



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. 2.1 – 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 October 26, 2021 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 Quality, Research
35 and Public Health Technical Framework. Comments are invited and can 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 is incorporates content from Release 4 of the HL7 FHIR 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.

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:

- 175
- 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.
- 180
- 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.

185 **Approach**

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

- 190
- 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
- 195
- the Terminology Consumer defined in the SVCM Profile for querying and validating codes

The FHIR Measure resource is used in mADX to define the metadata required to validate an 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.

200

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)?
- 210
2. 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?

3. 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 4. 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 5. FHIR supports batch use of the Read and Update transactions. Should those transactions be profiled in mADX?
6. 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.

5. 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?

245 Resolution: This behavior is described in the SVCN transaction Validate Code [ITI-99] detailed in Section 3.99.4.3.3 of the SVCN Profile. The Terminology Service shall respond with an error message.

IHE Technical Frameworks General Introduction

250 The [IHE Technical Framework General Introduction](#) is shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to this document where appropriate.

9 Copyright Licenses

255 IHE technical documents refer to, and make use of, a number of standards developed and published by several standards development organizations. Please refer to the IHE Technical Frameworks General Introduction, [Chapter 9 - Copyright Licenses](#) for copyright license information for frequently referenced base standards. Information pertaining to the use of IHE International copyrighted materials is also available there.

10 Trademark

260 IHE® and the IHE logo are trademarks of the Healthcare Information Management Systems Society in the United States and trademarks of IHE Europe in the European Community. Please refer to the IHE Technical Frameworks General Introduction, [Chapter 10 - Trademark](#) for information on their use.

IHE Technical Frameworks General Introduction Appendices

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

270 *Update the following appendices to the General Introduction as indicated below. Note that these are **not** appendices to this domain's Technical Framework (TF-1, TF-2, TF-3 or TF-4) but rather, they are appendices to the IHE Technical Frameworks General Introduction located [here](#).*

[Appendix A](#) – Actors

275 *Add the following **new or modified** actors to the [IHE Technical Frameworks General Introduction Appendix A](#):*

New (or modified) Actor Name	Definition
No new actors	

[Appendix B](#) – Transactions

280 *Add the following **new or modified** transactions to the [IHE Technical Frameworks General Introduction Appendix B](#):*

New (or modified) Transaction Name and Number	Definition
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.

285 **Appendix D – Glossary**

*Add the following **new or modified** glossary terms to the [IHE Technical Frameworks General Introduction Appendix D](#):*

Glossary Term	Definition	Acronym
No new terms		

290

Volume 1 – Profiles

Copyright Licenses

Add the following to the IHE Technical Frameworks General Introduction Copyright section:

295 NA

Domain-specific additions

300 NA

<i>Add new Section X</i>

X Mobile Aggregate Data Exchange (mADX) Profile

305 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 ADX Section X for more details on the needs for this profile.

310 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.

315 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.

320 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, referred to as a Data Structure Definition (DSD).

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

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

325 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

330 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.

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”).

335

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, 8A, 8E
Content Data Structure Consumer	mADX Measure	R	QRPH TF-3: 8.2-8.3, 8A, 8E
Content Creator	mADX Message	R	QRPH TF-3: 8G
Content Consumer	mADX Message	R	QRPH TF-3: 8G
Care Services Update Supplier	mCSD/ Request for Care Services Updates	O	ITI mCSD: Sec 46.1
Care Services Update Consumer	mCSD/ Request for Care Services Updates	O	ITI mCSD: Sec 46.1
Terminology Consumer	SVCM/Query Value Set	O	ITI SVCM: 51.1
Terminology Consumer	SVCM/Query Code System	O	ITI SVCM: 51.1
Terminology Consumer	SVCM/Expand Value Set	O	ITI SVCM: 51.1
Terminology Consumer	SVCM/Lookup Code	O	ITI SVCM: 51.1
Terminology Consumer	SVCM/Validate Code	O	ITI SVCM: 51.1
Terminology Consumer	SVCM/Query Concept Map	O	ITI SVCM: 51.1
Terminology Consumer	SVCM/Translate Code	O	ITI SVCM: 51.1

X.1.1 Actor Descriptions and Actor Profile Requirements

X.1.1.1 Content Data Structure Creator

340 The mADX Profile defines the process for a Content Data Structure Creator to develop an 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.

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

345 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.

350 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.

X.1.1.2 Content Data Structure Consumer

355 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.

- The Content Data Structure Consumer SHALL retrieve a Measure resource by executing a Retrieve Aggregate Report Definition [QRPH-59] as defined in this profile.
- 360 • 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

365 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 Message Option, shall be grouped with a Care Services Update Consumer and a Content Data Structure Consumer.

X.1.1.4 Content Consumer

370 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 Message Option, **SHALL** be grouped with a Care Services Update Consumer and a Content Data Structure Consumer.

X.1.1.5 Care Services Update Supplier

375 The Care Services Update Supplier is defined in the mCSD Profile in Section X.1. mADX leverages location services from Care Services Update Supplier.

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

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

X.2 mADX Actor Options

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	Validate mADX Message	X.2.1
Content Consumer	Validate mADX Message	X.2.1
Terminology Consumer	Validate mADX Message	X.2.1

X.2.1 Validate mADX Message Option

385 The Content Creator or Content Consumer Actors, **SHALL** be grouped with the Content Data Structure Consumer, the SVCN Terminology 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

390 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, the SVCN Terminology Consumer and the mCSD Care Services Updates Consumer as indicated in Section X.2.1.

X.4 mADX Overview

395 mADX defines a 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.

400 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 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
405 Creator and Content Consumer are both enacting the Validate mADX Message Option.

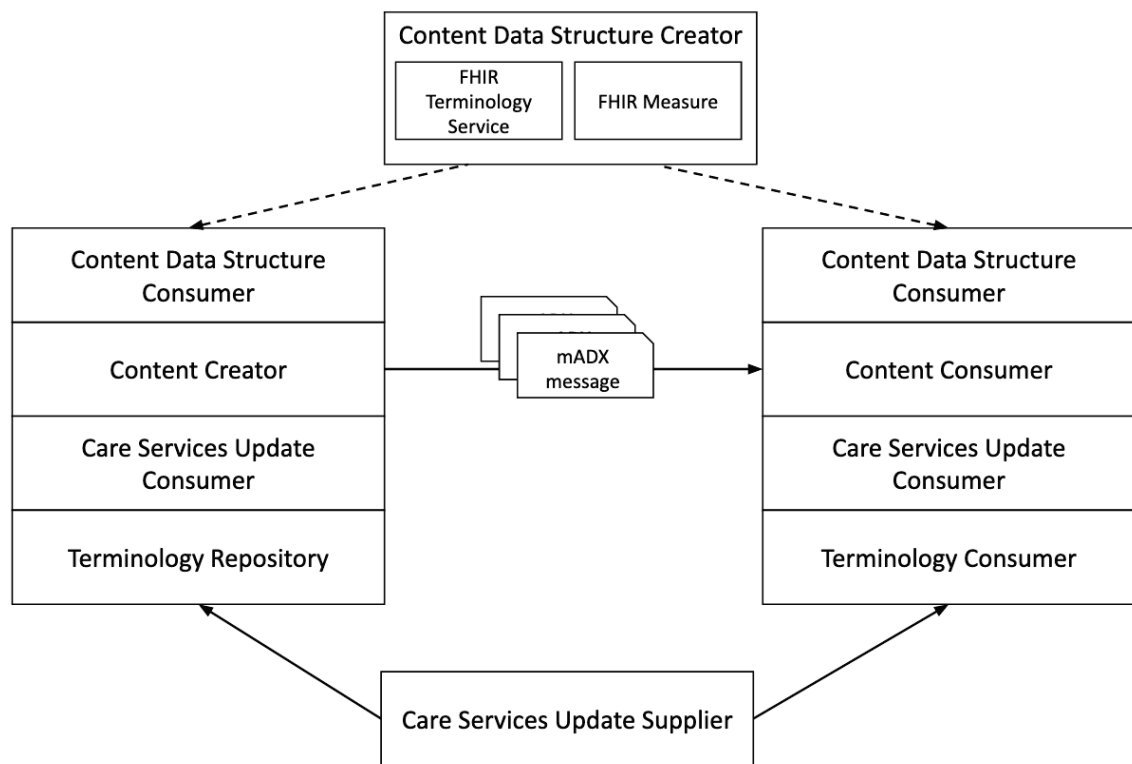


Figure X.4-1: An illustration of mADX Profile inputs and outputs

X.4.1 Concepts

410 The following concepts are used in this profile:

- Data value: Refer to Section X.4.1 of the ADX Profile.
- 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.
- 415 • Measure: The FHIR resource by which a formal definition of the structural metadata of an 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.
- MeasureReport: The FHIR resource that contains and/or represents the results of the calculation of a Measure.
- 420 • Organization Unit: Refer to Section X.4.1 of the ADX Profile. Note that Organization Unit may encompass the mCSD Location.
- 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.

- 425
 - Value: Refer to Section X.4.1 of the ADX Profile.

X.4.2 Use Cases

The use cases that mADX is solving for are the same as those defined in Section X.4.2. of the ADX Profile.

X.5 mADX Security Considerations

- 430 The mADX Profile does not support the exchange of person-centric health 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
- 435 safeguarded according to jurisdictional guidelines.

Person-centric Health Information (PHI) should be de-identified according to jurisdictional guidelines, however recommendations can be found in the IT Infrastructure Handbook De-Identification.

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.6.2 The Mobile Care Services Discovery (mCSD)

- 445 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 Care Services Updates transaction initiated by a Care Services Update Consumer against a Care
- 450 Services Update Supplier. See [ITI TF-2: Appendix Z.8](#) for common mobile security considerations.

- Under the Section X.2.1 Validate mADX Message Option, a Content Creator or a Content Consumer shall be grouped 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
- 455 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 the use case in Section

X.4.2.2 of ADX in which a district health manager running an aggregate report on staffing levels by location and health care practitioner role.

460 **X.6.3 Sharing Valuesets, Codes and Maps (SVCN)**

The Sharing Valuesets, Codes and Maps (SVCN) Profile defines an interface for the exchange of nomenclature and terminology mappings between code systems in a centrally managed setting. These terminology sets are most effective, and intended, to be used across geographies and disciplines in a standardized fashion to maximize interoperability.

465 Like with mCSD, under the X.2.1 Validate mADX Option, a Content Creator or Content Consumer shall be grouped with an SVCN Terminology Consumer to support any transactions defined in SVCN for the querying, expansion, lookup, or validation of valuesets and terminologies.

470 The terminology mappings can be used in conjunction with the retrieval of the DSD defined by the Retrieve Aggregate Report Definition [QRPH-59] to validate the messages being sent or received in the Send Aggregate Report [QRPH-58] transaction.

Appendices to Volume 1

None

Volume 2 – Transactions

475 *Add Section 3.58*

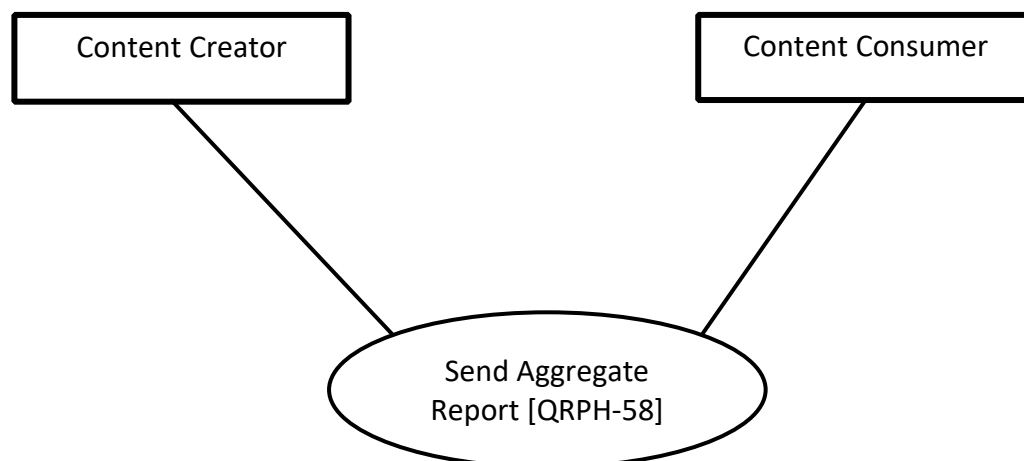
3.58 Send Aggregate Report [QRPH-58]

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.

480 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



485 **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 an 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.

490 3.58.3 Referenced Standards

- HL7 FHIR HTTP

3.58.4 Messages

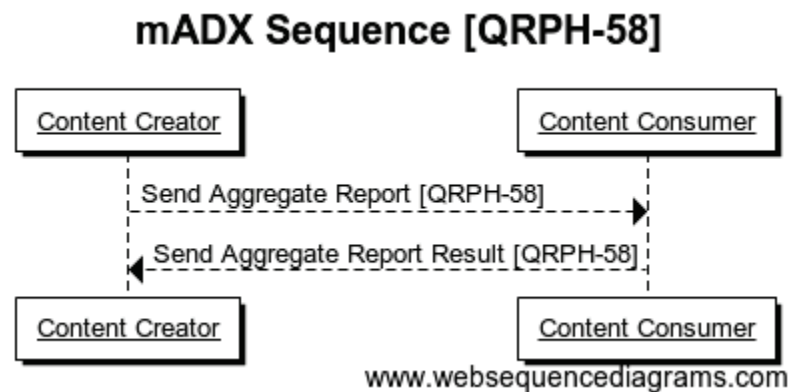


Figure 3.58.4-1: Send Aggregate Report Diagram

495 3.58.4.1 Send Aggregate Report

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>.

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.

3.58.4.1.2 Message Semantics

510 The Content Creator creates an 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.

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 an mADX Send Aggregate Report request SHALL contain a valid mADX data payload as described in Section 8.2 of this profile

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

A required location reference
period

The start and end of the reporting period
group.coding.code

520 A required reference for a valid indicator
stratifier.stratum.value

A required value for each reported aggregate report
stratifier.stratum.component

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

3.58.4.1.3 Expected Actions

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

3.58.4.1.4 Send Indicator Report Bundle Message

530 A Content Creator may submit multiple Measures using a Collection Bundle in FHIR in a single transaction. This option can be valuable in use cases where the system may not have constant connection. (See <https://www.hl7.org/fhir/bundle.html>.)

3.58.4.2 Send Aggregate Report Result

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

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.

540 3.58.4.2.1 Trigger Events

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.

3.58.4.2.2 Message Semantics

550 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 which have a specific meaning related to the transaction.

555 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>).

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

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

3.58.4.2.3 Expected Actions

560 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*.

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:

- 565 • The Submit Indicator Report Request message does not adhere to the message semantics as defined in Section 3.58.4.2.2 Message Semantics.

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**:

- 570 • 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.

3.58.5 Protocol Requirements

See [ITI TF-2: Appendix Z](#)

575 **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 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.

585 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.

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

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

<i>Add Section 3.59</i>

3.59 Retrieve Aggregate Report Definition [QRPH-59]

595 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.

3.59.1 Scope

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

3.59.2 Actor Roles

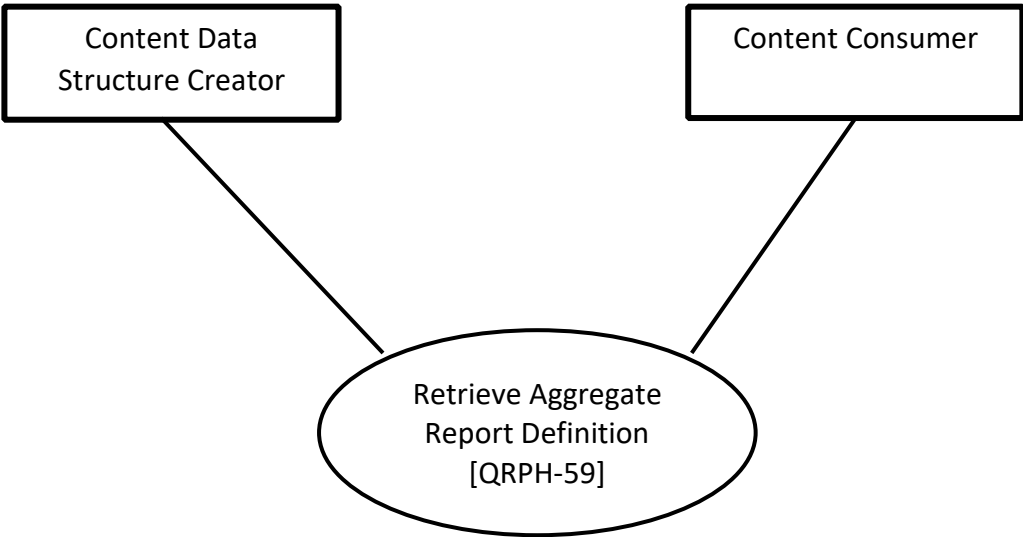


Figure 3.59.2-1: Use Case Diagram

605 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.

3.59.3 Referenced Standards

- 610
- HL7 FHIR HTTP

3.59.4 Messages

Retrieve Aggregate Report Definition [QRPH-59]

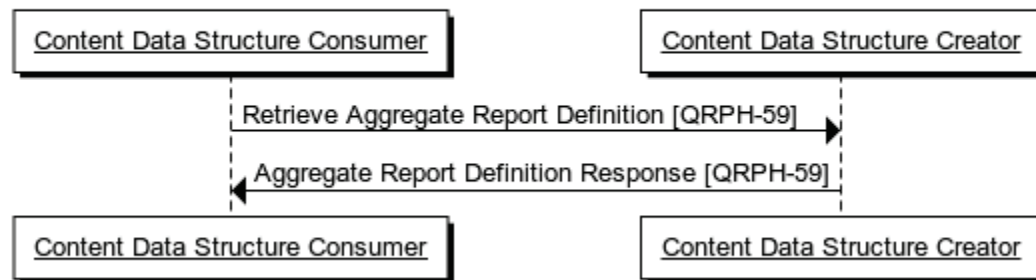


Figure 3.59.4-1: Interaction Diagram

3.59.4.1 Retrieve Indicator Definition

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

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

620 <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

625 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 an 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

- 630 This transaction responds to the Content Consumer requesting an 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:

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

An example Measure is provided in Appendix 8B.

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.

640 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.

HTTP status code	Interpretation
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.

645

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

title

A human friendly name for this Measure.

Version

650 The business version of this Measure.

url

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

publisher

The organization responsible for publishing and maintaining the Measure.

655 description

A narrative description of the scope of the Measure.

subject.subjectCodableConcept.coding[].code

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.

660

group[]

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.

665 group[].description

A narrative description of an indicator.

group[].code.coding[]

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

group[].stratifier[]

670 Contains the disaggregating value sets needed required for an indicator.

group[].stratifier[].component[]

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

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

675 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[]`

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

680 `relatedArtifact[].label`

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

`relatedArtifact[].url`

685 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”.

3.59.5.2.3 Expected Actions

690 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

Volume 2 Namespace Additions

695

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

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

Volume 2 additions to the QRPH OID Registry are:

700 None

Volume 3 – Content Modules

NA

705 5 IHE Namespaces, Concept Domains and Vocabularies

Add to Section 5 IHE Namespaces, Concept Domains and Vocabularies

5.1 IHE Namespaces

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

710 Additions to the QRPH OID Registry are:

codeSystem	codeSystemName	Description
NA	NA	NA

5.2 IHE Concept Domains

NA

715 5.3 IHE Format Codes and Vocabularies

5.3.1 IHE Format Codes

720 *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

5.3.2 IHEActCode Vocabulary

725

*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.*

730

Code	Description
NA	NA

5.3.3 IHERoleCode Vocabulary

735

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 Content Modules

740 NA

7 DICOM Content Definitions

NA

8 mADX Content Modules

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

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.

- 750
- An 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.

755 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 8C.

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

760 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 an mADX Measure are fixed by the profile and which parts may be extended to support implementation-specific requirements.

765 8.3 mADX Message Exchange Constraints

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:

- 770
- 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.

- 775
- 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).

780 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 – Sample Messages for the mADX Profile

785

A.1 (Informative) Sample mADX Measure

An electronic copy of the file is available at <https://www.hl7.org/fhir/measure-hiv-indicators.html>.

```
790  {
    "resourceType": "Measure",
    "id": "madx-hiv-indicators-example",
    "title": "HIV",
    "version": "0.0.0",
795  "publisher" : "ohie.org",
    "description" : "EXAMPLE indicators supporting OpenHIE implementations of
the IHE ADX-HIV content profile",
    "subject" : {
        "coding" : [
800          {
            "system" : "http://hl7.org/fhir/ValueSet/subject-type",
            "code" : "Patient"
          }
        ]
805    },
    "group" : [
        {
            "code" : "QRPH_ADX_ART1_N",
            "description" : "Number of adults and children newly enrolled on
810 antiretroviral therapy (ART)",
            "stratifier" : [
                {
                    "component" : [
                        {
815                          "code" : {
                            "coding" : [
                                {
```



```

                                "system" : "http://ihe.net/qrph/madx-example-
components",
820                                "code" "AGE_GROUP"
                                }
                                ]
                                }
                                },
825                                {
                                "code" : {
                                "coding" : [
                                {
830                                "system" : "http://ihe.net/qrph/adx-example-
components",
                                "code" "SEX"
                                }
                                ]
                                }
835                                }
                                ]
                                }
                                ]
                                }
840                                ],
                                "relatedArtifact" : [
                                {
                                "label" : "AGE_GROUP",
                                "url" : "http://ihe.net/qrph/adx-hiv-example-age-groups",
845                                "type" : "depends-on"

                                },
                                {
                                "label" : "SEX",
850                                "url" : "http://ihe.net/qrph/adx-hiv-example-sex",
                                "type" : "depends-on"
```

```
      },
    ],
855    "url": "http://ohie.org/Measure/madx-hiv-indicators-example",
    "identifier": [
      {
        "system": "http://ohie.org/Measure/",
        "value": "madx-hiv-indicators-example"
860      }
    ],
    "status": "draft",
    "experimental": true,
    "date": "2019-08-02",
865  }
```

A.2 (Informative) Sample mADX Message

An electronic copy of the file is available at <https://www.hl7.org/fhir/measurereport-hiv-indicators.html>.

```
870  {
    "resourceType": "MeasureReport",
    "measure": "http://ohie.org/Measure/madx-hiv-indicators-example",
    "id" : "12345-example",
875    "period": {
      "start": "2018-01-01",
      "end": "2018-01-31"
    },
    "group": [
880      {
        "code": {
          "coding": [
            {
885              "code": "QRPH_ADX_ART1_N"
            }
          ]
        }
      }
    ]
  }
```

```
    ]
  },
  "stratifier": [
    {
890      "stratum": [
        {
          "measureScore": {
            "value": 5
          },
895      "component": [
        {
          "code": {
            "coding": [
900              {
                "code": "AGE_GROUP"
              }
            ]
          },
          "value": {
905      "coding": [
        {
          "system" : "http://ihe.net/qrph/adx-hiv-
example-age-group",
          "code": "P0Y--P1Y"
910      }
        ]
      }
    },
    {
915      "code": {
        "coding": [
          {
            "code": "SEX"
          }
        ]
      }
    }
  ]
}
```

```
920         ]
        },
        "value": {
          "coding": [
925             {
              "system" : "http://ihe.net/qrph/adx-hiv-
example-sex",
              "code": "F"
            }
          ]
930       }
    }
  }
935 }
]
}
940 }
```

Volume 4 – National Extensions

Not applicable