

Integrating the Healthcare Enterprise



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

10 **Aggregate Data Exchange
(ADX)**

15 **Draft for Public Comment**

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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 V0.1. 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 May 29, 2015 for public comment. Comments are invited and may be submitted at [http://www.ihe.net/QRPH Public Comments](http://www.ihe.net/QRPH_Public_Comments). In order to be considered in development of the trial implementation version of the supplement, comments must be received
35 by June 28, 2015.

“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.

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

45 Information about the IHE QRPH domain can be found at: [http://www.ihe.net/IHE Domains](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](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](http://www.ihe.net/Technical_Frameworks).

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Introduction to this Supplement

120 Aggregate Data Exchange (ADX) is an IHE content profile for *aggregate data exchange* between two actors:

Content creator

Content consumer

125 The ADX Profile has been developed as a mechanism to automate public health reporting of aggregate health data which is going on in most countries in the world and is, for many, the most important health information exchange.

The need for this profile arises from the fact that data is currently being exchanged using a variety of formats that are not formally described. The aim of ADX is to describe a lightweight formal profile that meets the requirements of the use cases in context.

130 This specification profiles an SDMX Data Structure Definition (DSD) to normatively describe the structure of routine aggregate data reports as xml. This is a content-only profile; specification of the message transmission is out of scope. Because of this, actor groupings are not defined.

Open Issues and Questions

There is some overlap in the aims with QRDA. We need to justify and explain.

135 Closed Issues

Maybe we have to create new actors if Content Creator/Content Consumer do not fit.

Placing dimensions at the dataset or data row level requires further discussion.

CSV format may be considered too low a bar for profiling. It should not be at the same conformance level as the other two.

140 SDMX v2.1 describes and xml and csv rendition of the data. It doesn't currently describe a json rendition. There is considerable pressure from implementers to support json. Should we incorporate a mapping in an informative appendix?

SDMX 2.0 vs. 2.1: version 2.0 is the most widely adopted version of SDMX, but it is 2.1 which is published by ISO. V2.0 is published by the SDMX consortium.

145

General Introduction

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

Appendix A – Actor Summary Definitions

150 *Add the following actors to the IHE Technical Frameworks General Introduction list of Actors:*

Actor	Definition
Content Creator	The content creator is responsible for creation of aggregate data based on a criteria requested by the content consumer.
Content Consumer	Content consumer is required to consume the content created by a Content Creator.

Appendix B – Transaction Summary Definitions

Add the following transactions to the IHE Technical Frameworks General Introduction list of Transactions:

155 No new transactions.

Glossary

Add the following glossary terms to the IHE Technical Frameworks General Introduction Glossary:

No new glossary terms.

160

Volume 1 –Profiles

Copyright Licenses

NA

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

165

Domain-specific additions

NA

Add Section X

170

X Aggregate Data Exchange (ADX) Profile

ADX is a content module profile which allows for the representation of reported public health data. It will most 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.

175 It addresses the problem of routine reporting in environments that may not have well developed
 surrounding IT infrastructure. Whereas producers and consumers are strictly constrained by the
 normative text in this document, there are few constraints regarding the nature and source of
 coding systems and there are liberal extension points intended to allow ADX content to be
 180 embedded within different envelopes and its message attributes extended in locally-meaningful
 ways.

The central concern is the reporting of data tuples; sets of values which are keyed according to a
 dataelement subject, a temporal and a spatial dimension. For example, the number of live births
 recorded in January 2015 at Nyamandhlovu Clinic.

X.1 ADX Actors, Transactions, and Content Modules

185 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 ADX Profile and the direction that the
 content is exchanged.

190



195

Figure X.1-1: ADX Actor Diagram

Table X.1-1 lists the content module(s) defined in the ADX 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”).

200

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

Actors	Content Modules	Optionality	Reference
Content Creator	ADX/XML	R	QRPH TF-3: 8.1
Content Consumer	ADX/XML	R	QRPH TF-3: 8.1

X.1.1 Actor Descriptions and Actor Profile Requirements

There are no additional requirements on profile's actors.

205 X.2 ADX Actor Options

Table X.2-1: ADX - Actors and Options

Actor	Option Name	Reference
Content Creator	No options defined	--
Content Consumer	No options defined	--

X.3 ADX Required Actor Groupings

210 There are no Required Actor Groupings defined.

X.4 ADX Overview

ADX defines a simple profile for the representation of a routine aggregate health data report.

The structure of the data is defined using an SDMX v2.1 Data Structure Definition (DSD).

215 SDMX v2.1 is defined in ISO 17639:2013(E). The schema for the data report is generated from the DSD.

The SDMX standard includes specifications regarding DSDs and regarding the SDMX messages that may be created from these DSDs. IHE's ADX specification profiles how an SDMX DSD is to be employed to develop an ADX-conformant message schema. This profile sets constraints on mandatory dimensions which shall be in a DSD used to define an ADX message. Additional data
220 element dimensions may be defined as necessary within the context of use - for example, within a particular country or jurisdiction. Similarly, whereas the profile has an expectation that codelists and other structural metadata will be exchanged between creators and consumers of content, the content of that structural metadata will be context specific and will be defined by the jurisdictional bodies governing the data exchange. These inputs to the ADX message schema
225 definition are conceptually illustrated by Figure X.4-1.

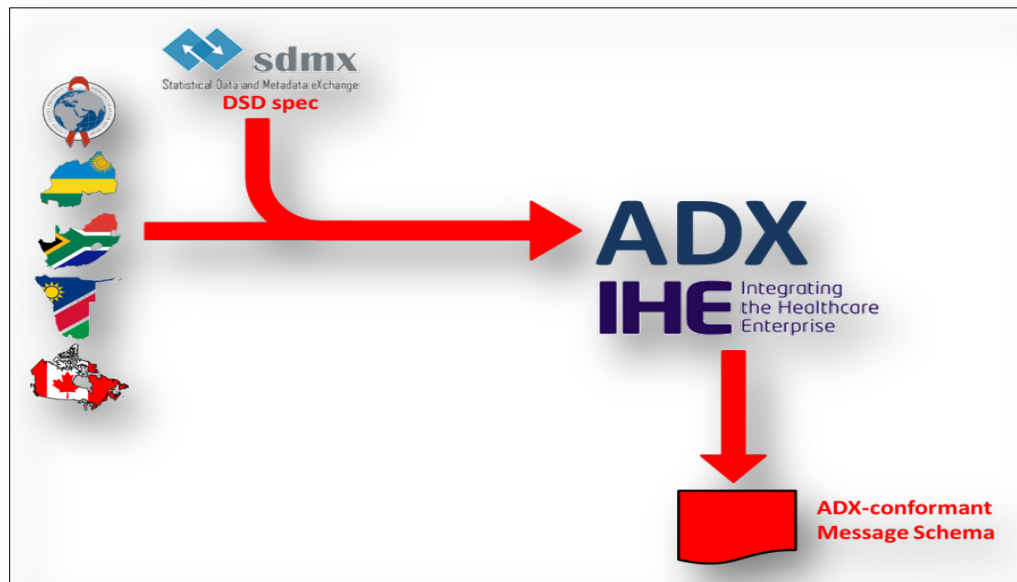


Figure X.4-1: An illustration of ADX Profile inputs and outputs

230 The shape of aggregate data reports can be different, as illustrated in the use cases below. In
some cases the data is “rectangular” (all data rows share the same dimensionality). In other
cases, where the electronic data must model a complex paper form, some dataelements are
disaggregated differently to others, leading to a “ragged-right” shape. Rectangular datasets are
shaped “long and skinny”; for each combination of organization unit (typically a “facility”) and
time period, there will be a list of data element and value pairs. Ragged-right messages, on the
235 other hand, may have tuples of differing lengths depending on whether disaggregation attributes
have been specified for the data element (e.g., number of malaria cases, disaggregated by gender
and by age range). These two characteristic message shapes are illustrated in Figure X.4-2.

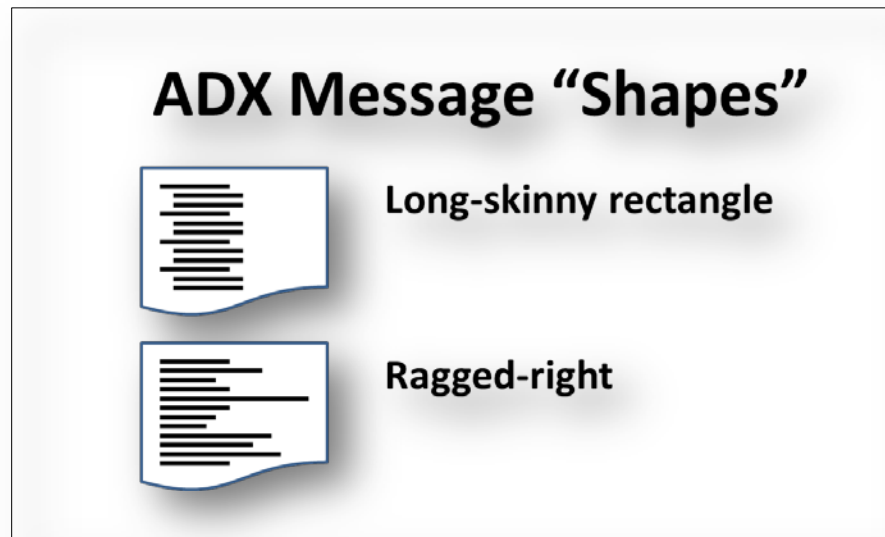


Figure X.4-2: ADX Message Shapes

240

In summary:

- The ADX Profile defines an SDMX-conformant DSD which describes the base constraints for a valid ADX data message as well as a non-exhaustive list of often-used concepts (e.g., age range, gender, etc.).
- Individual jurisdictions will extend the DSD by specifying relevant codelists and additional dimensions of data to satisfy their message exchange use cases.
- ADX defines the transformation of the resulting DSD to an XML message schema.
- A non-normative appendix describes how an ADX XML schema may be mapped to a CSV message format.

245

250 **X.4.1 Concepts**

The following concepts are used in this profile:

Data Structure Definition (DSD): a formal SDMX v2.1 definition of the structural metadata of an ADX message.

Data value: a reported value with its associated keys

255 **Data Value Set:** a collection of data values conforming to the ADX DSD.

Data element: the atomic subject of data collection such as “number of bed nets distributed”, “number of confirmed malaria cases”, or “number of midwives”. This concept is required for the construction of public health indicators, but is not in itself an indicator.

260 **Organization Unit:** the spatial dimension of the data value tuple. It can identify a single health facility or a geographic/administrative area such as district, province or country. Within a national reporting structure, an organization unit represents a single node in a reporting hierarchy.

265 **Time:** the temporal dimension of the data value tuple. For routine data this would represent a time period such as the month of January 2015, the ISO8601 week number 3 of 2015, or the year 2015.

Value: the recorded value which is keyed in the data value tuple.

X.4.2 Use Cases

X.4.2.1 Use Case #1: Community health workers filing routine reports

X.4.2.1.1 Community health workers filing routine reports: Use Case Description

270 An Auxiliary Nurse Midwife (ANM) in an Indian state uses a simple SMS message to report some 40 simple aggregate data elements. These are reported monthly and some of the more critical ones also daily. For example

- Number of ANY new cases registered
- Number of children given full immunization

275 These are all related to mother and child health services provided by the sub center and either in her clinic or outreach. She would take these numbers from her register. The data elements are all simple without further disaggregation.

280 The SMS message is sent to a gateway system, which (today) pushes the aggregate data report into the state level HMIS system using a proprietary format. In the future state, the gateway system can act as an ADX Content Creator to produce these reports in a format that can be readily consumed by an ADX Content Consumer.

For ADX messages sent from the gateway that relate to a particular ANM for a particular time period, this message exchange would be a potential example of the “long skinny” rectangular shape.

X.4.2.2 Use Case #2: Reporting health worker data

X.4.2.2.1 Reporting health worker data Use Case Description

In Sierra Leone the two systems central to the management of the health system are the national HMIS (Health Management Information System) and the human resource system, or health worker registry (HWR). A routine human resource report is reported by the health facility on a

290 six monthly basis. The reports consist of counts of health worker cadre’s working at the facility (number of doctors, nurses, community health workers etc.). There is an additional disaggregation on all report rows which indicates the salaried status of the employee.

295 This data could instead be extracted directly from the health worker registry and represented as an ADX summary report to be consumed by the national HMIS. The benefits of doing this can be either to reduce the reporting burden at the facility by replacing the manual data entry or to supplement it by acting as a control to detect staffing anomalies. The report extracted from the health worker registry would contain data for a single time period but for multiple health facilities.

300 In this use case the health worker registry acts as an ADX Content Creator and the national HMIS is a Content Consumer.

X.4.2.3 Use Case #3: Routine reporting from EMR

This use of ADX enables generation and reporting of aggregate data from EMRs and transmitted to HMIS without the need for double data entry by facility staff in both systems.

X.4.2.3.1 Routine reporting from EMR: Use Case Description

305 In the majority of countries, routine health facility reports are compiled manually at the facility from paper registers and tally sheets. To deal with the challenge of continuity of care, the ART treatment center of a health facility has acquired an EHR system to manage patients. The routine ART reports demanded of the facility are complex, so there are considerable benefits in terms of reducing reporting burden as well as increasing accuracy to extracting the ANC reports from the
310 EHR.

Current state

In the current state, aggregate data from a facility EMR is generated as a printed report and sent to a district office. Here, this aggregate data is hand-entered into the district health information system (DHIS), which feeds the national health management information system (HMIS). This
315 workflow is illustrated by Figure X.4.2.3.1-1.

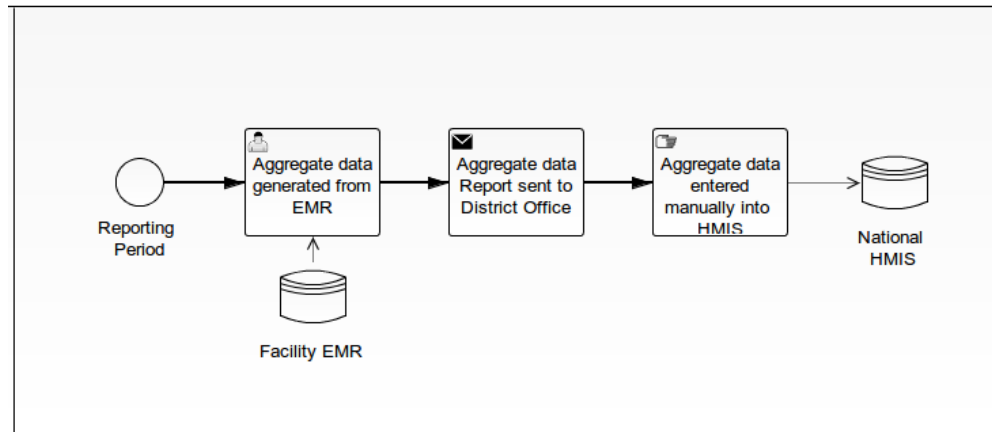


Figure X.4.2.3.1-1: Current state of EMR to HMIS data exchange

320 **Desired state**

The desired state is illustrated by Figure X.4.2.3.1-2. In the desired state, data from the facility EMR is used to generate an ADX-conformant message. The ADX-conformant message is sent by the facility EMR (acting as a Content Creator) to the DHIS (acting as a Content Consumer). Such a message exchange improves the timeliness and efficiency of the HMIS data reporting

325 workflow.

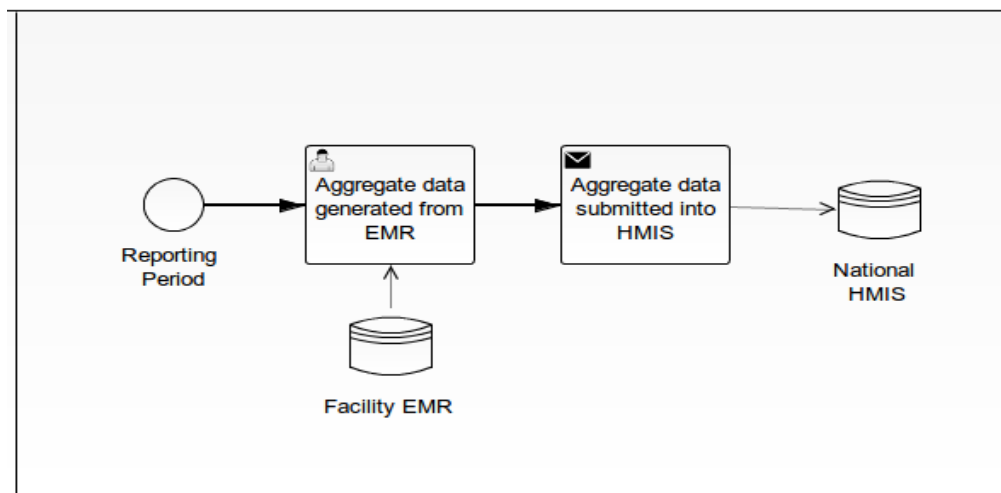


Figure X.4.2.3.1-2: Desired state of EMR to HMIS data exchange

330 The facility monthly reports are modeled off the paper reporting form and consist of a set of dataelements which form a logical set but are disaggregated differently. For example, the number of ART stage 1 new enrollments is disaggregated by three age groups and by gender, whereas

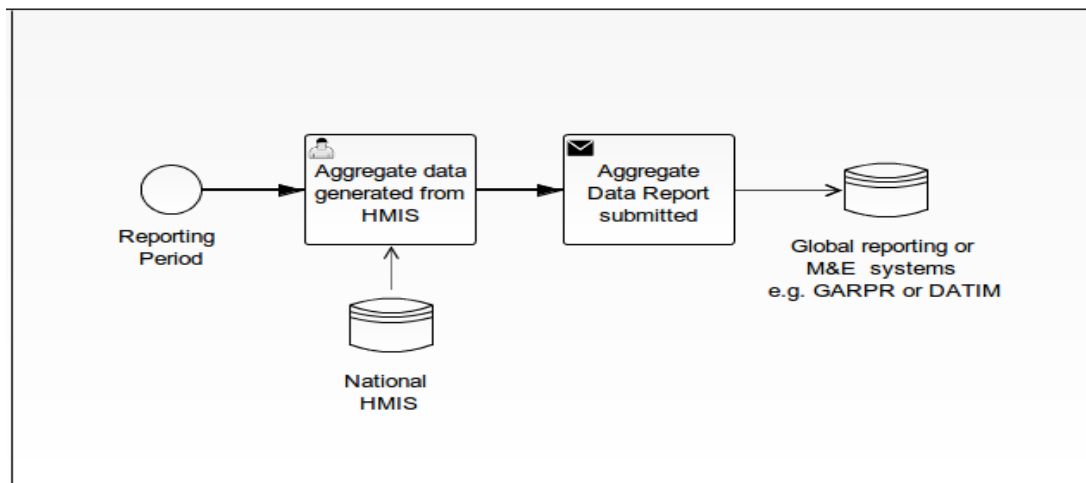
335 the number of patients on particular first line regimens are collected as simple counts without further disaggregation. The ART monthly summary report from the facility will then consist of data that is not neatly rectangular in terms of dimensions, but will instead be an example of the “ragged-right” ADX message shape.

X.4.2.4 Use Case #4: Reporting data from HMIS to Other Aggregate Data Repositories

340 This use case describes ADX enabling the reporting of aggregate data from a national HMIS and consumed by other aggregate data repositories used for global reporting.

X.4.2.4.1 Reporting national data from HMIS: Use Case Description

345 To facilitate Indicator reporting, country offices may generate aggregate data from national HMIS for submission to funding agencies. In this case the national HMIS is the ADX Content Creator. This data can be consumed by other aggregate data repositories, such as UNAIDS Global AIDS Response Progress Reporting (GARPR) online tool and PEPFAR information system, Data for Accountability, Transparency and Impact (DATIM), for monitoring health goals. As in the previous use case, the reported data will have a ragged disaggregation dimensionality.



350

Figure X.4.2.4.1-1: Global reporting to M&E Systems (e.g., DATIM)

X.5 ADX Security Considerations

355 The ADX Profile does not support the exchange of person-centric health information. Therefore, this profile does not specify security mechanisms, such as ATNA, 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.

X.6 ADX Cross Profile Considerations

360 There are no Cross Profile considerations.

Appendices

None

Volume 2 – Transactions

365 Not applicable

Appendices

370 None

Volume 2 Namespace Additions

Add the following terms to the IHE General Introduction Appendix G:

NA

375

Volume 3 – Content Modules

380 5 Namespaces and Vocabularies

The following are namespaces referred to in this profile together with the prefix which is used to refer to that namespace within this document.

Namespace	Prefix	Description
http://www.sdmx.org/resources/sdmxml/schemas/v2_1/message	mes	SDMX 2.1 message
http://www.sdmx.org/resources/sdmxml/schemas/v2_1/structure	str	SDMX 2.1 structure definitions
http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common	com	SDMX 2.1 common elements
http://www.w3.org/2001/XMLSchema	xs	W3C Schema
urn:ihe:qrph:adx:2015		ADX data payload

6 Content Modules

385 CDA® Content Modules – Not applicable

7 Content Modules

DICOM Content Modules –Not applicable

390 8 Content Modules

8.1 Overview of ADX process

An ADX Content Creator creates an ADX compliant data payload. An ADX Content Consumer consumes the ADX data payload generated by the Content Creator.

395 An ADX compliant data payload shall conform to an ADX compliant W3C XML schema. A sample ADX compliant data payload is provided in the informative Appendix 8G.

An ADX compliant schema is one that can be derived from an ADX compliant Data Structure Definition (DSD), as described in section 8.3. The generation of an ADX schema from an ADX DSD makes use of a normative XSLT stylesheet provided in Appendix 8B. A sample ADX compliant schema is provided in the informative Appendix 8F.

400 An ADX compliant DSD is a profile of the SDMX 2.1 DSD, as described in section 8.2 and formally expressed as a Schematron rule set in Appendix 8A.

Pre-conditions for interoperability of ADX data which are outside of the scope of this profile are described in section 8.4.

8.2 The Data Structure Definition (DSD)

405 An ADX compliant DSD shall be all of:

a well-formed XML 1.0 document;

a valid SDMX 2.1 `mes:Structure` message;

compliant with the additional constraints defined below.

410 The purpose of profiling the base DSD is to provide guidance regarding which parts of an ADX DSD are fixed by the profile and which parts may be extended for implementation-specific requirements.

8.2.1 ADX DSD constraints

415 A Schematron (ISO/IEC 19757-3:2006) schema is provided in appendix 8A which provides a formal means of validating ADX DSD documents. This section 8.2.1 provides an informative description of the constraints within the Schematron schema. In the event of disagreement or ambiguity between the text and the schema, the Schematron shall be considered normative.

8.2.1.1 Top level structure

The root element of an ADX DSD document shall be a `mes:Structure` element.

The root element shall have a single `mes:Structures` child element.

420 The `mes:Structures` element shall have the following three child elements:

Element	Description
str:Codelists	Defines sets of data values that are allowed when a data dimension or attribute is constrained to an element within a set.
str:Concepts	Used to produce the dimension attribute names in an ADX data message.
str:DataStructures	Specifies the dimensions and attributes of the data including their syntax, tying them to Codelists and Concepts.

Note: ADX does not preclude the DSD producer from including other SDMX elements in the structure message. Elements that are not prescribed in this specification may be ignored by the XSLT transform when generating an ADX schema.

425 Central to the governance of SDMX structure definitions is the notion of Agency. Each structure
 element (e.g., Codelist, ConceptScheme, DataStructure) has a maintenance agency identifier
 associated with it. ADX defines one agency identifier, 'IHE_QRPH', which is the maintenance
 agency for the mandatory concept scheme listed in Appendix 8D. An implementing jurisdiction
 430 which is defining an ASD shall make use of an agency identifier which indicates that it is the
 maintenance authority for those structures.

The illustrative sample DSD in appendix 8E assumes a hypothetical use case where the West
 African Health Organisation uses the identifier 'WAHO' to define a DSD.

8.2.1.2 Codelists

The str:Codelists element may have any number of str:Codelist child elements.

435 The ADX Profile does not specify the content of code lists. The code lists used for controlling
 vocabulary of dimensions should be provided within the DSD in SDMX v2.1 compatible format.
 The following example, Figure 8.2.1.2-1, shows a hypothetical code list for the West Africa
 Health Organisation to represent data elements:

```

440 <str:Codelists>
      <str:Codelist id="CL_DataElements" agencyID="WAHO" version="1.0">
        <com:Name xml:lang="en">West Africa Health Organisation Data elements</com:Name>
        <str:Code id="MAL01">
          <str:Name xml:lang="en">Confirmed Malaria cases</str:Name>
445 </str:Code>
        <str:Code id="MAL02">
          <str:Name xml:lang="en">Unconfirmed Malaria cases</str:Name>
          </str:Code>
        <str:Code id="MAL03">
450   <str:Name xml:lang="en">Malaria deaths</str:Name>
          </str:Code>
        </str:Codelist>
        ...
    </str:Codelists>
    
```

455 **Figure 8.2.1.2-1: DSD Codelist example**

The full example in Appendix 8C shows additional Codelists for orgUnits, Age Group and Sex representation.

8.2.1.3 Concepts

460 The `str:Concepts` element shall have one or more `str:ConceptScheme` child elements.

One of these `str:ConceptScheme` elements shall have an `@id` attribute of `ADX_MANDATORY_CONCEPTS` and `@AgencyID` attribute of `IHE_QRPH`.

465 The mandatory `str:ConceptScheme` is shown in Figure 8.2.1.3-1. An implementing jurisdiction is not the maintenance agency for this `str:ConceptScheme` and is therefore neither expected nor permitted to make any changes to its content.

```
470 <str:ConceptSchemeid="ADX_MANDATORY_CONCEPTS" agencyID="IHE_QRPH"version="1.0"
isFinal="true">
  <com:Name xml:lang="en">Mandatory concepts defined by IHE ADX profile</com:Name>
  <str:Concept id="dataElement" >
    <com:Name xml:lang="en">Subject of data measure</com:Name>
  </str:Concept>
  <str:Concept id="orgUnit" >
    <com:Name xml:lang="en">Spatial dimension of measure</com:Name>
  </str:Concept>
  <str:Concept id="period" >
    <com:Name xml:lang="en">The temporal dimension of the measure</com:Name>
  </str:Concept>
  <str:Concept id="value" >
    <com:Name xml:lang="en">Observed measure value</com:Name>
    <str:CoreRepresentation>
      <str:TextFormat textType="Decimal" />
    </str:CoreRepresentation>
  </str:Concept>
485 </str:ConceptScheme>
```

Figure 8.2.1.3-1: DSD mandatory ConceptScheme

490 Note that the value concept is the only concept which provides a core representation in the mandatory concept scheme. The enumerated code list representation for `orgUnit` and `dataElement` shall be provided as a `str:LocalRepresentation` of the `str:Dimension` as described below.

An implementing jurisdiction may provide this concept scheme inline in the DSD content, though it is recommended that it refers to it with an external reference such as in Figure 8.2.1.3-2:

495

```
<str:ConceptScheme id="ADX_MANDATORY_CONCEPTS" agencyID="IHE_QRPH" version="1.0"
  isExternalReference="true" structureURL="qrph_structures.xml">
  <com:Name xml:lang="en">Mandatory concepts defined by IHE ADX profile</com:Name>
</str:ConceptScheme>
```

500

Figure 8.2.1.3-2: External reference to ConceptScheme

Implementers of ADX may provide additional str:ConceptScheme elements to meet requirements of additional disaggregation. Figure 8.2.1.3-3 shows an example of one concept within an implementation-defined concept scheme:

505

```
<str:ConceptScheme id="ADX_WAHO_CONCEPTS" agencyID="WAHO" version="1.0">
  <com:Name xml:lang="en">Disaggregation concepts used in West Africa Health
    Organisation data warehouse</com:Name>
  <str:Concept id="AGE_GROUP" >
    <com:Name xml:lang="en">Age group</com:Name>
    <str:CoreRepresentation>
      <str:Enumeration>
        <Ref agencyID="WAHO" id="CL_AgeGroup" version="1.0"/>
      </str:Enumeration>
    </str:CoreRepresentation>
  </str:Concept>
  ...
</str:ConceptScheme>
```

510

515

520

Figure 8.2.1.3-3: DSD Implementation ConceptScheme example

Note that concept schemes other than the mandatory concept scheme may, and should where possible, provide a str:CoreRepresentation which refers to a str:Codelist within the DSD. Where this is not possible (for example if the DSD producer is not the maintenance Agency for the str:ConceptScheme) then the representation shall be provided as a str:LocalRepresentation of the str:Dimension as described below.

525

8.2.1.4 DataStructures

The str:DataStructures element defines the format of the data dimensions and ties them to concepts and codelists. SDMX v2.1 DSD allows the str:DataStructures element to have any number of child str:DataStructure elements, however the ADX Profile specifies that there will be exactly one.

530

535

540

```
<str:DataStructures>
  <str:DataStructure id="ADX" agencyID="WAHO" version="1.0">
    <com:Name xml:lang="en">ADX data structure</com:Name>
    <str:DataStructureComponents>
      <str:DimensionList> ... </str:DimensionList>
      <str:Group id="OUTER_DIMENSIONS"> ... </str:Group>
      <str:MeasureList> ... </str:MeasureList>
    </str:DataStructureComponents>
  </str:DataStructure>
</str:DataStructures>
```

545

Figure 8.2.1.4-1: DataStructure example

SDMX allows for the definition of `str:Attributes` in addition to `str:Dimensions`. The xslt transformation which creates a data payload schema ignores any such `str:Attribute` definitions.

550 8.2.1.4.1 Dimensions

The `str:DataStructure` element shall have exactly one `str:DimensionList` child element. The `str:DimensionList` element shall have all of the following child elements:

- a `str:Dimension` with a `str:ConceptIdentity/Ref` child which refers to the concept in the mandatory concept scheme with `@id='dataElement'`.
- a `str:Dimension` with a `str:ConceptIdentity/Ref` child which refers to the concept in the mandatory concept scheme with `@id='orgUnit'`.
- a `str:TimeDimension` with a `str:ConceptIdentity/Ref` child which refers to the concept in the mandatory concept scheme with `@id='period'`.

555

The `str:DimensionList` may contain additional `str:Dimension` elements which refer to concepts that are provided by one or more `str:ConceptSchemes` outside of the ADX mandatory `ConceptScheme`. These may be used by an implementing jurisdictions to provide additional optional disaggregation dimensions in addition to `dataElement`, `orgUnit` and `period`. The `dataElement` dimension in the sample is shown in the Figure 8.2.1.4.1-1 below:

560

```
<str:Dimension id="dataElement">
  <str:ConceptIdentity>
    <Ref id="dataElement" maintainableParentID="ADX_MANDATORY_CONCEPTS"
      maintainableParentVersion="1.0" agencyID="IHE_QRPH"/>
  </str:ConceptIdentity>
  <str:LocalRepresentation>
    <str:Enumeration>
      <Ref agencyID="WAHO" id="CL_DataElements" version="1.0"/>
    </str:Enumeration>
  </str:LocalRepresentation>
</str:Dimension>
```

565

570

575

Figure 8.2.1.4.1-1: The dataElement str:Dimension element

Note that, because the dataelement dimension is linked to a mandatory concept which has no `str:CoreRepresentation`, the DSD producer shall provide a `str:LocalRepresentation` which constrains the vocabulary to that provided by a `str:Codelist` in the DSD.

An additional disaggregation dimension is shown in Figure 8.2.1.4.1-2 below:

```
<str:Dimension>
  <str:ConceptIdentity>
    <Ref id="ageGroup" maintainableParentID="ADX_WAHO_CONCEPTS"
      maintainableParentVersion="1.0" agencyID="WAHO"/>
  </str:ConceptIdentity>
</str:Dimension>
```

Figure 8.2.1.4.1-2: An optional disaggregation `str:Dimension` element

Note that this `str:Dimension` refers to a `str:Concept` which has a `str:CoreRepresentation` so there is no requirement to provide a `str:LocalRepresentation`.

It is not a requirement that a dimension must have an `@id` attribute unless

- i. it is one of the mandatory dimensions, in which case it should have an `@id` attribute of 'dataelement', 'orgUnit' or 'TIME_PERIOD' respectively;
- ii. the dimension is intended to be attached to the outer group as described below.

8.2.1.4.2 The TimeDimension

The `str:TimeDimension` shall have a `str:LocalRepresentation` child element which encloses a `str:TextFormat` element. The `str:TextFormat` shall have a `@textType` attribute with a value of either 'DateTime' or 'TimeRange', depending on whether the DSD is to be used for event based or routinely reported data. The choice of value for this attribute determines the xml data type for the `period` attribute which will be used in an ADX data payload.

TextType	Data type of period
dateTime	xs:dateTime
TimeRange	com:TimeRange

The SDMX `com:TimeRange` is defined in the SDMX common namespace and is modeled after (xs:dateTime OR xs:date)/xs:duration. An informative description of the use of this data type is provided in Appendix 8.F.

610 **8.2.1.4.3 Dimension grouping**

SDMX 2.1 allows dimensions to be grouped so that each dimension does not have to be repeated for each measure value in the payload. ADX mandates that the orgUnit and period dimensions shall be attached at the group level and that the dataElement dimension shall be attached at the data value level. Optional disaggregation dimensions can be attached at either the group or
615 datavalue level. The informative sample adx data payload in Appendix 8E illustrates the implication of this grouping.

- Astr:Group child element with an ID of TIME_PERIOD that refers as shown in the example below to the Concept elements with ID period.
- Under str:TimeDimension will be a str:localRepresentation element, and
620 under this will be a str:TextFormat element with attribute textType having the value "ObservationalTimePeriod". SDMX v2.1 DSD allows many different ObservationalTimePeriod formats in data messages, but the ADX Profile further constrains these to the time periods discussed in the next section of this document.
- The str:DataStructure element shall have exactly one str:Group child element
625 with ID OUTER_DIMENSIONS, as shown in the following example (this specifies which data attributes must be present in a group element within a data payload conforming to this DSD).

Figure 8.2.1.4.3-1 below shows an example of the str:Group element showing the mandatory orgUnit and period dimensions as well as an additional disaggregation dimension with
630 @id='mechanism'.

```
<str:Group id="OUTER_DIMENSIONS">  
  <str:GroupDimension>  
    <str:DimensionReference>  
      <Ref id="orgUnit"/>  
    </str:DimensionReference>  
  </str:GroupDimension>  
  <str:GroupDimension>  
    <str:DimensionReference>  
      <Ref id="TIME_PERIOD"/>  
    </str:DimensionReference>  
  </str:GroupDimension>  
  <str:GroupDimension>  
    <str:DimensionReference>  
      <Ref id="mechanism"/>  
    </str:DimensionReference>  
  </str:GroupDimension>  
</str:Group>
```

Figure 8.2.1.4.3-1: Example of str:Group element

8.2.1.4.4 The measure dimension

ADX requires that there be a primary measure which is linked to the mandatory value concept as shown in Figure 8.2.1.4.4-1 below.

```
655 <str:MeasureList>
      <str:PrimaryMeasure>
        <str:ConceptIdentity>
          <Ref id="value" maintainableParentID="ADX_MANDATORY_CONCEPTS"
660         maintainableParentVersion="1.0" agencyID="IHE" />
        </str:ConceptIdentity>
      </str:PrimaryMeasure>
    </str:MeasureList>
```

Figure 8.2.1.4.4-1: Example of str:Group element

665 The Representation for the value concept is provided as a CoreRepresentation in the ConceptScheme. Implementers may not override this with a LocalRepresentation.

8.3 Generating the schema for an ADX data payload

670 ADX data within a particular jurisdiction shall be constrained by a schema that is generated from the ADX DSD. That schema shall be generated by applying the xslt transformation given in Appendix 8B to the ADX compliant DSD file.

This transformation assumes that all structure elements appear inline in the DSD XML document. Where external references are used, the DSD may be pre-processed, for example using the transformation provided in appendix 8C.

8.4 ADX Preconditions

675 There are implicit assumptions regarding the sharing of additional metadata between communicating producers and consumers of ADX data which are not covered within the scope of this profile. It is assumed that interoperability errors and anomalies would be dealt with at a higher semantic level. In order to ensure semantic validity of the data, any constraints of the following types shall be specified:

- 680
- The dataelements which should be reported for particular orgUnits. For example, reporting ‘Number of lab Tests performed’ from a health facility which did not perform laboratory tests is not constrained by ADX.
 - The disaggregation dimensions which are expected for particular dataElements.
 - The Value type (real or integer) expected for individual dataElements.
- 685
- Which period types are appropriate for which dataElements.

- Any other business rules that may affect interoperability including, but not necessarily limited to, bounds on data values, bounds on date ranges, relationships between different dataElements (e.g., the sum of these dataElements cannot be greater than the sum of those dataElements, etc.)

690

Appendices to Section 8

Appendix 8A – (Normative) Schematron constraining ADX DSD

Current working copy available at https://github.com/dhis2/adx/blob/master/IHE/schema/dsd_validation.sch

```
695 <?xml version="1.0" encoding="UTF-8"?>
<schema xmlns="http://purl.oclc.org/dsdl/schematron"
  queryBinding="xslt"
  xmlns:h="http://www.w3.org/1999/xhtml">
700   <title>Validation of ADX Data Structure Definition</title>
   <p>An ADX profiled Data Structure Definition (DSD) is
     (i) a well formed XML document and
705     (ii) a valid SDMX 2.1 Structure message and
     (iii) is further subject to additional constraints expressed in
     this schematron schema.
   </p>
   <p>The following are namespaces defined in SDMX 2.1 which are used in
   an ADX profiled DSD</p>
   <ns prefix="mes" uri="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/message" />
   <ns prefix="str" uri="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/structure" />
   <ns prefix="com" uri="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common" />
715   <pattern >
     <title>Testing that Structures are all present</title>
     <rule context="mes:Structure">
       <assert test="count(mes:Structures)=1">
         There shall be a single mes:Structures element in the message.
720       </assert>
     </rule>
     <rule context="mes:Structures" >
       <assert test="count(str:Codelists)=1">
         There shall be a single Codelists element.
725       </assert>
       <assert test="count(str:Concepts)=1">
         There shall be a single Concepts element.
```

730

```
</assert>
```

```
<assert test="count(str:DataStructures/str:DataStructure)=1">
  There shall be a single DataStructure element.
```

735

```
</assert>
```

```
<let name="ADX_Concepts" value="str:Concepts/str:ConceptScheme[
  @id='ADX_MANDATORY_CONCEPTS' and @agencyID='IHE_QRPH']"/>
```

740

```
<assert
  test="count($ADX_Concepts)=1">
  There shall be a ConceptScheme with @id='ADX_MANDATORY_CONCEPTS' and
  @agencyID='IHE_QRPH'.
</assert>
```

745

```
</rule>
```

```
</pattern>
```

750

```
<pattern>
  <title>Testing DataStructureComponents</title>
```

```
<let name="components" value="str:DataStructureComponents" />
<let name="dimensions" value="$components/str:DimensionList"/>
```

755

```
<rule context="str:DataStructure/str:DataStructureComponents">
  <assert test="count(str:Group[@id='OUTER_DIMENSIONS'])=1">
    There shall be a Group with @id='OUTER_DIMENSIONS'
  </assert>
```

760

```
</rule>
```

```
<p>The dimension list shall include the mandatory dimensions</p>
```

765

```
<rule context="str:DimensionList">
  <let name="dataElementDimension" value="str:Dimension[@id='dataElement']" />
  <let name="orgUnitDimension" value="str:Dimension[@id='orgUnit']" />
  <let name="periodDimension" value="str:TimeDimension[@id='TIME_PERIOD']" />
```

770

```
<assert test="count($dataElementDimension)=1">
  There shall be a dimension with @id='dataElement'.
</assert>
```

775

```
<assert test="count($orgUnitDimension)=1">
  There shall be a dimension with @id='orgUnit'.
</assert>
```

780

```
<assert test="count($periodDimension)=1">
  There shall be a TimeDimension with @id='TIME_PERIOD'.
</assert>
```

```
</rule>
```

785

```
<p>
  The dataElement dimension must be linked to the mandatory 'dataElement' concept and
  provide a LocalRepresentation.
</p>
```

```
<rule context="str:Dimension[@id='dataElement']">
```

790

```
  <assert
    test="str:ConceptIdentity/Ref/@id='dataElement'">
    @id of dataElement concept reference must be 'dataElement'.
  </assert>
```

795

```
  <assert
    test="str:ConceptIdentity/Ref/@maintainableParentID='ADX_MANDATORY_CONCEPTS'">
    @maintainableParentID of dataElement dimension concept reference
    must be 'ADX_MANDATORY_CONCEPTS'.
  </assert>
```

800

```
  <assert test="count(str:LocalRepresentation)=1">
    dataElement dimension must provide LocalRepresentation.
  </assert>
```

```
</rule>
```

805

```
<p>
  The orgUnit dimension must be linked to the mandatory 'orgUnit' concept and
  provide a LocalRepresentation.
</p>
```

810

```
<rule context="str:Dimension[@id='orgUnit']">
```

815

```
  <assert
    test="str:ConceptIdentity/Ref/@id='orgUnit'">
    @id of orgUnit concept reference must be 'orgUnit'.
  </assert>
```

820

```
  <assert
    test="str:ConceptIdentity/Ref/@maintainableParentID='ADX_MANDATORY_CONCEPTS'">
    @maintainableParentID of orgUnit dimensions concept reference
    must be 'ADX_MANDATORY_CONCEPTS'.
  </assert>
```

```
<assert test="count(str:LocalRepresentation)=1">
```

```
825     orgUnit dimension must provide LocalRepresentation.
        </assert>

    </rule>

830   <p>
    The TimeDimension must be linked to the mandatory 'period' concept and
    provide a LocalRepresentation.
  </p>
  <rule context="str:TimeDimension">
835    <assert
      test="str:ConceptIdentity/Ref/@id='period'">
      @id of orgUnit concept reference must be 'period'.
    </assert>

840    <assert
      test="str:ConceptIdentity/Ref/@maintainableParentID='ADX_MANDATORY_CONCEPTS'">
      @maintainableParentID of period dimension concept reference
      must be 'ADX_MANDATORY_CONCEPTS'.
    </assert>

845    <let name="periodFormat" value="str:LocalRepresentation/str:TextFormat/@textType"/>

    <assert test="$periodFormat='TimeRange' or $periodFormat='DateTime'">
      The time period format must be either 'TimeRange' or 'DateTime'.
    </assert>

850  </rule>

  <p>
855  The orgUnit and period dimensions must be attached to the outer group. The dataElement
  dimension may not be in the outer group.
  </p>
  <rule context="str:Group[@id='OUTER_DIMENSIONS']">

860    <assert test="count(str:GroupDimension/str:DimensionReference/Ref[@id='orgUnit'])=1" >
      The orgUnit dimension must appear once in the 'OUTER_DIMENSIONS' group.
    </assert>

    <assert test="count(str:GroupDimension/str:DimensionReference/Ref[@id='TIME_PERIOD'])=1" >
865    The period dimension must appear once in the 'OUTER_DIMENSIONS' group.
    </assert>

    <assert test="count(str:GroupDimension/str:DimensionReference/Ref[@id='dataElement'])=0" >
870    The period dimension must appear once in the 'OUTER_DIMENSIONS' group.
    </assert>
```

```

875     </rule>
      <p>
        The PrimaryMeasure must be linked to the mandatory 'value' concept.
      </p>
      <rule context="str:PrimaryMeasure">
        <assert
          test="str:ConceptIdentity/Ref/@id='value'">
            @id of PrimaryMeasure concept reference must be 'value'.
          </assert>
        <assert
          test="str:ConceptIdentity/Ref/@maintainableParentID='ADX_MANDATORY_CONCEPTS'">
            @maintainableParentID of PrimaryMeasure concept reference
            must be 'ADX_MANDATORY_CONCEPTS'.
          </assert>
        </rule>
      </pattern>
    </schema>

```

Appendix 8B – (Normative) XSLT to generate W3C schema from DSD

Current working copy available at <https://github.com/dhis2/adx/blob/master/IHE/xslt/dsd2adx2.xsl>

```

895 <?xml version="1.0" encoding="UTF-8"?>
    <xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
      xmlns:xs="http://www.w3.org/2001/XMLSchema"
900     xmlns:str="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/structure"
      exclude-result-prefixes="xs" version="1.0">
      <xsl:output encoding="UTF-8" xml:space="preserve" method="xml" indent="yes"/>
      <!--
905         This stylesheet is a normative part of the ADX profile (urn:ihe:qrph:adx:2015)
          When applied to an ADX conformant SDMX Data Structure Definition it emits
          a W3C XML Schema document suitable for validation of ADX data payloads.
      -->
910 <!-- =====
      Variable declarations

```

```

===== -->
915 <!-- Dimension nodes -->
<xsl:variable name="dimensions" select="//str:Dimension"/>

<!-- Jurisdiction specific Dimensions at group level -->
920 <xsl:variable name="outerDimensions"
select="$dimensions[//str:Group[@id='OUTER_DIMENSIONS']/descendant::Ref/@id = @id
and @id != 'orgUnit']"/>

<!-- Jurisdiction specific Dimensions at dataValue level -->
925 <xsl:variable name="innerDimensions"
select="$dimensions[not (//str:Group[@id='OUTER_DIMENSIONS']/descendant::Ref/@id = @id )
and str:ConceptIdentity/Ref/@id != 'dataElement']"/>

<!-- Mandatory dimensions -->
930 <xsl:variable name="orgUnitDimension" select="$dimensions[@id='orgUnit']" />
<xsl:variable name="dataElementDimension" select="$dimensions[@id='dataElement']" />

<!-- Reference to the orgUnit code list -->
935 <xsl:variable
name="orgUnitCLRef"
select="$orgUnitDimension/str:LocalRepresentation/str:Enumeration/Ref" />

<!-- Construction of the orgUnit type name -->
940 <xsl:variable name="orgUnitType"
select="concat($orgUnitCLRef/@id,'_', $orgUnitCLRef/@agencyID,'_',
$orgUnitCLRef/@version,'_Type')" />

<!-- Reference to the dataElement code list -->
945 <xsl:variable
name="dataElementCLRef"
select="$dataElementDimension/str:LocalRepresentation/str:Enumeration/Ref" />

<!-- Construction of the dataElement type name -->
950 <xsl:variable name="dataElementType"
select="concat($dataElementCLRef/@id,'_',
$dataElementCLRef/@agencyID,'_', $dataElementCLRef/@version,'_TypeID')" />
<!-- =====
Root Template Match
===== -->
955 <xsl:template match="/">

<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns="urn:ihe:qrph:adx:2015"
xmlns:common="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common"

```

```

960     targetNamespace="urn:ihe:qrph:adx:2015" elementFormDefault="qualified">
        <!-- Copyright notice -->
965     <xs:annotation>
        <xs:documentation> This is an example of a tightly constrained schema which should
            validate an adx data document which has been formed in compliance with the
            sample SDMX DSD. </xs:documentation>
        </xs:annotation>
970     <xs:import namespace="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common"
        schemaLocation="sdmx/SDMXCommon.xsd"/>
        <!-- generate enumerated types for dimensions -->
975     <xsl:apply-templates select="//str:Codelist"/>
        <!-- generate dateTime type -->
        <xsl:apply-templates select="//str:TimeDimension" />
980     <!-- generate complex types -->
        <xsl:call-template name="adx" />
        <xsl:call-template name="group" />
        <xsl:call-template name="dataValue" />
985     <xs:element name="adx" type="adxType"/>
        </xs:schema>
    </xsl:template>
990 <!-- =====
    Complex Element types
        1. ADX Root element type
        ===== -->
995 <xsl:template name="adx">
    <xs:complexType name="adxType">
        <xs:sequence maxOccurs="unbounded">
            <xs:element name="group" type="groupType"/>
        </xs:sequence>
1000    <xs:attribute name="exported" use="required" type="xs:dateTime"/>
        <xs:anyAttribute processContents="skip"/>
    </xs:complexType>
    </xsl:template>
1005 <!-- =====
        2. groupType
        ===== -->

```

```

1010 <xsl:template name="group">
    <xs:complexType name="groupType">
        <xs:sequence maxOccurs="unbounded">
            <xs:element name="dataValue" type="DataValueType"/>
        </xs:sequence>
        <xs:attribute name="orgUnit" use="required" type="{ $orgUnitType }"/>
        <xs:attribute name="period" use="required" type="periodType"/>
1015
        <xsl:apply-templates select="$outerDimensions" />
        <xs:anyAttribute processContents="skip"/>
    </xs:complexType>
</xsl:template>
1020
<!-- =====
3. dataValueType
===== -->
1025 <xsl:template name="dataValue">
    <xs:complexType name="DataValueType">
        <xs:sequence maxOccurs="1" minOccurs="0">
            <xs:element name="annotation" />
        </xs:sequence>
1030
        <xs:attribute name="dataElement" use="required" type="{ $dataElementType }"/>
        <xs:attribute name="value" use="required" type="xs:decimal"/>
        <xsl:apply-templates select="$innerDimensions" />
1035
        <xs:anyAttribute processContents="skip"/>
    </xs:complexType>
</xsl:template>
1040
<!-- =====
Type restrictions derived from SDMX DSD Codelists
===== -->
1045 <xsl:template match="str:Codelist">
    <xsl:variable name="type" select="concat(@id, '_', @agencyID, '_', @version, '_Type')"/>
    <xs:simpleType name="{ $type }">
        <xs:restriction base="xs:token">
            <xsl:for-each select="str:Code">
                <xs:enumeration value="{ @id }"/>
            </xsl:for-each>
1050
        </xs:restriction>
    </xs:simpleType>
</xsl:template>

```



```

1055 <!-- =====
      Time dimension type
      ===== -->
1060 <xsl:template match="str:TimeDimension">
      <xsl:variable name="timeFormat" select="str:LocalRepresentation/str:TextFormat"/>
      <xs:simpleType name="periodType">
1065   <xsl:choose>
      <xsl:when test="$timeFormat/@textType='DateTime'">
      <xs:restriction base="xs:dateTime"/>
      </xsl:when>
1070   <xsl:when test="$timeFormat/@textType='TimeRange'">
      <xs:restriction base="common:TimeRangeType"/>
      </xsl:when>
      <xsl:otherwise>
      <xsl:message>
      Only SDMX DateTime and TimeRange are supported types
      </xsl:message>
      </xsl:otherwise>
      </xsl:choose>
      </xs:simpleType>
    </xsl:template>
1075 <!-- =====
      Produce attributes for dimension
      ===== -->
1080 <xsl:template match="str:Dimension">
      <xsl:variable name="conceptID" select="str:ConceptIdentity/Ref/@id"/>
      <xsl:variable name="conceptSchemeID" select="str:ConceptIdentity/Ref/@maintainableParentID"/>
1085   <xsl:choose>
      <!-- if there is a LocalRepresentation, use that -->
      <xsl:when test="str:LocalRepresentation">
      <xsl:variable name="codelist" select="str:LocalRepresentation/str:Enumeration/Ref"/>
      <xsl:variable name="type"
      select="concat($codelist/@id,'_', $codelist/@agencyID,'_', $codelist/@version,'_Type')"/>
1090   <xs:attribute name="{ $conceptID}" type="{ $type}" use="optional"/>
      </xsl:when>
      <!-- otherwise lookup the CoreRepresentation for the Concept -->
      <xsl:otherwise>
      <xsl:variable name="concept"
      select="//str:ConceptScheme[
1095   @id=$conceptSchemeID]/str:Concept[@id=$conceptID]"/>
      <xsl:variable name="codelist"
      select="$concept/str:CoreRepresentation/str:Enumeration/Ref"/>
      <xsl:variable name="type"
      select="concat($codelist/@id,'_', $codelist/@agencyID,'_', $codelist/@version,'_Type')"/>
1100   <xs:attribute name="{ $conceptID}" type="{ $type}" use="optional"/>
    
```

```

        </xsl:otherwise>
    </xsl:choose>
</xsl:template>
</xsl:stylesheet>

```

1105 **Appendix 8C – (Informative) DSD pre-processor to resolve external references**

Current working copy available at https://github.com/dhis2/adx/blob/master/IHE/xslt/dsd_preprocess.xsl

```

1110 <?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:mes="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/message"

  exclude-result-prefixes="xs"
  version="1.0">
1115
<!--
  Stylesheet to pre-process an SDMX 2.1 DSD to pull in external references
-->
1120 <xsl:strip-space elements="*" />
<xsl:output method="xml" indent="yes" />

<!-- The default action is to just copy each node to output - identity template -->
<xsl:template match="/" | @* | node()>
1125   <xsl:copy>
     <xsl:apply-templates select="@* | node()" />
   </xsl:copy>
</xsl:template>

1130 <!-- Copy in external references where indicated -->
<xsl:template match="*[@isExternalReference = 'true' and @structureURL]">
  <xsl:message>
    External reference for <xsl:value-of select="name()" /> fetched from <xsl:value-of select="@structureURL" />
  </xsl:message>
  <xsl:variable name="elementName" select="name()" />
  <xsl:variable name="id" select="@id" />
  <xsl:variable name="agencyID" select="@agencyID" />
  <xsl:variable name="version" select="@version" />
  <xsl:copy-of select="document(@structureURL)//*[name()=$elementName
    and @id=$id and @agencyID=$agencyID and @version=$version]" />
1140 </xsl:template>
</xsl:stylesheet>

```

Appendix 8D – (Normative) ADX Mandatory ConceptScheme

Current working copy available at https://github.com/dhis2/adx/blob/master/IHE/samples/qrph_structures.xml

```

1145 <?xml version="1.0" encoding="UTF-8"?>
1150 <mes:Structure xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
      xsi:schemaLocation="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/message ../schema/sdmx/SDMXMessage.xsd"
      xmlns:com="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common"
      xmlns:str="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/structure"
      xmlns:mes="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/message">
1155   <mes:Header>
      <mes:ID>ADX_STRUCTURES</mes:ID>
      <mes:Test>false</mes:Test>
      <mes:Prepared>2015-05-01T14:30:47.000Z</mes:Prepared>
      <mes:Sender id="IHE_QRPH">
        <com:Name xml:lang="en">QRPH Technical Committee</com:Name>
      </mes:Sender>
    </mes:Header>
1160   <mes:Structures>
      <str:OrganisationSchemes>
        <str:AgencyScheme id="AGENCIES" agencyID="IHE_QRPH">
          <com:Name>List of AGENCY identifiers maintained by IHE QRPH</com:Name>
          <str:Agency id="IHE_QRPH" >
            <com:Name>IHE Quality Research and Public Health Technical Committee</com:Name>
          </str:Agency>
        </str:AgencyScheme>
      </str:OrganisationSchemes>
1170   <str:Concepts>
      <!-- ADX Mandatory concepts -->
      <str:ConceptScheme id="ADX_MANDATORY_CONCEPTS" agencyID="IHE_QRPH" version="1.0">
        <com:Name xml:lang="en">Mandatory concepts defined by IHE ADX profile</com:Name>
1175
        <!-- There is no default representation for these concepts. An Agency which makes
              use of these to construct an ADX DataStructure has to provide a local representation -->
        <str:Concept id="dataElement">
          <com:Name xml:lang="en">Subject of the data measure</com:Name>
1180        </str:Concept>
        <str:Concept id="orgUnit">
          <com:Name xml:lang="en">Spatial dimension of the measure</com:Name>
        </str:Concept>
        <str:Concept id="period">
1185        <com:Name xml:lang="en">Temporal dimension of the measure</com:Name>
    </str:Concepts>
  </mes:Structure>

```

```

1190     </str:Concept>
        <!-- The value concept is represented by an integer or real number (xsd:decimal)-->
        <str:Concept id="value">
            <com:Name xml:lang="en">Value of the data measure</com:Name>
            <str:CoreRepresentation>
                <str:TextFormat textType="Decimal"/>
            </str:CoreRepresentation>
1195     </str:Concept>
    </str:ConceptScheme>
</str:Concepts>
</mes:Structures>
</mes:Structure>

```

1200 **Appendix 8E – (Informative) Sample ADX DSD**

Current working copy available at https://github.com/dhis2/adx/blob/master/IHE/samples/adx_sample_dsd2.xml

```

1205 <?xml version="1.0" encoding="UTF-8"?>
<?xml-model href=" ../schema/dsd_validation.sch" type="application/xml" schematypens="http://purl.oclc.org/dsdl/schematron"?>
<mes:Structure xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
1210   xsi:schemaLocation="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/message ../schema/sdmx/SDMXMessage.xsd"
   xmlns:com="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common"
   xmlns:str="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/structure"
   xmlns:mes="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/message">
    <mes:Header>
1215     <mes:ID>DSD_ADX</mes:ID>
     <mes:Test>true</mes:Test>
     <mes:Prepared>2015-01-13T14:30:47.000Z</mes:Prepared>
     <mes:Sender id="Bob">
        <com:Name xml:lang="en">Bob Jolliffe</com:Name>
     </mes:Sender>
    </mes:Header>

1220   <mes:Structures>

     <str:Codelists>
1225     <!-- These are used to constrain vocabulary of dimension values -->

        <str:Codelist id="CL_OrgUnits" agencyID="WAHO" version="1.0" >
            <com:Name xml:lang="en">Reporting health clinics</com:Name>
            <str:Code id="342">
                <com:Name xml:lang="en">Bob's clinic</com:Name>
            </str:Code>
        </str:Codelist>
    </str:Codelists>

```

1230

```

</str:Code>
<str:Code id="343">
  <com:Name xml:lang="en">Jim's clinic</com:Name>
</str:Code>
</str:Codelist>

```

1235

```

<str:Codelist id="CL_DataElements" agencyID="WAHO" version="1.0">
  <com:Name xml:lang="en">WAHO Data elements</com:Name>
  <str:Code id="MAL01">
    <com:Name xml:lang="en">Confirmed Malaria cases</com:Name>
  </str:Code>

```

1240

```

  <str:Code id="MAL02">
    <com:Name xml:lang="en">Unconfirmed Malaria cases</com:Name>
  </str:Code>

```

1245

```

  <str:Code id="MAL03">
    <com:Name xml:lang="en">Confirmed Malaria deaths</com:Name>
  </str:Code>
  <str:Code id="MAL04">
    <com:Name xml:lang="en">Unconfirmed Malaria deaths</com:Name>
  </str:Code>
</str:Codelist>

```

1250

```

<str:Codelist id="CL_AgeGroup" agencyID="WAHO" version="1.0">
  <com:Name xml:lang="en">WAHO Age Groups</com:Name>
  <str:Code id="under5">
    <com:Name xml:lang="en">Under 5 years of age</com:Name>
  </str:Code>

```

1255

```

  <str:Code id="5andOver">
    <com:Name xml:lang="en">5 Years and over</com:Name>
  </str:Code>
</str:Codelist>

```

1260

```

<str:Codelist id="CL_Sex" agencyID="WAHO" version="1.0">
  <com:Name xml:lang="en">WAHO Sex categories</com:Name>
  <str:Code id="M">
    <com:Name xml:lang="en">Male</com:Name>
  </str:Code>

```

1265

```

  <str:Code id="F">
    <com:Name xml:lang="en">Female</com:Name>
  </str:Code>
</str:Codelist>

```

1270

```

<str:Codelist id="CL_Mechanism" agencyID="WAHO" version="1.0">
  <com:Name xml:lang="en">Funding mechanisms</com:Name>
  <str:Code id="PEPFAR">
    <com:Name xml:lang="en">PEPFAR</com:Name>
  </str:Code>

```

1275

```
<str:Code id="GFATM">
  <com:Name xml:lang="en">Global Fund</com:Name>
</str:Code>
```

1280

```
<str:Code id="OTHER">
  <com:Name xml:lang="en">Other</com:Name>
</str:Code>
</str:Codelist>
```

```
</str:Codelists>
```

1285

```
<str:Concepts>
  <!-- These are named concepts which are referred to in the definition of
  data dimensions. They can be constrained through the use of codelists
  or text format patterns using a CoreRepresentation.
  -->
```

1290

```
<str:ConceptScheme id="ADX_MANDATORY_CONCEPTS" agencyID="IHE_QRPH" version="1.0"
  isExternalReference="true" structureURL="qrph_structures.xml" >
  <com:Name xml:lang="en">Mandatory concepts defined by IHE ADX profile</com:Name>
</str:ConceptScheme>
```

1295

```
<str:ConceptScheme id="ADX_WAHO_CONCEPTS" agencyID="WAHO" version="1.0" >
  <!-- These concepts are user-defined by an Agency other than IHE_QRPH.
  A concept is declared together with its core representation reference
  to a codelist.
  -->
```

1300

```
<com:Name xml:lang="en">Disaggregation concepts used in WAHO data warehouse</com:Name>
```

```
<str:Concept id="ageGroup">
  <com:Name xml:lang="en">Age group</com:Name>
  <str:CoreRepresentation>
    <str:Enumeration>
      <Ref agencyID="WAHO" id="CL_AgeGroup" version="1.0"/>
    </str:Enumeration>
  </str:CoreRepresentation>
</str:Concept>
```

1305

```
<str:Concept id="sex">
  <com:Name xml:lang="en">Sex</com:Name>
  <str:CoreRepresentation>
    <str:Enumeration>
      <Ref agencyID="WAHO" id="CL_Sex" version="1.0"/>
    </str:Enumeration>
  </str:CoreRepresentation>
</str:Concept>
```

1310

1315

```
<str:Concept id="mechanism">
  <com:Name xml:lang="en">Funding Mechanism</com:Name>
  <str:CoreRepresentation>
    <str:Enumeration>
```

1320

```
1325     <Ref agencyID="WAHO" id="CL_Mechanism" version="1.0"/>
        </str:Enumeration>
    </str:CoreRepresentation>
</str:Concept>
</str:ConceptScheme>
</str:Concepts>

1330 <str>DataStructures>
    <!-- An implementing Agency other than IHE_QRPH defines the DataStructure to
        use for ADX data payloads in that jurisdiction. The DataStructure must
        have Dimensions which correspond to the core concepts and provide a
        local representation which links those dimensions to codelists. -->

1335 <str:DataStructure id="ADX" agencyID="WAHO" version="1.0" >
    <com:Name xml:lang="en">ADX data structure</com:Name>

    <str>DataStructureComponents>

1340     <str:DimensionList>

        <str:Dimension id="dataElement" >
            <str:ConceptIdentity>
1345         <Ref id="dataElement" maintainableParentID="ADX_MANDATORY_CONCEPTS"
            maintainableParentVersion="1.0" agencyID="IHE_QRPH"/>
            </str:ConceptIdentity>
            <str:LocalRepresentation>
                <str:Enumeration>
1350         <Ref agencyID="WAHO" id="CL_DataElements" version="1.0"/>
                </str:Enumeration>
            </str:LocalRepresentation>
        </str:Dimension>

        <str:Dimension id="orgUnit">
            <str:ConceptIdentity>
1355         <Ref id="orgUnit" maintainableParentID="ADX_MANDATORY_CONCEPTS"
            maintainableParentVersion="1.0" agencyID="IHE_QRPH"/>
            </str:ConceptIdentity>
            <str:LocalRepresentation>
                <str:Enumeration>
1360         <Ref agencyID="WAHO" id="CL_OrgUnits" version="1.0"/>
                </str:Enumeration>
            </str:LocalRepresentation>
        </str:Dimension>

1365 <str:Dimension>
    <str:ConceptIdentity>
        <Ref id="sex" maintainableParentID="ADX_WAHO_CONCEPTS">
```

1370

```
        maintainableParentVersion="1.0" agencyID="WAHO"/>
    </str:ConceptIdentity>
</str:Dimension>
```

1375

```
    <str:Dimension>
        <str:ConceptIdentity>
            <Ref id="ageGroup" maintainableParentID="ADX_WAHO_CONCEPTS"
                maintainableParentVersion="1.0" agencyID="WAHO"/>
        </str:ConceptIdentity>
    </str:Dimension>
```

1380

```
    <str:Dimension id="mechanism">
        <str:ConceptIdentity>
            <Ref id="mechanism" maintainableParentID="ADX_WAHO_CONCEPTS"
                maintainableParentVersion="1.0" agencyID="WAHO"/>
        </str:ConceptIdentity>
    </str:Dimension>
```

1385

```
    <str:TimeDimension id="TIME_PERIOD">
        <str:ConceptIdentity>
            <Ref id="period" maintainableParentID="ADX_MANDATORY_CONCEPTS"
                maintainableParentVersion="1.0" agencyID="IHE_QRPH"/>
        </str:ConceptIdentity>
        <str:LocalRepresentation>
            <!-- An ADX DSD allows either an SDMX 'TimeRange' or 'DateTime'
                representation of the time dimension -->
            <str:TextFormat textType="TimeRange"/>
        </str:LocalRepresentation>
    </str:TimeDimension>
</str:DimensionList>
```

1390

1395

1400

```
    <!-- These dimensions are identified as being used as outer dimensions
        of the data. They must include orgUnit and period. -->
    <str:Group id="OUTER_DIMENSIONS">
```

1405

```
        <str:GroupDimension>
            <str:DimensionReference>
                <Ref id="orgUnit"/>
            </str:DimensionReference>
        </str:GroupDimension>
```

1410

```
        <str:GroupDimension>
            <str:DimensionReference>
                <Ref id="TIME_PERIOD"/>
            </str:DimensionReference>
        </str:GroupDimension>
```

1415

```
        <str:GroupDimension>
            <str:DimensionReference>
                <Ref id="mechanism"/>
            </str:DimensionReference>
        </str:GroupDimension>
    </str:Group>
```



```

1420     </str:DimensionReference>
1421     </str:GroupDimension>
1422 </str:Group>
1423
1424     <!-- ADX requires that there be a primary measure which is linked to
1425     the value concept. -->
1426     <str:MeasureList>
1427         <str:PrimaryMeasure>
1428             <str:ConceptIdentity>
1429                 <Ref id="value" maintainableParentID="ADX_MANDATORY_CONCEPTS"
1430                 maintainableParentVersion="1.0" agencyID="IHE"/>
1431             </str:ConceptIdentity>
1432         </str:PrimaryMeasure>
1433     </str:MeasureList>
1434
1435 </str:DataStructureComponents>
1436
1437 </str:DataStructure>
1438 </str>DataStructures>
1439 </mes:Structures>
1440 </mes:Structure>
    
```

Appendix 8F – (Informative) Generated sample ADX data schema

Current working copy available at https://github.com/dhis2/adx/blob/master/IHE/schema/adx_sample_generated.xsd

```

1440 <?xml version="1.0" encoding="UTF-8"?>
1441 <xs:schema xmlns="urn:ihe:qrph:adx:2015" xmlns:common="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common"
1442 xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:str="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/structure"
1443 targetNamespace="urn:ihe:qrph:adx:2015" elementFormDefault="qualified">
1444     <xs:annotation>
1445         <xs:documentation> This is an example of a tightly constrained schema which should
1446             validate an adx data document which has been formed in compliance with the
1447             sample SDMX DSD. </xs:documentation>
1448     </xs:annotation>
1449     <xs:import namespace="http://www.sdmx.org/resources/sdmxml/schemas/v2_1/common" schemaLocation="sdmx/SDMXCommon.xsd" />
1450     <xs:simpleType name="CL_OrgUnits_WAHO_1.0_Type">
1451         <xs:restriction base="xs:token">
1452             <xs:enumeration value="342"/>
1453             <xs:enumeration value="343"/>
1454         </xs:restriction>
1455     </xs:simpleType>
1456     <xs:simpleType name="CL_DataElements_WAHO_1.0_Type">
    
```

```
1460 <xs:restriction base="xs:token">
    <xs:enumeration value="MAL01"/>
    <xs:enumeration value="MAL02"/>
    <xs:enumeration value="MAL03"/>
    <xs:enumeration value="MAL04"/>
  </xs:restriction>
</xs:simpleType>
1465 <xs:simpleType name="CL_AgeGroup_WAHO_1.0_Type">
  <xs:restriction base="xs:token">
    <xs:enumeration value="under5"/>
    <xs:enumeration value="5andOver"/>
  </xs:restriction>
</xs:simpleType>
1470 <xs:simpleType name="CL_Sex_WAHO_1.0_Type">
  <xs:restriction base="xs:token">
    <xs:enumeration value="M"/>
    <xs:enumeration value="F"/>
  </xs:restriction>
</xs:simpleType>
1475 <xs:simpleType name="CL_Mechanism_WAHO_1.0_Type">
  <xs:restriction base="xs:token">
    <xs:enumeration value="PEPFAR"/>
    <xs:enumeration value="GFATM"/>
    <xs:enumeration value="OTHER"/>
  </xs:restriction>
</xs:simpleType>
1480 <xs:simpleType name="periodType">
  <xs:restriction base="common:TimeRangeType"/>
</xs:simpleType>
1485 <xs:complexType name="adxType">
  <xs:sequence maxOccurs="unbounded">
    <xs:element name="group" type="groupType"/>
  </xs:sequence>
  <xs:attribute name="exported" use="required" type="xs:dateTime"/>
  <xs:anyAttribute processContents="skip"/>
</xs:complexType>
1490 <xs:complexType name="groupType">
  <xs:sequence maxOccurs="unbounded">
    <xs:element name="dataValue" type="DataValueType"/>
  </xs:sequence>
  <xs:attribute name="orgUnit" use="required" type="CL_OrgUnits_WAHO_1.0_Type"/>
  <xs:attribute name="period" use="required" type="periodType"/>
  <xs:attribute name="mechanism" type="CL_Mechanism_WAHO_1.0_Type" use="optional"/>
  <xs:anyAttribute processContents="skip"/>
</xs:complexType>
1495 <xs:complexType name="DataValueType">
  <xs:sequence maxOccurs="1" minOccurs="0">
```

```

1505 </xs:element name="annotation"/>
      </xs:sequence>
      <xs:attribute name="dataElement" use="required" type="CL_DataElements_WAHO_1.0_Type" />
      <xs:attribute name="value" use="required" type="xs:decimal" />
      <xs:attribute name="sex" type="CL_Sex_WAHO_1.0_Type" use="optional" />
1510 <xs:attribute name="ageGroup" type="CL_AgeGroup_WAHO_1.0_Type" use="optional" />
      <xs:anyAttribute processContents="skip" />
    </xs:complexType>
  <xs:element name="adx" type="adxType" />
</xs:schema>

```

1515

Appendix 8G – (Informative) Sample ADX data

Current working copy available at https://github.com/dhis2/adx/blob/master/IHE/samples/adx_data_sample1.xml

```

1520 <?xml version="1.0" encoding="UTF-8"?>
<adx xmlns="urn:ihe:qrph:adx:2015"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:ihe:qrph:adx:2015 ../schema/adx_sample_generated.xsd"
  exported="2015-02-08T19:30:00Z">
1525   <group orgUnit="342" period="2015-01-01/P1M" dataSetComplete="true" mechanism="PEPFAR">
     <dataValue dataElement="MAL01" value="32" />
     <dataValue dataElement="MAL02" value="20" />
     <dataValue dataElement="MAL04" value="10" ageGroup="under5" sex="M" />
1530     <dataValue dataElement="MAL04" value="10" ageGroup="under5" sex="F" />
     <dataValue dataElement="MAL04" value="10" ageGroup="5andOver" sex="M" />
     <dataValue dataElement="MAL04" value="10" ageGroup="5andOver" sex="F" />
   </group>
   <group orgUnit="342" period="2015-01-01/P1M" mechanism="OTHER" comment="Imported from facility system">
1535     <dataValue dataElement="MAL01" value="32" />
     <dataValue dataElement="MAL02" value="20" />
     <dataValue dataElement="MAL03" value="0" >
       <annotation>Some qualifying text here on the datavalue</annotation>
     </dataValue>
     <dataValue dataElement="MAL04" value="10" ageGroup="under5" sex="M" />
1540     <dataValue dataElement="MAL04" value="10" ageGroup="under5" sex="F" />
     <dataValue dataElement="MAL04" value="10" ageGroup="5andOver" sex="M" />
     <dataValue dataElement="MAL04" value="10" ageGroup="5andOver" sex="F" />
   </group>
</adx>

```

1545

Appendix 8H – (Informative) Formatting of times and time intervals in ADX

1550 The SDMX v2.1 DSD `ObservationalTimePeriod` data type allows a variety of formats for specifying time periods, with the result that there are several equivalent ways of expressing the same period. In the interest of greater and easier interoperability, ADX further restricts that an `ObservationalTimePeriod`. This can be either a `xs:dateTime`, or a `com:TimeRange`, as specified under the `str:TimeDimension` element of the DSD.

`xs:dateTime` is formatted as `yyyy-mm-ddThh:mm:sszzzzzz`, where:

- yyyy is the year
- 1555 mm is the month (01-12)
- dd is the day of the month (01-31)
- T indicates the time (required)
- hh is the hours
- mm is the minutes
- 1560 ss is the seconds optionally followed by '.' and fractional seconds
- zzzzzz is the optional time zone: a '+' or '-' followed by the hh:mm (hours and minutes) offset from UTC, or Z to indicate UTC.

All parts are required except the fractional seconds and the time zone.

1565 Examples:

2016-01-01T00:00:00	Midnight on January 1, 2016
2016-01-01T12:00:00	Noon on January 1, 2016
2016-01-01T12:00:12.34Z	Noon and 12.34 seconds on January 1, 2016, UTC
2016-01-01T12:00:00+03:00	Noon on January 1, 2016, three hours ahead of UTC

`com:TimeRange` is modeled after (`xs:dateTime` OR `xs:date`)/`xs:duration`.

- `xs:dateTime` is as described above.
 - `xs:date` follows the same rules as `xs:dateTime` except that the elements `Thh:mm:ss` are not present.
 - `xs:duration` is of the form `P[n]Y[n]M[n]DT[n]H[n]M[n]S` or `P[n]W`, where `n` is the number of units and the letters have the meaning:
 - P - Period indicator (always present for durations)
- 1570

- 1575 Y - Years (follows the number of years)
M - Months (follows the number of months)
D - Days (follows the number of days)
W - Weeks (follows the number of weeks)
T - Time indicator (preceding any of the following):
H - Hours (follows the number of hours)
1580 M - Minutes (follows the number of minutes)
S - Seconds (follows the number of seconds)

Examples:

2016-01-01/P1Y	One-year period starting on 2016-01-01
2016-04-01/P1Y	One-year period starting on 2016-04-01
2016-07-01/P6M	Six-month period starting on 2016-07-01
2016-03-01/P1M	One-month period starting on 2016-03-01
2016-01-03/P7D	One-week period starting on 2016-01-03
2016-01-01/P1Y6M	A year and six month period starting on 2016-01-01
2016-01-01T12:00:00/PT1H30M	A period of 1 hour and 30 minutes starting on 2016-01-01 at 12:00 noon

1585 **Volume 3 Namespace Additions**

Add the following terms to the IHE Namespace:

None

1590

Volume 4 – National Extensions

Add appropriate Country section

1595 Not applicable