",
      "id" : "12345-example",
      "period": {
890      "start": "2018-01-01",
        "end": "2018-01-31"
      },
      "group": [
        {
895      "code": {
          "coding": [
            {
              "code": "QRPH_ADX_ART1_N"
            }
900      ]
        },
      ],
    }
```

```

    "stratifier": [
      {
        "stratum": [
905          {
            "measureScore": {
              "value": 5
            },
            "component": [
910              {
                "code": {
                  "coding": [
                    {
915                      "code": "AGE_GROUP"
                    }
                  ]
                },
                "value": {
                  "coding": [
920                      {
                        "system" : "http://ihe.net/qrph/adx-hiv-
example-age-group",
                        "code": "P0Y--P1Y"
925                      }
                    ]
                  }
                },
                {
930                  "code": {
                    "coding": [
                      {
                        "code": "SEX"
                      }
                    ]
                  }
                },
935              ],
            ],
          },
        ],
      },
    ],
  },
}
```

```

940         "value": {
            "coding": [
                {
                    "system" : "http://ihe.net/qraph/adx-hiv-
example-sex",
                    "code": "F"
                }
            ]
        }
    ]
}
}
955
```

Volume 4 – National Extensions

Not applicable