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Definitions and Acronyms

SDMX	Statistical Data and Metadata eXchange
CDS	Compact Data Schema
CDC	Center for Disease Control
FAO	Food and Agriculture Organization
IXF	Indicator eXchange Format

1. Introduction

The third version of the Indicator eXchange Format (IXF) closely adheres to the concepts of the Standard Data & Metadata eXchange (SDMX) protocol. As such, there is no single schema against which IXF3 data can be validated, but rather a set of processes and procedures that ensure a valid and well formed IXF3 data/metadata file is generated. This document describes those processes and procedures and defines the expected outputs, and what constitutes a valid IXF3 data.

This document separates the discussion of Data and Metadata into two parts. In the first part, the Data portion of the IXF3 will be discussed in detail. The topics under this part are split into the sections detailing the various elements of the SDMX Data definition and coding. To begin with, the basic IXF3 Data message will be described. This message is the output of the IXF3 process that conforms to the SDMX message format. Following that, the Compact Schema Definition is defined, and the nuances of the IXF3 are discussed in detail. Finally, the entire process of generating IXF3 compact data and validating it against the previously discussed schema definitions will be detailed.

In part two, the Metadata portion of the IXF3 will be discussed. The topics under this part are split into the sections detailing the various elements of the SDMX Metadata definition and coding. To begin with, the basic Metadata message will be described. Since there is some overlap between the SDMX Metadata message and Data message, this section will cover only the unique features of the Metadata message. Following that, the process of generating the Metadata Schema that conforms to the SDMX metadata message will be discussed. Finally, some examples will be used to detail the IXF3 metadata report.

Finally, the entire process of documenting data and metadata messages, generating schemas, producing data, and validating and sharing of data will be discussed.

2. Data Message

The IXF3 has an SDMX Data Message. This message has a structure which conforms to the SDMX v2 Message Schema¹. The IXF3 Data Message has the following obligatory sections:

- Code Lists
- Concepts
- Hierarchical Code Lists
- Key Families

The content and function of these sections will be discussed here.

¹ For a detail discussion of SDMX, please refer to the SDMX user guide version 2007-1-3, available at their website: <http://www.smdx.org>

2.1. Code Lists

In the IXF3 Data Message, Code Lists detail the possible values that a dimension can take. In the following sample, some values of the Gender and Region dimensions are presented.

```
<CodeList id="CL_GENDER" agencyID="UN" uri="http://www.unaids.org/ixf">
  <Name>GENDER</Name>
  <Description xml:lang="en">Gender of respondent</Description>
  <Code value="F"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code:UNAIDS:CL_GENDER.F">
    <Description xml:lang="en">Females</Description>
  </Code>
  <Code value="M"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code:UNAIDS:CL_GENDER.M">
    <Description xml:lang="en">Males</Description>
  </Code>
  <Code value="A"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code:UNAIDS:CL_GENDER.A">
    <Description xml:lang="en">All</Description>
  </Code>
</CodeList>
<CodeList id="CL_AREA" agencyID="UNAIDS" uri="http://www.unaids.org/ixf">
  <Name>AREA</Name>
  <Description xml:lang="en">Regions</Description>
  <Code value="AF"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code:UNAIDS:CL_AREA.AF">
    <Description xml:lang="en">Afghanistan</Description>
  </Code>
  <Code value="AL"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code:UNAIDS:CL_AREA.AL">
    <Description xml:lang="en">Albania</Description>
  </Code>
  <Code value="DZ"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code:UNAIDS:CL_AREA.DZ">
    <Description xml:lang="en">Algeria</Description>
  </Code>
  <Code value="AR"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code:UNAIDS:CL_AREA.AR">
    <Description xml:lang="en">Argentina</Description>
  </Code>
</CodeList>
```

Each Code within a Code List has a value and a URN. The value of the Code is only unique within the Code List. However, the URN is a universally unique identifier that distinguishes it from any other code in time and space.

2.2. Hierarchical Code Lists

The next section of the Data Message, HierarchicalCodelists, references the Code Lists defined in the previous section (2.1 Code Lists) and defines the structure by which the codes are assembled into a hierarchy. Codes may be reused multiple times, and at different levels of the hierarchy, hence a many-to-many relationship among codes. In practice, this allows for one indicator to belong to multiple programs, and for one program to have several indicators.

In the diagram below, the indicator “Blood Safety” belongs to both the UNGASS National Program as well as the PEPFAR program.

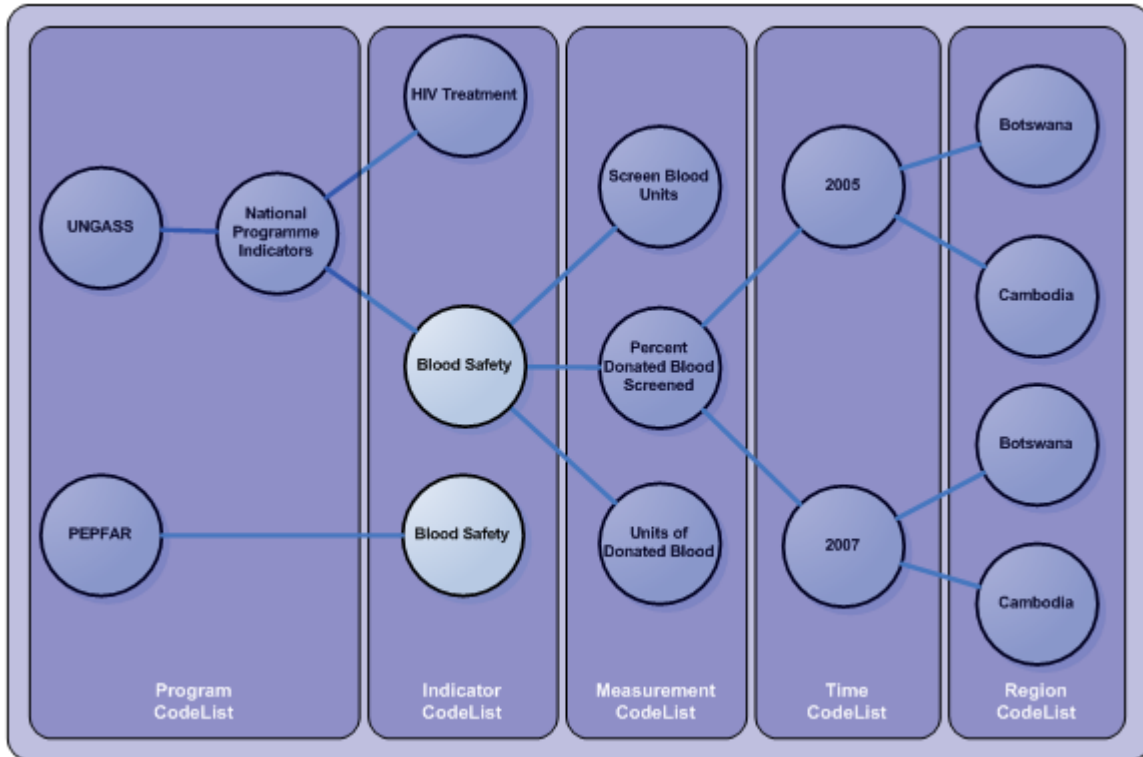


Figure 1. IXF3 - Hierarchical Code Lists

Additionally, the hierarchical code list allows for codes from the same list to be linked to one another in a parent child relationship. This linking, for example, is used to define the relationship between three Indicators: Blood Safety (calculated value), Units of Blood screened (Numerator), and Units of Blood Donated (Denominator).

```

<HierarchicalCodelist id="HCL_INDICATOR_DISAGGREGATION">
  <Name>Indicator Disaggregation</Name>
  <CodelistRef>
    <CodelistID>CL_INDICATOR</CodelistID><Alias>AL_IND</Alias>
  </CodelistRef>
  <CodelistRef>
    <CodelistID>CL_OPERAND</CodelistID><Alias>AL_OP</Alias>
  </CodelistRef>
  <Hierarchy id="OPERAND_HIERARCHY">
    <Name>Hierarchy of Indicator Operands (Num,Den,Perc)</Name>
    <CodeRef>
      <CodelistAliasRef>AL_IND</CodelistAliasRef><CodeID>8</CodeID>
      <CodeRef>
        <CodelistAliasRef>AL_IND</CodelistAliasRef><CodeID>50</CodeID>
        <CodeRef>
          <CodelistAliasRef>AL_OP</CodelistAliasRef><CodeID>1</CodeID>
        </CodeRef>
      </CodeRef>
    </CodeRef>
    <CodeRef>
      <CodelistAliasRef>AL_IND</CodelistAliasRef><CodeID>67</CodeID>
      <CodeRef>
        <CodelistAliasRef>AL_OP</CodelistAliasRef><CodeID>2</CodeID>
      </CodeRef>
    </CodeRef>
  </Hierarchy>
</HierarchicalCodelist>

```

The structure defined by hierarchical code lists, addresses a fundamental use of the IXF in separating the indicator definition from indicator data. Additionally, reuse of code list structures among systems and entities will enable better standardization, and facilitate harmonization and analysis.

2.3. Concepts

The next section of the IXF3 Data Message document describes the concepts that are shared by the Data and the Metadata. For the Data Message, concepts pertain to the various dimensions by which indicators can be disaggregated. The following sample shows several concepts encoded in SDMX.

```
<Concepts>
<ConceptScheme id="IXF_CONCEPTS" agencyID="UN" version="1.0">
  <Concept id="TIME" agencyID="UN" version="1.0">
    <Name>Time</Name>
  </Concept>
  <Concept id="GENDER" agencyID="UN" version="1.0">
    <Name>Gender of respondent</Name>
  </Concept>
  <Concept id="AGEGROUP" agencyID="UN" version="1.0">
    <Name>Age-group of respondent</Name>
  </Concept>
  <Concept id="AREA" agencyID="UN" version="1.0">
    <Name>Geospatial Region</Name>
  </Concept>
</ConceptScheme>
</Concepts>
```

2.4. Key Families

The next section of the IXF3 Data Message brings together the code lists with concepts to define the various programs, indicators, and their disaggregation, in the form of key families. The following sample shows a sample of what the IXF3 indicator family would look like:

```

<KeyFamilies>
  <KeyFamily id="IXF" version="3.0" isFinal="true" validFrom="2007-02-11"
agencyID="UNAIDS">
    <Name xml:lang="en-GB">HIV/AIDS IXF</Name>
    <Description xml:lang="en-GB">Indicator data related to
HIV/AIDS</Description>
    <Components>
      <Dimension conceptSchemeAgency="UNAIDS" conceptSchemeRef="IXF_CONCEPTS"
conceptRef="FREQ" codelist="CL_FREQ" codelistAgency="UNAIDS"
isFrequencyDimension="true" />
      <Dimension conceptSchemeAgency="UNAIDS" conceptSchemeRef="IXF_CONCEPTS"
conceptRef="PROGRAM" codelist="CL_PROGRAM" codelistAgency="UNAIDS" />
      <Dimension conceptSchemeAgency="UNAIDS" conceptSchemeRef="IXF_CONCEPTS"
conceptRef="INDICATOR" codelist="CL_INDICATOR" codelistAgency="UNAIDS" />
      <Dimension conceptSchemeAgency="UNAIDS" conceptSchemeRef="IXF_CONCEPTS"
conceptRef="GENDER" codelist="CL_GENDER" codelistAgency="UNAIDS" />
      <Dimension conceptSchemeAgency="UNAIDS" conceptSchemeRef="IXF_CONCEPTS"
conceptRef="AREA" codelist="CL_AREA" codelistAgency="UNAIDS" />
      <Dimension conceptSchemeAgency="UNAIDS" conceptSchemeRef="IXF_CONCEPTS"
conceptRef="INDICATOR_MEASURE_TYPE" codelist="CL_IND_MEASURE_TYPE"
codelistAgency="UNAIDS" />
      <TimeDimension conceptSchemeAgency="UNAIDS"
conceptSchemeRef="IXF_CONCEPTS" conceptRef="TIME"
crossSectionalAttachGroup="true" />
      <PrimaryMeasure conceptSchemeAgency="UNAIDS"
conceptSchemeRef="IXF_CONCEPTS" conceptRef="OBS_VALUE">
        <TextFormat textType="Double" />
      </PrimaryMeasure>
    </Components>
  </KeyFamily>
</KeyFamilies>

```

Once an SDMX Data Message is generated, it can be loaded into an indicator registry which allows for brokering of indicator definitions. SDMX and Metadata Technologies provide free tools for hosting indicator registries, and define the protocols by which the registries can be queried².

3. Compact Schema

The IXF3 Compact Schema is a bi-product of the IXF3 Data Message described in the previous section. The Compact Schema defines a data structure by which IXF3 data can be exchanged with a smaller memory footprint than the full SDMX message data.

The IXF3 Compact Schema can be auto-generated from the IXF3 Data Message, using tools freely available from Metadata Technology³. Any IXF3 Compact Data export must validate against this Schema.

The Compact Schema will contain the following required elements:

- **DataSet:** defines the KeyFamily in a compact format. It can contain several series that define various data disaggregated by the concepts defined in the Data Message document.

² For more information on Indicator Registries see <http://www.metadatatechnology.com/>

³ See Metadata Technologies tools on <http://www.metadatatechnology.com>

- Series: defines the structural definition of an indicator, and can contain several Observations. Each Series has a fixed set of dimensions and its Observations are varied across Time.
- Obs: Observations; has a value; has a time period when value was observed.

The content and function of these sections will be discussed here.

3.1. *DataSet*

The DataSet element is a child element of the DataSetType defined by the SDMX Compact Data Schema⁴. The excerpt below demonstrates this concept:

```
<complexType name="DataSetType">
  <complexContent mixed="false">
    <extension base="compact:DataSetType">
      <choice minOccurs="0" maxOccurs="unbounded">
        <element ref="Series" />
        <element name="Annotations" type="common:AnnotationsType" />
      </choice>
      <attribute name="FREQ" type="CL_FREQ" use="optional" />
      <attribute name="PROGRAM" type="CL_PROGRAM" use="optional" />
      <attribute name="INDICATOR" type="CL_INDICATOR" use="optional" />
      <attribute name="GENDER" type="CL_GENDER" use="optional" />
      <attribute name="AGEGROUP" type="CL_AGEGROUP" use="optional" />
      <attribute name="AREA" type="CL_AREA" use="optional" />
      <attribute name="INDICATOR_MEASURE_TYPE" type="CL_IND_MEASURE_TYPE"
use="optional" />
    </extension>
  </complexContent>
</complexType>
```

3.2. *Series*

The Series element is a child element of the SeriesType defined by the SDMX Compact Data Schema (CDS). The excerpt below from the IXF3 CDS demonstrates this concept:

⁴ See SDMXCompactData.xsd on <http://www.sdmx.org>

```

<complexType name="SeriesType">
  <complexContent mixed="false">
    <extension base="compact:SeriesType">
      <sequence>
        <element minOccurs="0" maxOccurs="unbounded" ref="Obs" />
        <element minOccurs="0" name="Annotations"
type="common:AnnotationsType" />
      </sequence>
      <attribute name="FREQ" type="CL_FREQ" use="optional" />
      <attribute name="PROGRAM" type="CL_PROGRAM" use="optional" />
      <attribute name="INDICATOR" type="CL_INDICATOR" use="optional" />
      <attribute name="GENDER" type="CL_GENDER" use="optional" />
      <attribute name="AGEGROUP" type="CL_AGEGROUP" use="optional" />
      <attribute name="AREA" type="CL_AREA" use="optional" />
      <attribute name="INDICATOR_MEASURE_TYPE" type="CL_IND_MEASURE_TYPE"
use="optional" />
    </extension>
  </complexContent>
</complexType>

```

3.3. Obs

The Obs element is a child element of the ObsType defined by the SDMX CDS. This element defines how observations can be recorded for a particular indicator at various times. As such, it contains a Time attribute as well as an Obs_Value attribute. The following excerpt demonstrates how these concepts can be encoded in the IXF3 Compact Schema:

```

<complexType name="ObsType">
  <complexContent mixed="false">
    <extension base="compact:ObsType">
      <sequence>
        <element minOccurs="0" name="Annotations"
type="common:AnnotationsType" />
      </sequence>
      <attribute name="TIME" type="common:TimePeriodType" use="required" />
      <attribute name="OBS_VALUE" type="OBS_VALUEType" use="optional" />
    </extension>
  </complexContent>
</complexType>

```

Note that the default generated compact schema using Metadata Technology tools does not specify the type of the TIME attribute, and sets it for “optional” use. Whereas, the IXF3 CDS modifies this to specify the type, and set its use to required.

4. Compact Data

The IXF3 Compact Data conforms to the Compact Data Schema described in the previous section. An example of a Compact Data is provided here. This sample demonstrates some indicator data for one country, two time periods, and several age groups.

```

<DataSet>
  <Program UID="2007i17">
    <Indicator UID="37" COUNTRY="UA">
      <Obs OBS_VALUE="69.10" TIME_PERIOD="5" />
      <Obs OBS_VALUE="71.90" TIME_PERIOD="7" />
    </Indicator>
    <Indicator UID="37" AGE_GROUP="8" COUNTRY="UA">
      <Obs OBS_VALUE="72.40" TIME_PERIOD="7" />
    </Indicator>
    <Indicator UID="37" AGE_GROUP="9" COUNTRY="UA">
      <Obs OBS_VALUE="77.00" TIME_PERIOD="7" />
    </Indicator>
  </Program>
</DataSet>

```

5. Metadata Message

The IXF3 has an SDMX Data Message. This message has a structure which conforms to the SDMX v2 Message Schema⁵. The IXF3 MSD has the following obligatory sections:

- Code Lists
- Concepts
- Metadata Structure Definitions

The “Code Lists” and “Concepts” define the relationship between referential metadata and data. The content and function of these sections will be discussed here.

5.1. Code Lists

While the structure and coding scheme of the Code Lists remains the same for a Metadata Message and a Data Message, its usage is different. The Metadata Message uses Code Lists for two purposes: First to describe sets of values that a metadata field can accept. And second, to create targets to which metadata concepts refer to. In the following example, two Code Lists, ‘Multiplier’ and ‘Data Collection Tools’, are presented as examples of referential metadata. A third Code List, ‘Indicator’, is presented as the target, to which metadata will be attached to. The Indicator code list also serves as a dimension, later used to describe the data structure.

⁵ For a detail discussion of SDMX, please refer to the SDMX user guide version 2007-1-3, available at their website: <http://www.smdx.org>

```

<CodeList id="CL_MULTIP" agencyID="UNAIDS" version="1.0"
urn="urn:sdmx:org.sdmx.infomodel.codelist.CodeList=UNAIDS:CL_MULTIP[1.0]">
  <Name>Multiplier</Name>
  <Code value="OH"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code=UNAIDS:CL_MULTIP[1.0].OH">
    <Description>0.01</Description>
  </Code>
  <Code value="OT"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code=UNAIDS:CL_MULTIP[1.0].OT">
    <Description>0.1</Description>
  </Code>
</CodeList>
<CodeList id="CL_DCT" agencyID="UNAIDS" version="1.0"
urn="urn:sdmx:org.sdmx.infomodel.codelist.CodeList=UNAIDS:CL_DCT[1.0]">
  <Name>Data Collection Tools</Name>
  <Code value="DHS"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code=UNAIDS:CL_DCT[1.0].DHS">
    <Description>Demographic and Health Survey (DHS)</Description>
  </Code>
  <Code value="MICS"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code=UNAIDS:CL_DCT[1.0].MICS">
    <Description>Multiple Indicator Cluster Survey (MICS)</Description>
  </Code>
</CodeList>
<CodeList id="CL_INDICATOR" agencyID="UNAIDS" version="1.0"
urn="urn:sdmx:org.sdmx.infomodel.codelist.CodeList=UNAIDS:CL_INDICATOR[1.0]">
  <Name>Indicator</Name>
  <Code value="3"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code=UNAIDS:CL_INDICATOR[1.0].3">
    <Description>Number of schools that provided life skills-based HIV
education in the last academic year</Description>
  </Code>
  <Code value="360"
urn="urn:sdmx:org.sdmx.infomodel.codelist.Code=UNAIDS:CL_INDICATOR[1.0].360">
    <Description>Blood safety</Description>
  </Code>
</CodeList>

```

5.2. Concepts

The IXF3 Metadata Message shares its concepts with the IXF3 Data Message. The unique use of Concepts in the Metadata Message document is to articulate what the metadata items represent, by referencing a Code List or data type. The following sample demonstrates three such metadata concepts.

```

<Concepts>
  <ConceptScheme id="CS_IND_REGI" agencyID="UNAIDS" version="1.0">
    <Name>Indicator Registry Concept Scheme</Name>
    <Concept id="C_WIM" version="1.0">
      <Name>What It Measures</Name>
      <TextFormat textType="String"/>
    </Concept>
    <Concept id="C_DCT" version="1.0" coreRepresentation="CL_DCT"
coreRepresentationAgency="UNAIDS">
      <Name>Data Collection Tools</Name>
    </Concept>
    <Concept id="C_MULTIPLIER" version="1.0" coreRepresentation="CL_MULTIPLIER"
coreRepresentationAgency="UNAIDS">
      <Name>Multiplier</Name>
    </Concept>
  </ConceptScheme>
</Concepts>

```

5.3. Metadata Structure Definitions

The Metadata Structure Definition section of the Metadata Message document is the only section unique to the IXF3 Metadata. There are two parts to the Metadata Structure Definition:

- Target Identifiers: These identify the entities to which the metadata will be applied. Entities can be Concepts, Code Lists, a particular code in a Code List, or individual Observations.
- Report Structure: This section relates the targets identified above with one or more metadata concepts. It also identifies or restricts the values those metadata can take by casting their type or relating them to existing Code Lists.

The content of Metadata Structure Definition section will be described in more detail here.

(a) Target Identifiers

The following is an extract shows the encoding of the Indicator Code List as a target Identifier.

```
<FullTargetIdentifier id="REGI_FT"
urn="urn:sdmx:org.sdmx.infomodel.metadatastructure.FullTargetIdentifier=UNAIDS:MSD_IR[1.0].REGI_FT">
  <Name>Indicator Registry Full Target Identifier</Name>
  <IdentifierComponent id="ID_COMP_IND"
urn="urn:sdmx:org.sdmx.infomodel.metadatastructure.IdentifierComponent=UNAIDS:MSD_IR[1.0].REGI_FT.ID_COMP_IND">
    <Name>Identifier Component for Indicator</Name>
    <TargetObjectClass>Codelist</TargetObjectClass>
    <RepresentationScheme representationSchemeType="Codelist"
representationScheme="CL_INDICATOR" representationSchemeAgency="UNAIDS" />
  </IdentifierComponent>
</FullTargetIdentifier>
```

(b) Report Structure

A sample Report Structure is provided below. This sample details several referential metadata types, and attributes them to the Indicator Target described in the previous section.

```
<ReportStructure id="IR_REP_STRUCT" target="REGI_FT"
urn="urn:sdmx:org.sdmx.infomodel.metadatastructure.ReportStructure=UNAIDS:MSD_IR[1.0].IR_REP_STRUCT">
  <Name>Registry Indicator Metadata Structure</Name>
  <MetadataAttribute conceptRef="C_WIM" usageStatus="Conditional"
conceptSchemeRef="CS_IND_REGI">
    <TextFormat textType="String" />
  </MetadataAttribute>
  <MetadataAttribute conceptRef="C_MULTIPLIER" usageStatus="Conditional"
conceptSchemeRef="CS_IND_REGI" representationScheme="CL_MULTIP" />
</ReportStructure>
```

6. Metadata Schema

The Metadata Schema can be generated from the IXF3 Metadata Message using the Metadata Editor tools provided by Metadata Technologies. The default generated SDMX Metadata Schema can be used after a modification to the target identifiers. The default cardinality of each identifier component is minimum occurrence of one and maximum occurrence of one. The IXF3 Metadata Schema requires that the minimum occurrence of each identifier component be zero and the maximum occurrence be unbounded.

7. Generic Metadata Report

The most common usage of the metadata report will be the association of metadata to Code Lists. This implies attachment of attributes to indicator definitions. The sample Generic Metadata Report below describes one indicator (codelist identifier “360”) and its attributes.

```
<MetadataSet>
  <MetadataStructureRef>MSD_INDICATORREGISTRY</MetadataStructureRef>
  <MetadataStructureAgencyRef>UNAIDS</MetadataStructureAgencyRef>
  <ReportRef>IR_REPORT_STRUCTURE</ReportRef>
  <AttributeValueSet>
    <TargetRef>FTI_REGI</TargetRef>
    <TargetValues>
      <ComponentValue component="IC_IND" object="Codelist">360</ComponentValue>
    </TargetValues>
    <ReportedAttribute conceptID="CONCEPT_WIM">
      <Value>To assess progress in ensuring a safe blood... </Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_DEFINITION">
      <Value>Percentage of donated blood units screened for HIV... </Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_NUMERATOR">
      <Value>Number of donated blood units screened for HIV in... </Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_DENOMINATOR">
      <Value>Total number of blood units donated</Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_DATATYPE">
      <Value>Percent</Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_COMPOSITEINDICATOR">
      <Value>No</Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_DCM">
      <Value>AT</Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_FREQUENCY">
      <Value>ANNUAL</Value>
    </ReportedAttribute>
    <ReportedAttribute conceptID="CONCEPT_EPIDEMICTYPE">
      <Value>CLL</Value>
    </ReportedAttribute>
  </AttributeValueSet>
</MetadataSet>
```

Note that this report conforms to the criteria and restrictions placed on it by the Metadata Structure Definition and Metadata Schema, which serve as the dictionary to de-reference the codes in the Metadata Report.

In another scenario, multiple codes in a Code List may be assigned to the same metadata attribute. The IXF3 encodes this with target values listing each indicator to which the unique attribute applies. In the example below, Indicators 92 and 27 are given “Count” data types, while indicator 30 is given a “Percent” data type.

```
<MetadataSet>
  <MetadataStructureRef>MSD_INDICATORREGISTRY</MetadataStructureRef>
  <MetadataStructureAgencyRef>UNAIDS</MetadataStructureAgencyRef>
  <ReportRef>IR_REPORT_STRUCTURE</ReportRef>
  <AttributeValueSet>
    <TargetRef>FTI_REGI</TargetRef>
    <TargetValues>
      <ComponentValue component="IC_IND" object="Codelist">92</ComponentValue>
      <ComponentValue component="IC_IND" object="Codelist">27</ComponentValue>
    </TargetValues>
    <ReportedAttribute conceptID="CONCEPT_DATATYPE">
      <Value>Count</Value>
    </ReportedAttribute>
  </AttributeValueSet>
  <AttributeValueSet>
    <TargetRef>FTI_REGI</TargetRef>
    <TargetValues>
      <ComponentValue component="IC_IND" object="Codelist">30</ComponentValue>
    </TargetValues>
    <ReportedAttribute conceptID="CONCEPT_DATATYPE">
      <Value>Percent</Value>
    </ReportedAttribute>
  </AttributeValueSet>
</MetadataSet>
```

8. Code Mapping & Reconciliation

It should be appreciated that there already exist numerous indicator databases, each with their own proprietary coding scheme. Moreover, it should be expected that any changes to those coding schemes would be highly resisted. It would therefore be prudent for an exchange format to support mapping and reconciling of differences in coding similar concepts across organizations with existing indicator databases. The SDMX data exchange format offers reconciliation of different codes and concepts thru its mapping syntax.

The excerpt below is an example of a Structure Set for mapping codes

```
<StructureSet id="REGMAPSET">
  <Name>IXF REGIONAL MAPPING SET</Name>
  <CodelistMap id="RCLM">
    <Name>REGIONAL MAPPING</Name>
    <CodelistRef>
      <AgencyID>UNAIDS</AgencyID>
      <CodelistID>CL_COUNTRY</CodelistID>
      <Version>1.0</Version>
    </CodelistRef>
    <TargetCodelistRef>
      <AgencyID>FAO</AgencyID>
      <CodelistID>GEOLOCATION</CodelistID>
      <Version>2.5</Version>
    </TargetCodelistRef>
    <CodeMap>
      <MapCodeRef>ZW</MapCodeRef>
      <MapTargetCodeRef>ZWE</MapTargetCodeRef>
    </CodeMap>
  </CodelistMap>
</StructureSet>
```

This structure in effect maps the country Zimbabwe, coded as “ZW” by UNAIDS, to FAO’s coding of the same country as “ZWA”. By sharing this mapping during data transfers from UNAIDS to FAO or vice versa, each organization can reference and interpret data in their own taxonomy.

9. IXF3 Process

The advantage of the IXF3 process over previous formats is in the flexibility of the data model, whereby the definition of the schema is dynamically generated from the indicator database. The business logic implemented to extract indicator definition and metadata ensure that only compliant SDMX schemas and IXF3 data are generated. Consequently, the schemas are used not just to validate the data, but also to share data definitions and update data brokerage services such as Indicator Registries. The entire process of preparing and generating data in the IXF3 format is described in Figure 3.

The first step to generate the Compact Schema is to create the IXF3 Data Message (links 1&2). The structure of the Data Message was described in detail in the first section of this document.

In the second step, the SDMX Offline Tools – which are freely available from Metadata Technologies - are used to create the baseline Compact Schema (links 4&5). The structure of the Compact Schema was described in detail in the second section of this document.

Once a Compact Schema is available, data can be extracted from the Producer Indicator Database (links 6&7) and validated against Compact Schema (links 8&9), and sent to the Receiving Indicator and Reporting Databases (links 10&11).

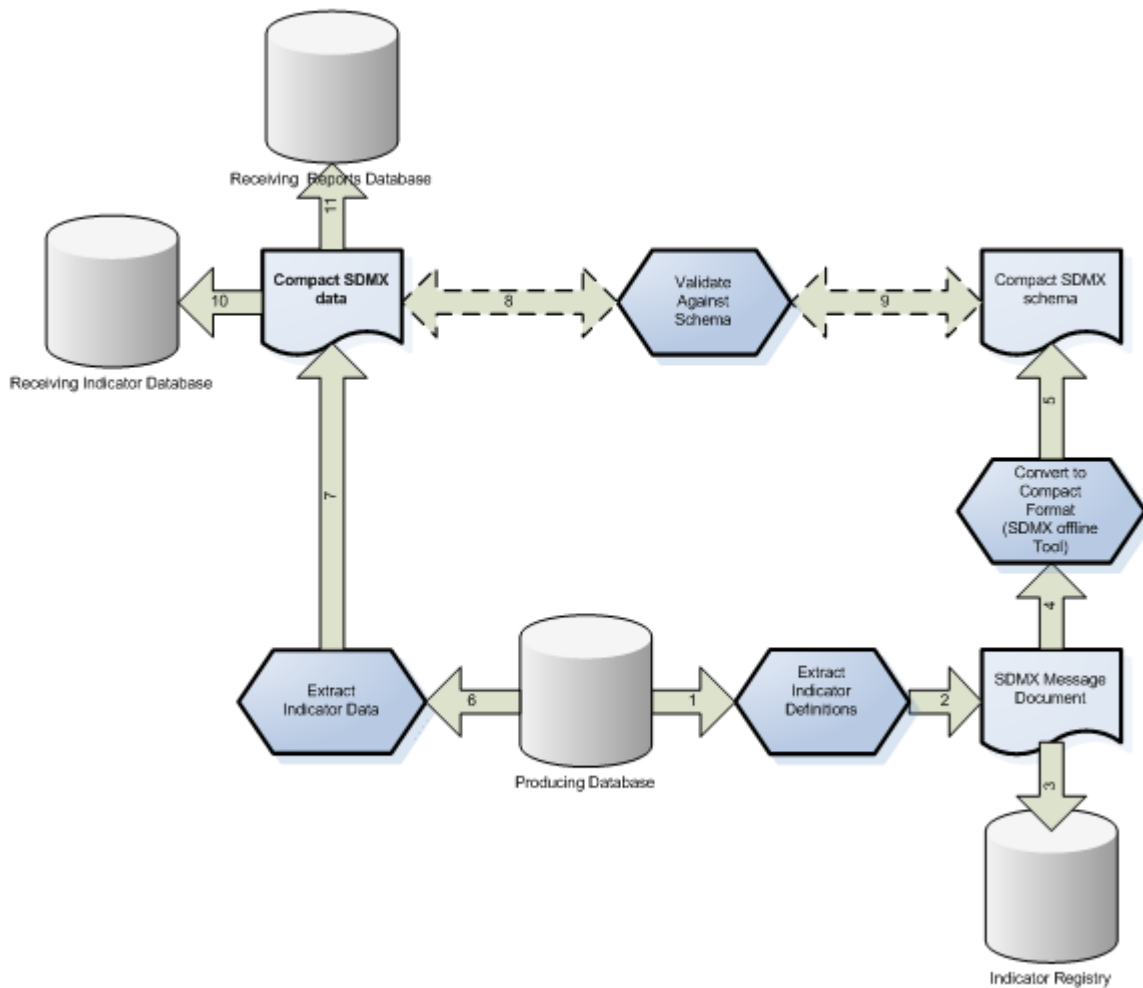


Figure 3. IXF3 Data Process

The Process to generate, validate, and publish IXF3 Metadata is identical to the IXF3 Data Process. Metadata definitions are normally extracted from the same producing database and translated into an IXF3 Metadata Message. An SDMX Metadata Schema is automatically generated from the messages, using freely available tools from Metadata Technologies. Finally, the metadata is extracted in generic metadata structure format, and validated against the schema.

10. Summary

More than just another schema definition, IXF3 is a definition of a process for producing schema and indicator data compliant with the SDMX standard, and fine-tuned for the exchange of geo-referenced indicator data with multiple levels of disaggregation.

The IXF3 inherits the ideas of the previous indicators exchange format in unbounded disaggregation of indicators, separation of data from metadata, and globally unique identification of indicators. The new version's improvements include further separation of structural definition from metadata/data, process and procedural based format of generating compliant indicator data, data exchange format with a compact footprint, complete conformance to the SDMX standard, and integration of various systems of the organization – indicator registry, reporting servers, data warehouse, etc. – with a common protocol of communication and exchange.

In addition to compatibility with international standards and ability to exchange data with conforming data producers, compliance with SDMX in IXF3 brings the added advantage of the numerous and freely available tools for authoring, publishing, and warehousing data.