METADATA MANAGEMENT
Using DDI and Colectica

EDDI 2015, Copenhagen
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00</td>
<td>Welcome</td>
</tr>
<tr>
<td>09:15</td>
<td>Introduction to Metadata, the DDI Information Model, and Colectica</td>
</tr>
<tr>
<td>09:45</td>
<td>Hands-on: Document a dataset</td>
</tr>
<tr>
<td>10:30</td>
<td>Break</td>
</tr>
<tr>
<td>11:00</td>
<td>Hands-on: Publish Metadata</td>
</tr>
<tr>
<td>11:30</td>
<td>Hands-on: Study descriptions</td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch</td>
</tr>
<tr>
<td>13:30</td>
<td>Documenting Surveys and Data Collection</td>
</tr>
<tr>
<td>14:00</td>
<td>Hands-on: Questions and surveys</td>
</tr>
<tr>
<td>15:00</td>
<td>Break</td>
</tr>
<tr>
<td>15:30</td>
<td>Documenting longitudinal data</td>
</tr>
<tr>
<td>16:30</td>
<td>Recap</td>
</tr>
<tr>
<td>17:00</td>
<td>The End</td>
</tr>
<tr>
<td>18:00</td>
<td>Informal Get-Together at TapHouse</td>
</tr>
</tbody>
</table>
Introductions

- Colectica – a Brief History
  - Jeremy Iverson
    - Wisconsin Longitudinal Study
  - Dan Smith
    - IBM, University of Minnesota
First: A Quick Survey

bit.ly/eddi2015-workshop
Introduction to Metadata

1. Usefulness of standardized metadata
2. Non-technical introduction to DDI
3. Opportunities created using standardized metadata
4. Case Studies
What do we mean by “metadata”?
Study Concepts measures about Universes made up of?

Survey Instruments using

Questions

Universe

<ddd>
Questions made up of Variables with values of Categories/Codes and Numbers resulting in Data Files.
DDI provides a vocabulary for this
What do we mean by “metadata”

- Information in three main areas
  - Survey design
  - Data documentation
  - Data lifecycle documentation
Data Documentation Initiative

- Open standard for describing data
  - Focus on social, behavioral, and economic sciences
  - XML
- Users
  - National Statistical Institutes
  - University Research Groups
  - Data Archives
  - Other Data Producers and Publishers
- Since 1995
DDI Content

**Study**
- Group
- StudyUnit
- Quality

**Survey**
- DataCollection
- Instrument
- ControlConstructs
- Question

**Data**
- PhysicalInstance
- DataRelationship
- Variable

**Foundational**
- Concept
- Universe
- Organization
- CodeList
- CategoryList
- Category
Why Metadata?

- So researchers can understand the data and its context
- Adds credibility to the data
The Benefits of a Data Documentation Standard

- Share tools
- Share funding
- Benefit from other organizations’ investments
# Harmonization and Reuse

<table>
<thead>
<tr>
<th>Reuse any metadata element</th>
<th>Discover relationships among items</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Question banks</td>
<td>• Which datasets are based on the same questions?</td>
</tr>
<tr>
<td>• Variables banks</td>
<td>• Which datasets have common variables</td>
</tr>
<tr>
<td>• Classification banks</td>
<td>• Find any other relationships among items</td>
</tr>
</tbody>
</table>
Metadata-Driven Processes

- **DRY: Don’t Repeat Yourself**
  - Define things once and create multiple outputs from that canonical information

- Generate documentation as a byproduct of the process

- Populate CAI systems
  - Out of the box: Blaise, CASES, CSPro, RedCAP, queXML
  - Custom systems: possible with addins
Some Use Cases

- Statistics New Zealand
- Statistics Denmark
- MIDUS
- CLOSER
Real-world Examples
<table>
<thead>
<tr>
<th>Fields</th>
<th>Questions</th>
<th>Categories</th>
<th>TextDomain</th>
<th>NumericDomain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>&quot;What is your name?: STRING[20]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>&quot;What is your sex?: (Male, Female)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>&quot;What is your age (in years)?: 0..120</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PaidJob</td>
<td>&quot;Do you have a paid job?: (Yes, No)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KindWork</td>
<td>&quot;What kind of work do you do?: STRING[40]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>&quot;What is the distance to your work (in km)?: 0..300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>&quot;How do you travel to work?: SET [3] OF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Population in Denmark

## Population at the First Day of the Quarter

**Time:** 2013Q2  |  **Unit:** Number

<table>
<thead>
<tr>
<th>Category</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2,480,576</td>
<td>2,825,260</td>
<td>5,605,836</td>
</tr>
<tr>
<td>0-9 years</td>
<td>328,422</td>
<td>312,500</td>
<td>640,922</td>
</tr>
<tr>
<td>10-19 years</td>
<td>354,242</td>
<td>337,050</td>
<td>691,292</td>
</tr>
<tr>
<td>20-29 years</td>
<td>348,907</td>
<td>338,939</td>
<td>687,846</td>
</tr>
<tr>
<td>30-39 years</td>
<td>348,614</td>
<td>347,209</td>
<td>695,823</td>
</tr>
<tr>
<td>40-49 years</td>
<td>411,408</td>
<td>403,416</td>
<td>814,824</td>
</tr>
<tr>
<td>50-59 years</td>
<td>365,489</td>
<td>363,646</td>
<td>729,135</td>
</tr>
<tr>
<td>60-69 years</td>
<td>342,568</td>
<td>352,122</td>
<td>694,690</td>
</tr>
<tr>
<td>70-79 years</td>
<td>195,802</td>
<td>223,620</td>
<td>419,422</td>
</tr>
<tr>
<td>80-89 years</td>
<td>74,692</td>
<td>116,781</td>
<td>191,473</td>
</tr>
<tr>
<td>90-99 years</td>
<td>10,275</td>
<td>29,163</td>
<td>39,438</td>
</tr>
<tr>
<td>100 years and more</td>
<td>157</td>
<td>814</td>
<td>971</td>
</tr>
</tbody>
</table>
Why DDI?

- Document the full data lifecycle in a standard manner
Why DDI?

- Reusable metadata definitions
- No copy and paste
- Just point to an item

- Including metadata by reference helps avoid error and confusion
- Reuse is explicit
Metadata Banks

- DDI 3 supports the concept of metadata registries
Metadata Banks

DDI 3 supports the concept of metadata registries

**Reuse any metadata element**
- Question banks
- Variables banks
- Classification banks

**Discover relationships among items**
- Which datasets are based on the same questions?
- Which datasets have common variables
- Find any other relationships among items
Multilingual Support

- Most text fields can specify what language the content is in
- These fields can be repeated to represent multiple languages
Colectica Overview
Colectica Overview

- Standards-based metadata management
  - Survey design
  - Data documentation
  - Data lifecycle documentation
## The Colectica Platform

| **Colectica Desktop Applications** | • Create, ingest, manage, and edit metadata  
|                                     | • Usable DDI 3 for end-users |
| **Colectica Repository**           | • Centralized, authoritative, metadata store built on DDI 3, ISO 11179, and Web Service standards |
| **Colectica Portal**               | • Search and browse metadata from Colectica Repository  |
| **Colectica SDK**                  | • Allows programmers to work with DDI 3 and interact with Colectica Repository  |
| **Colectica Toolkit**              | • Command line utilities to perform specific tasks  |
How to get information into DDI?

- Manually enter information
- **Import** *(Colectica or Stat/Transfer)*
  - Excel
  - Delimited Files
  - SPSS
  - Stata
- Integrate custom data sources
- Blaise
- CASES
- RedCAP
- queXML
Publish from Colectica

Generate Paper Documentation

- Survey instruments, code lists, variable descriptions
- PDF, Word formats

Publish to Colectica Portal

- Full study descriptions
- Interactive browsing and discovery

Custom Publications

- Use Colectica Repository as a data source
- Custom web sites, paper formats, or other formats
Populate CAI systems

- Out of the box: Blaise, CASES, CSPro, RedCAP, queXML
- Custom systems: possible with addins
Common Patterns in DDI

- Identification
- Naming
- Packaging
Common Elements

- Identification
  - Agency ID
  - Identifier
  - Version number
Common Elements: Descriptive

- Either
  - Name
  - Label
  - Description

- Or
  - Citation/Title (Dublin Core style)
DDI 3 Packaging

- **Fragment**
- OR: Modules + Schemes + Packages + Redundancy
In-depth: Data

Study
- Group
- StudyUnit
- Quality

Survey
- DataCollection
- Instrument
- ControlConstructs
- Question

Data
- PhysicalInstance
- DataRelationship
- Variable
- StatisticalSummary

Foundational
- Concept
- Universe
- Organization
- CodeList
- CategoryList
- Category
Data

- Dataset
  A data file, database, or other source of data

- Data Layout
  Describes the layout of a data file

- Variable
  A column in a dataset

- Variable Statistics
  Summary statistics for a single variable

- NCube
  Aggregate data

- Represented Variable
  Describes the common information of one or more harmonized variables...

- Conceptual Variable
  Describes the common information of one or more harmonized variables
### PhysicalInstance (Dataset)

A dataset titled `WorldPhones` with 7 observations of 7 variables. The table includes columns for `row.names`, `N.Amer`, `Europe`, `Asia`, `S.Amer`, `Oceania`, `Africa`, and `Mid.Amer`.

<table>
<thead>
<tr>
<th>row.names</th>
<th>N.Amer</th>
<th>Europe</th>
<th>Asia</th>
<th>S.Amer</th>
<th>Oceania</th>
<th>Africa</th>
<th>Mid.Amer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1951</td>
<td>45939</td>
<td>21574</td>
<td>2876</td>
<td>1815</td>
<td>1646</td>
<td>89</td>
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<tr>
<td>2</td>
<td>1956</td>
<td>60423</td>
<td>29990</td>
<td>4708</td>
<td>2568</td>
<td>2366</td>
<td>1411</td>
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<tr>
<td>3</td>
<td>1957</td>
<td>64721</td>
<td>32510</td>
<td>5230</td>
<td>2695</td>
<td>2526</td>
<td>1546</td>
</tr>
<tr>
<td>4</td>
<td>1958</td>
<td>68484</td>
<td>35218</td>
<td>6662</td>
<td>2845</td>
<td>2691</td>
<td>1663</td>
</tr>
<tr>
<td>5</td>
<td>1959</td>
<td>71799</td>
<td>37598</td>
<td>6856</td>
<td>3000</td>
<td>2868</td>
<td>1769</td>
</tr>
<tr>
<td>6</td>
<td>1960</td>
<td>76036</td>
<td>40341</td>
<td>8220</td>
<td>3145</td>
<td>3054</td>
<td>1905</td>
</tr>
<tr>
<td>7</td>
<td>1961</td>
<td>79831</td>
<td>43173</td>
<td>9053</td>
<td>3338</td>
<td>3224</td>
<td>2005</td>
</tr>
</tbody>
</table>
Variable

<table>
<thead>
<tr>
<th>row.names</th>
<th>N.Amer</th>
<th>Europe</th>
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<td>43173</td>
<td>9053</td>
<td>3338</td>
<td>3224</td>
<td>2005</td>
</tr>
</tbody>
</table>
Statistical Summary

<table>
<thead>
<tr>
<th>row.names</th>
<th>N.Amer</th>
<th>Europe</th>
<th>Asia</th>
<th>S.Amer</th>
<th>Oceania</th>
<th>Africa</th>
<th>Mid.Amer</th>
</tr>
</thead>
<tbody>
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<td>79831</td>
<td>43173</td>
<td>9053</td>
<td>3338</td>
<td>3224</td>
<td>2005</td>
</tr>
</tbody>
</table>

```r
> summary(worldPhones[3])
Min. 1st Qu.  Median     Mean 3rd Qu.     Max.
64720  64720  64720  64720  64720  64720
```
Hands-on: Document a Dataset

- Have your own?
- Or, try:
Finding the Details
Finding the Details

- Sources
  - DDI Documentation
  - Colectica (or other tools)
  - XML Schemas
DDI Documentation

Available at http://www.ddialliance.org/
DDI in Colectica Reader and Designer

EDDI 2014

XML

```xml
<Fragment xmlns="ddi:instance:3_2">
  <StudyUnit isUniversallyUnique="true" versionDate="2014-11-21T17:46:12.811Z">
    <URN xmlns="ddi:reusable:3_2">urn:ddi:int.example:dca8de27-c534-4227-bd1</URN>
    <Agency xmlns="ddi:reusable:3_2">int.example</Agency>
    <ID xmlns="ddi:reusable:3_2">dca8de27-c534-4227-bdb4-84c54c6cf9f5</ID>
    <Version xmlns="ddi:reusable:3_2">1</Version>
    <Title>
      <String xml:lang="en-US">EDDI 2014</String>
    </Title>
    <Citation>
      <String xml:lang="en-US">Welcome to EDDI 2014.</String>
    </Citation>
    <Abstract xmlns="ddi:reusable:3_2">
      <Content xml:lang="en-US">Welcome to EDDI 2014.</Content>
    </Abstract>
  </StudyUnit>
</Fragment>
```
In-depth: Data

Study
- Group
- StudyUnit
- Quality

Survey
- DataCollection
- Instrument
- ControlConstructs
- Question

Data
- PhysicalInstance
- DataRelationship
- Variable
- StatisticalSummary

Foundational
- Concept
- Universe
- Organization
- CodeList
- CategoryList
- Category
Concept
   An abstract idea or general notion

Category
   A class of people or things

Code List
   A list of categories, each with an assigned value

Universe
   A population being studied

Organization
   An institution, company, or other group
Classifications in DDI
Classifications in DDI

- DDI 2 and DDI 3 do not directly support this
- But other things do:
  - Neuchâtel
  - GSIM
- DDI 3 is quite extensible
Copenhagen Mapping

- Map the Neuchâtel-GSIM classifications model to DDI 3.2
- Built around:
  - CodeLists
  - Categories
  - Groups of items with well-defined terms from controlled vocabularies
- DDI 3.3 should support this model without extensions
Metadata Publication

PDF
Repository
Web
Publish to PDF
Publish to a Repository
Publish to the Web
Hands-on: Publish

- Publish to PDF
- Publish to the Web
Repository Information

- Hostname: workshop.colectica.org
- User Name: workshop
- Password: iassist
DDI Versioning
Version Propagation

- Project
  - ResourcePackage
    - CategoryScheme
    - CodeScheme
  - Series
    - StudyUnit
    - PhysicalInstance
    - Variable
- Category
Colectica takes care of this for you
In-depth: Study Lifecycle

**Study**
- Group
- StudyUnit
- Quality

**Survey**
- DataCollection
- Instrument
- ControlConstructs
- Question

**Data**
- PhysicalInstance
- DataRelationship
- Variable

**Foundational**
- Concept
- Universe
- Organization
- CodeList
- CategoryList
- Category
Colectica lets you document both individual and repeated studies.

- **Study**
  - A single research project
- **Series**
  - A repeated set of studies
- **Archive**
  - Information about how a study is archived for long term preservation
Science Deserves Better: The Imperative to Share Complete Replication Files

AUTHOR(S): Allan Dafoe

ISPS ID: D108

RELATED PUBLICATIONS: Science Deserves Better: The Imperative to Share Complete Replication Files

KEYWORD(S): Replication

RESEARCH DESIGN: Observational

DATA TYPE: Survey, Administrative

DATA SOURCES: Author

DATA SOURCE INFORMATION: Author.

(1) Data is of scholars responding to a survey about their experiences trying to replicate published quantitative work.
(2) Observations are articles published in APSR or AJPS in recent years. Variables code whether replication files are available.


FIELD DATE: December 1, 2013

LOCATION: United States
EDDI 2015

A study of EDDI workshop attendees in Copenhagen
### Universe (Population)

<table>
<thead>
<tr>
<th>DATA SOURCE INFORMATION:</th>
<th>Author.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Data is of scholars responding to a survey about their experiences trying to replicate published quantitative work. (2) Observations are articles published in APSR or AJPS in recent years. Variables code whether replication files are available. Suggested citation: &quot;Dafoe, Allan (2014). Replication Materials for: 'Science Deserves Better: The Imperative to Share Complete Replication Files,' <a href="http://hdl.handle.net/10079/66t1gdc">http://hdl.handle.net/10079/66t1gdc</a>. ISPS Data Archive.&quot;</td>
</tr>
<tr>
<td>FIELD DATE:</td>
<td>December 1, 2013</td>
</tr>
<tr>
<td>LOCATION:</td>
<td>United States</td>
</tr>
<tr>
<td>UNIT OF OBSERVATION:</td>
<td>(1) scholars who attempted replications, (2) published articles</td>
</tr>
<tr>
<td>SAMPLE SIZE:</td>
<td>(1) 190, (2) 342</td>
</tr>
<tr>
<td>INCLUSION/EXCLUSION:</td>
<td>(1) Three groups of scholars were surveyed about their experiences attempting to replicate statistical studies: students from the author’s PhD methods class, students from Gary King’s PhD methods class, and subscribers to the Political Methodology listserve, (2) Data was collected on the availability of replication files for recent publications in the two top political science journals, the American Political Science Review (APSR) since 2010 and the American Journal of Political Science (AJPS) since 2009.</td>
</tr>
</tbody>
</table>
Universe (Population)

- People in this room, right now
Group (Series)
Group (Series)

- European DDI User Conference
  - IASSIST 2012
  - IASSIST 2013
  - IASSIST 2014
  - IASSIST 2015
  - IASSIST 2016
Hands-on: Document a Study

- Have your own?
- Or, try:
In-depth: Surveys

Study
- Group
- StudyUnit
- Quality

Survey
- DataCollection
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- Question

Data
- PhysicalInstance
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Foundational
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Data Collection

- Instrument
  A survey or other data capture instrument
- Question
  A question that can appear in a survey instrument
- Question Grid
  A question grid that can appear in a survey instrument
- Question Block
  A question block that can appear in a survey instrument
- Statement
  A statement that can appear in a survey instrument
- Instruction
  Information for an interviewer or respondent
- Computation
  Source code that performs calculations, validation, or other actions
- Sequence
  A set of items in an instrument, used for grouping, paging, or other organization

Data Collection
Describes the processes and methods used to collect data
Questions

- What is your name?
- How did you get here?
A Question in DDI

<d:QuestionItem>
  <r:Agency>example.org</r:Agency>
  <r:ID>q1</r:ID>
  <r:Version>1</r:Version>

  <d:QuestionItemName xml:lang="en">
    <r:String>name</r:String>
  </d:QuestionItemName>

  <d:QuestionText audienceLanguage="en">
    <d:LiteralText>
      <d:Text>What is your name?</d:Text>
    </d:LiteralText>
  </d:QuestionText>

  <d:TextDomain minLength="1"/>
</d:QuestionItem>
A Question in DDI

<d:QuestionItem>
  <r:Agency>example.org</r:Agency>
  <r:ID>q1</r:ID>
  <r:Version>1</r:Version>

  <d:QuestionItemName xml:lang="en">
    <r:String>name</r:String>
  </d:QuestionItemName>

  <d:QuestionText audienceLanguage="en">
    <d:LiteralText>
      <d:Text>What is your name?</d:Text>
    </d:LiteralText>
  </d:QuestionText>

  <d:TextDomain minLength="1"/>
</d:QuestionItem>
Other Response Types

- Text
- Numeric
- DateTime
- Code
Question

☐ Does your organization currently use DDI for any purpose?
  ☐ Yes
  ☐ No
B19. [B1PB19] Are you married, separated, divorced, widowed, or never married?

1. MARRIED
2. SEPARATED
3. DIVORCED
4. WIDOWED
5. NEVER MARRIED
6. DON'T KNOW/NOT SURE
7. REFUSED
8. INAPP

B20. [B1PB20] How many times have you been married altogether?

# TIMES MARRIED
97. DON'T KNOW/NOT SURE
98. REFUSED
99. INAPP

B21MO. [B1PB21M] In what month and year were you married (for the first time)?

(MONTH)

1. JANUARY
2. FEBRUARY
3. MARCH
4. APRIL
5. MAY
6. JUNE
7. JULY
8. AUGUST
9. SEPTEMBER
10. OCTOBER
11. NOVEMBER
12. DECEMBER
97. DON'T KNOW/NOT SURE
98. REFUSED
99. INAPP
Let’s make a quick survey for the workshop
If the organization uses DDI, ask:

Which parts?

- Survey
- Data
- Study Lifecycle
- Other
Control Constructs

Question: What is your age?

IfThen:
- Age $\geq 16$
  - 3 items
- $(\text{Age} \neq \text{EMPTY}) \text{ AND } (\text{Age} < 14)$
  - 1 item

Sequence:
- Job = Yes
  - 3 items
- $(\text{Job} \neq \text{EMPTY}) \text{ AND } (\text{Job} = \text{No})$
  - 1 item
Demonstration
Hands-on: Make a Survey

☐ Have your own?

☐ Or, try:
Longitudinal Data
Another Quick Survey

DDI Model for Repeated Data

- Variable
- RepresentedVariable
- ConceptualVariable
Recap

- Colectica and DDI let you document:
  - Data
  - Surveys
  - Study Lifecycle
- Publish to PDF and the Web
“Informal Gathering”

Location: [Taphouse](#)
Feedback

bit.ly/eddi2015-workshop-feedback
Thank You

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Photo by johnanes on flickr