CountryData
Technologies for Data Exchange

Developing a Data Model

Figures vs Data

1.1 Proportion of population below $1 (PPP) per day

Series	1990	1992	1994	1996	1998	1999	2000	2002	2006	2007	2008	2009	2011
Rwanda													
MDG Population below $1 (PPP) per day, percentage Last updated: 02 Jul 2012							74.6[1,3]		72.1[1,3]				63.2[1,3]
State of Palestine													
MDG Population below $1 (PPP) per day, percentage Last updated: 02 Jul 2012										0.4[1,2,3]		0.0[1,2,3]	
Thailand													
MDG Population below $1 (PPP) per day, percentage Last updated: 02 Jul 2012	11.6[1,3]	8.6[1,2]	4.1[1,2]	2.5[1,3]	2.1[1,3]	3.2[1,2]	3.0[1,3]	1.6[1,3]	1.0[1,3]		0.4[1,3]	0.4[1,3]	

- Figures by themselves are meaningless.
- For data to be usable, it must be properly described. The descriptions let users know what the data actually represent.

Developing a Data Model for SDMX Exchange

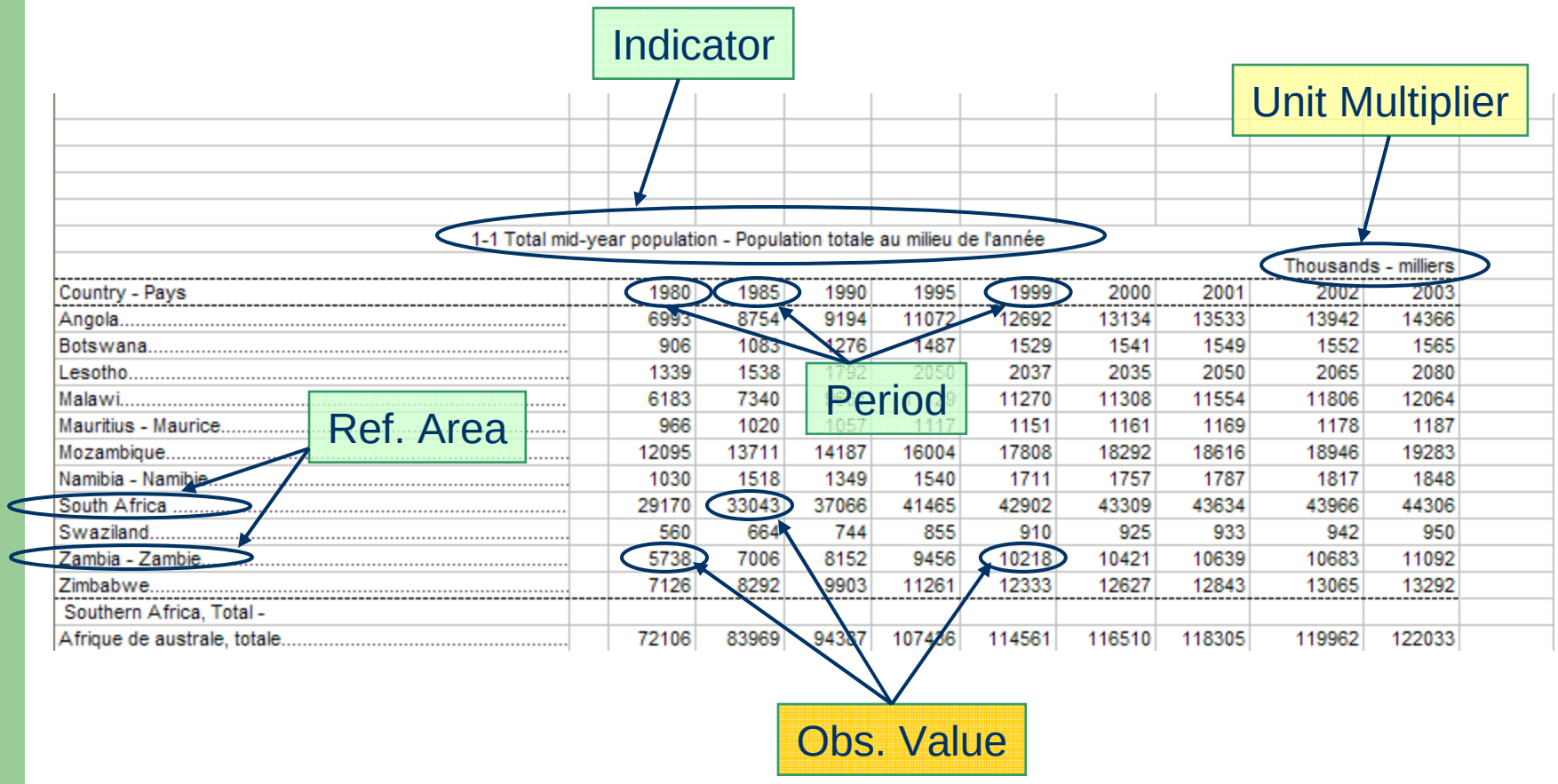
- In some aspects similar to a developing a relational database
- In SDMX, data model is represented by a Data Structure Definition.
  - The “shape” of SDMX DSD is roughly similar to star schema.
- To design a DSD, we first need to find *concepts* that identify and describe our data.

Concept

- “A unit of knowledge created by a unique combination of characteristics”*
- Each concept describes something about the data.
- Concepts should express all relevant data characteristics.

* Source: **Metadata Common Vocabulary**

Identifying Concepts



Country - Pays	1980	1985	1990	1995	1999	2000	2001	2002	2003
Angola	6993	8754	9194	11072	12692	13134	13533	13942	14366
Botswana	906	1083	1276	1487	1529	1541	1549	1552	1565
Lesotho	1339	1538	1792	2050	2037	2035	2050	2065	2080
Malawi	6183	7340	8577	9840	11270	11308	11554	11806	12064
Mauritius - Maurice	966	1020	1057	1117	1151	1161	1169	1178	1187
Mozambique	12095	13711	14187	16004	17808	18292	18616	18946	19283
Namibia - Namibie	1030	1518	1349	1540	1711	1757	1787	1817	1848
South Africa	29170	33043	37066	41465	42902	43309	43634	43966	44306
Swaziland	560	664	744	855	910	925	933	942	950
Zambia - Zambie	5738	7006	8152	9456	10218	10421	10639	10683	11092
Zimbabwe	7126	8292	9903	11261	12333	12627	12843	13065	13292
Southern Africa, Total - Afrique de australe, totale	72106	83969	94387	107436	114561	116510	118305	119962	122033

Dimension

- Which of the concepts are used to identify an observation?
  - Indicator
  - Reference area
  - Period
- When all 3 are known, we can unambiguously locate an observation in the table.
- In SDMX such concepts are called **dimensions**.
  - A dimension is similar in meaning to a database table's primary key field.

Measure

- Observation Value represents a concept that describes the actual values being transmitted.
- In SDMX, such a concept is called **measure**.
- Measure is usually represented by concept **OBS_VALUE**.

Attribute

- In our example, **Unit Multiplier** represent additional information about observations.
- This concept is not used to identify a series or observation.
- Such concepts in SDMX are called **attributes**.
  - Not to be confused with XML attributes!
  - Similar to a database table's non-primary key fields.

Dimension or Attribute?

- Choosing the role of a concept has profound implications on the structure of data.
- Concepts that identify data, should be made dimensions. Concepts that provide additional information about data, should be made attributes.
- If a concept is a dimension, it is possible to have time series that are different only in the value of this concept.

Special Dimensions

- **TIME** dimension provides observation time. If a DSD describes time series data, it must have one TIME dimension.
- **FREQUENCY** dimension describes interval between observations. If there is a TIME dimension, one other dimension must be marked as FREQUENCY dimension.

Group Exercise 1: Identifying concepts

- Identify concepts in the table
- Mark each concept as:
  - Dimension
  - Time Dimension
  - Measure
  - Attribute

Representation

- When data are transferred, its descriptor concepts must have valid values.
- A concept can be
  - Coded
  - Un-coded with format
  - Un-coded free text

Code

- “A language-independent set of letters, numbers or symbols that represent a concept whose meaning is described in a natural language.”
- A sequence of characters that can be associated with descriptions in any number of languages.
  - Descriptions can be easily updated without disrupting mappings or other components of data exchange.

Code List

- “A predefined list from which some statistical coded concepts take their values.”
- A code list enumerates all possible values for a concept or set of concepts
  - Sex code list
  - Country code list
  - Indicator code list, etc

Code List: Some Examples

Code	Description
AG_LND_FRST	Proportion of and area covered by forest
DC_AID_LLDC	ODA received in landlocked developing countries
DC_AID_LLDCG	ODA received in landlocked developing countries as a percentage of their GNI
DC_AID_SIDS	ODA received in small island developing states
DC_AID_SIDSG	ODA received in small island developing states as a percentage of their GNI
DC_HPC_COMR	Debt relief committed under HIPC Initiative, cumulative
DC_HPC_MDRI	Debt relief delivered in full under MDRI initiative, cumulative

Code	English Description	French Description
1	Africa	Afrique
2	America, North	Amérique du Nord
3	America, South	Amérique du Sud
4	Asia	Asie
5	Europe	Europe
6	Oceania	Océanie
9	Continent not defined	Continent non précisé

Code	Description
ABW	Aruba
AFG	Afghanistan
AGO	Angola
AIA	Anguilla
ALA	Åland Islands
ALB	Albania
AND	Andorra
ANT	Netherlands Antilles
ARE	United Arab Emirates

Code	Description
F	Female
M	Male
NA	Not applicable
T	Both sexes

Un-coded Concepts

- Can be free-text: Any valid text can be used as a value for the concept.
  - Footnote
- Can have their format specified
  - Passport number: 10 letters and digits
  - Postal code: 5 digits
  - Birth rate: floating point number

Representation of concepts in SDMX

- **Dimensions** must be either coded or have their format specified.
  - Free text is not allowed.
- **Attributes** can be coded or un-coded; format may optionally be specified.
- **Measures** can be coded or un-coded; format may optionally be specified.

Group Exercise 2: Representation

- Working with your model, determine representation for each concept
  - Coded, formatted, free-text
- Develop code lists and formats for your concepts
  - Use any approach for your codes

Importance of Data Model

- Data model, represented by DSD, defines what data can be encoded and transmitted.
- Flaws in a DSD may have significant adverse impact on data exchange
  - Missing concepts
  - Incorrect role of concepts
  - Un-optimized model

Data Structure Definition: Design Considerations

- Parsimony
  - No redundant dimensions
  - Attributes attached at the highest possible level
- Simplicity
  - “Mixed dimensions” are used to minimize the number of dimensions
  - Can help avoid invalid combinations of key values
  - Should be used with caution
  - Opposite of “purity”

Source: **Guidelines for the Design of SDMX Data Structure Definitions**

Data Structure Definition: Design Considerations (2)

- Unambiguousness
  - Data must retain meaning outside usual context
  - Do you supply country code with your data?
- Density
  - Data should be supplied for most or all of possible combinations of key values
  - Related to simplicity
- Orthogonality
  - Meaning of the value of concepts should be independent of each other
  - Helps avoid ambiguity

Source: **Guidelines for the Design of SDMX Data Structure Definitions**

DSD Design Tradeoffs: Simplicity vs Purity

- A *simple* model may increase maintenance costs
  - Codes frequently need to be added
- A *pure* model may increase the number of errors due its lower *density*
  - Some combinations of key values are impossible in reality but valid from the DSD point of view
- Splitting the *pure* model into multiple DSDs to improve *density* may increase maintenance costs
  - Multiple DSDs and other artefacts need to be maintained