Managing Confidentiality and Provenance across Mixed Private and Publicly-Accessed Data and Metadata

Lars Vilhuber[1] John M. Abowd[1] William Block[2]
Carl Lagoze[3] Jeremy Williams[2]

[1]Labor Dynamics Institute, ILR,

[2]Cornell Institute for Social and Economic Research,

[3]University of Michigan

November 2013, FCSM 2013

Introduction

NCRN

- This work is part of the NSF Census Research Network (NCRN) - Cornell Node (”Integrated Research Support, Training and Data Documentation”)
- Funded by NSF Grant #1131848.
- For more information, see www.ncrn.cornell.edu.

Introduction

Overview of work

- Basic program outlined in Abowd, Vilhuber, and Block (PSD 2012) [3] and Lagoze, Block, Williams, Abowd, and Vilhuber, (IDCC 2013) [8]
- PROV extension described in more detail in Lagoze, Williams, Vilhuber (Metadata and Semantics Research Conference, November 2013) and Lagoze et al (European DDI User Confernce, December 2013) [9]

Introduction

Some facts that motivated us

Stating the problem in the U.S. case

CED^{2}AR: A proposed solution
What is DDI
DDI extension for confidentiality protection
DDI extension for provenance tracing

Replication of research results

Critical element of science

- Replication of methods, data inputs, computational environment is a critical element of the scientific approach
- Journals, funding agencies (in the U.S.) have been moving to making archiving of inputs to scientific results more robust, even mandatory

Not a new problem

Econometrica

“In its first issue, the editor of Econometrica (1933), Ragnar Frisch, noted the importance of publishing data such that readers could fully explore empirical results. Publication of data, however, was discontinued early in the journal’s history. [...] The journal arrived full-circle in late 2004 when Econometrica adopted one of the more stringent policies on availability of data and programs.

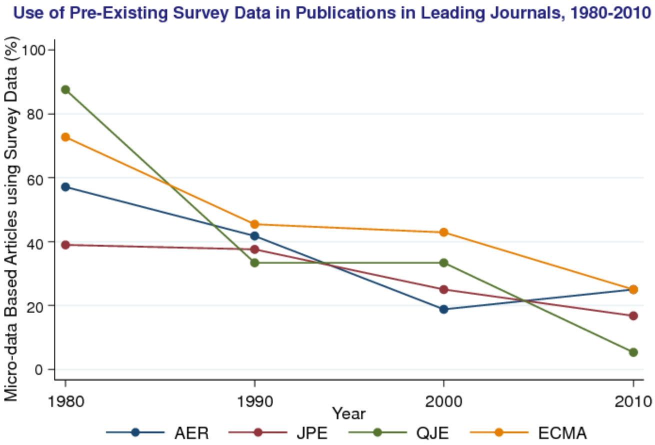
http://www.econometricsociety.org/submissions.asp#4 as cited in Anderson et al (2005)

Problem will become worse

Increased use of restricted-access data

- Today's young scholars pursue research programs that mandate inherently identifiable data
  - Geospatial relations,
  - Exact genome data,
  - Networks of all sorts,
  - Linked administrative records
- These researchers acquire authorized, generally unfettered, restricted access to the confidential, identifiable data and perform their analyses in secure environments.
- Archiving (curation) of input data is complicated
- Knowledge discovery is complicated

Decline in the use of classic public-use data

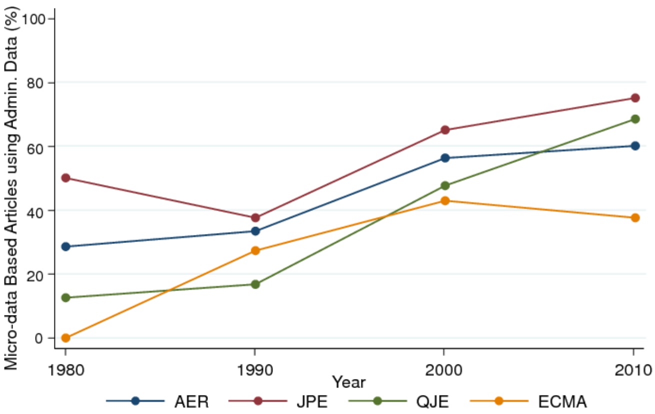


Use of Pre-Existing Survey Data in Publications in Leading Journals, 1980-2010

Note: "Pre-existing survey" datasets refer to micro surveys such as the CPS or SIPP and do not include surveys designed by researchers for their study. Sample excludes studies whose primary data source is from developing countries.

Increase in the use of administrative data in economics

Use of Administrative Data in Publications in Leading Journals, 1980-2010



Note: "Administrative" datasets refer to any dataset that was collected without directly surveying individuals (e.g., scanner data, stock prices, school district records, social security records). Sample excludes studies whose primary data source is from developing countries.

Not limited to economics

Nature, 2012

“Many of the emerging ‘big data’ applications come from private sources that are inaccessible to other researchers. The data source may be hidden, compounding problems of verification, as well as concerns about the generality of the results.”

(Huberman, Nature 482, 308 (16 February 2012) doi:10.1038/482308d)

Other domains

- Biology (genetics data, chemical compounds)
- Computer science (search records, single-firm examples)

Introduction

Some facts that motivated us

Stating the problem in the U.S. case

CED^{2}AR: A proposed solution
- What is DDI
- DDI extension for confidentiality protection
- DDI extension for provenance tracing

Why we think there is a problem

Core issues

a. Insufficient curation (starting with archiving)
b. No way to reference data (unique identifiers)
c. No consistent way to learn about the data (metadata dissemination)
d. Weak or non-existent provenance tracing

Generalized problem

Multiple data sources in the US

- U.S. Census Bureau (RDC) ▸ more
- Internal Revenue Service (confidential, public-use) ▸ more
- Bureau of Labor Statistics (confidential, public-use data) ▸ more

Present elsewhere?

- Canada:
  - Centre for Data Development and Economic Research (CDER: RDC-like for business data) ▸ more
  - better: Canadian RDC network ▸ more
- France: Réseau Quetelet ▸ more , Centre d'accés sécurisé distant aux données (CASD)
- Germany: IAB

Introduction

Some facts that motivated us

Stating the problem in the U.S. case

CED^{2}AR: A proposed solution

- What is DDI
- DDI extension for confidentiality protection
- DDI extension for provenance tracing

Comprehensive Extensible Data Documentation and Access (CED^{2}AR)

Core

We develop the core of a method for solving the data archive and curation problem that confronts the custodians of restricted-access research data and the scientific users of such data. Our solution recognizes the dual protections afforded by physical security and access limitation protocols, and allows for much improved provenance tracing.

Proposed solution

Extensible framework

- Based on existing standards (Data Documentation Initiative, DDI) with extension to accomodate disclosure protection mechanisms and provenance tracing

Proposed solution

Extensible framework

- Based on existing standards (Data Documentation Initiative, DDI) with extension to accomodate disclosure protection mechanisms and provenance tracing
- Connectors (import/export) to other sources and standards

Proposed solution

Extensible framework

- Based on existing standards (Data Documentation Initiative, DDI) with extension to accomodate disclosure protection mechanisms and provenance tracing
- Connectors (import/export) to other sources and standards
- To be filled by multiple sources of metadata (some the curators/owners, others “crowd-sourced”)

Proposed solution

Extensible framework

- Based on existing standards (Data Documentation Initiative, DDI) with extension to accomodate disclosure protection mechanisms and provenance tracing
- Connectors (import/export) to other sources and standards
- To be filled by multiple sources of metadata (some the curators/owners, others “crowd-sourced”)
- Interim solution for those datasets without unique identifiers (Digital Object Identifier, DOI)

Proposed solution

Extensible framework

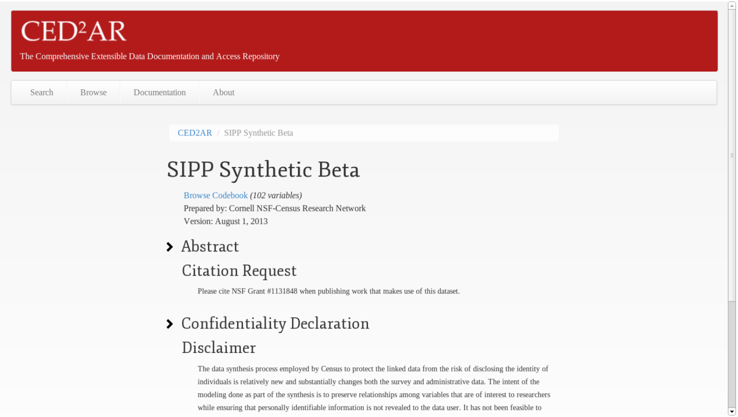
- Based on existing standards (Data Documentation Initiative, DDI) with extension to accomodate disclosure protection mechanisms and provenance tracing
- Connectors (import/export) to other sources and standards
- To be filled by multiple sources of metadata (some the curators/owners, others “crowd-sourced”)
- Interim solution for those datasets without unique identifiers (Digital Object Identifier, DOI)

What is DDI?

Example of DDI

```
<?xml version="1.0" encoding="UTF-8"?>
<codeBook xmlns="ddi:codebook:2_5" ...>
   <docDscr>
      <citation>
         <titlStmt>
           <titl>SIPP_Synthetic_Beta</titl>
           <altTitl>SSB</altTitl>
           <IDNo agency="DOI">TBD</IDNo>
         </titlStmt>
         <rspStmt>
            <AuthEnty affiliation="Cornell University">
               Virtual RDC
            </AuthEnty>
          </rspStmt>
```

..better seen as



CED²AR

The Comprehensive Extensible Data Documentation and Access Repository

CED2AR / SIPP Synthetic Beta

SIPP Synthetic Beta

Browse Codebook *(102 variables)*
Prepared by: Cornell NSF-Census Research Network
Version: August 1, 2013

Abstract

Citation Request

Please cite NSF Grant #1131848 when publishing work that makes use of this dataset.

Confidentiality Declaration

Disclaimer

The data synthesis process employed by Census to protect the linked data from the risk of disclosing the identity of individuals is relatively new and substantially changes both the survey and administrative data. The intent of the modeling done as part of the synthesis is to preserve relationships among variables that are of interest to researchers while ensuring that personally identifiable information is not revealed to the data user. It has not been feasible to

Example DDI: ICPSR

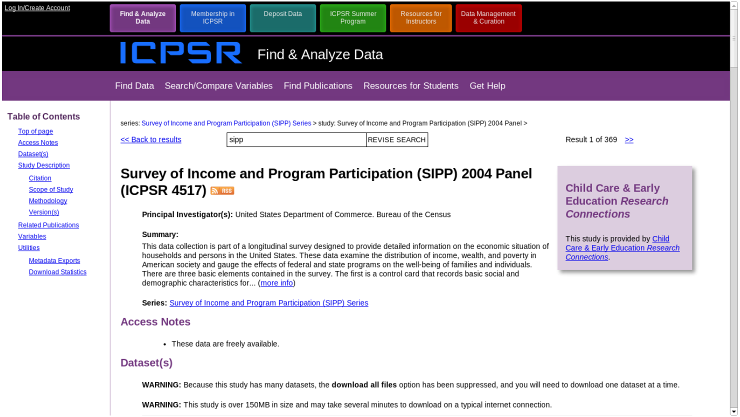


Table of Contents

- Top of page
- Access Notes
- Dataset(s)
- Study Description
  - Citation
  - Scope of Study
  - Methodology
  - Version(s)
- Related Publications
- Variables
- Utilities
  - Metadata Exports
  - Download Statistics

series: Survey of Income and Program Participation (SIPP) Series > study: Survey of Income and Program Participation (SIPP) 2004 Panel >

<< Back to results   sipp   REVISE SEARCH   Result 1 of 369 >>

Survey of Income and Program Participation (SIPP) 2004 Panel (ICPSR 4517) RSS

Principal Investigator(s): United States Department of Commerce. Bureau of the Census

Summary:
This data collection is part of a longitudinal survey designed to provide detailed information on the economic situation of households and persons in the United States. These data examine the distribution of income, wealth, and poverty in American society and gauge the effects of federal and state programs on the well-being of families and individuals. There are three basic elements contained in the survey. The first is a control card that records basic social and demographic characteristics for... (more info)

Series: Survey of Income and Program Participation (SIPP) Series

Child Care & Early Education *Research Connections*

This study is provided by Child Care & Early Education *Research Connections*.

Access Notes

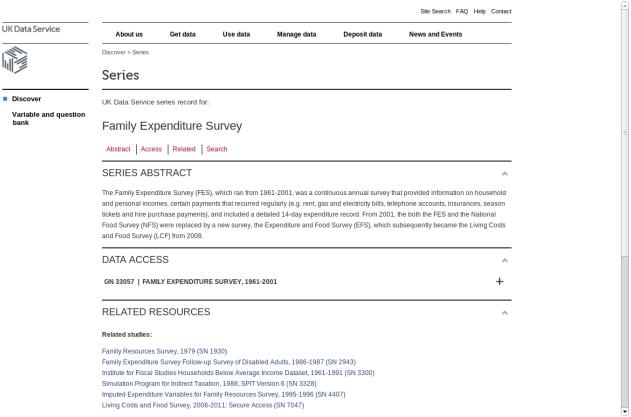
- These data are freely available.

Dataset(s)

WARNING: Because this study has many datasets, the **download all files** option has been suppressed, and you will need to download one dataset at a time.

WARNING: This study is over 150MB in size and may take several minutes to download on a typical internet connection.

Example DDI: UK data archive



Series

UK Data Service series record for:

Family Expenditure Survey

SERIES ABSTRACT

The Family Expenditure Survey (FES), which ran from 1961-2001, was a continuous annual survey that provided information on household and personal incomes, certain payments that recurred regularly (e.g. rent, gas and electricity bills, telephone accounts, insurances, season tickets and hire purchase payments), and included a detailed 14-day expenditure record. From 2001, the both the FES and the National Food Survey (NFS) were replaced by a new survey, the Expenditure and Food Survey (EFS), which subsequently became the Living Costs and Food Survey (LCF) from 2008.

DATA ACCESS

GN 33057 | FAMILY EXPENDITURE SURVEY, 1961-2001

RELATED RESOURCES

Related studies:

Family Resources Survey, 1979 (SN 1930)
Family Expenditure Survey Follow-up Survey of Disabled Adults, 1986-1987 (SN 2943)
Institute for Fiscal Studies Households Below Average Income Dataset, 1961-1991 (SN 3300)
Simulation Program for Indirect Taxation, 1988; SPIT Version 6 (SN 3328)
Imputed Expenditure Variables for Family Resources Survey, 1995-1996 (SN 4407)
Living Costs and Food Survey, 2006-2011: Secure Access (SN 7047)

Expanded DDI attributes

Standard DDI

Fragment of variable description*

```
<var ID="V1" dcml="0" files="F1" intrvl="discrete"
 name="cur_end mar_flag">
    <location width="12"/>
      <labl>Flag: Linked marriage ended</labl>
        <valrng>
          <range UNITS="REAL" max="2" min="0"/>
        </valrng>
        <sumStat type="vald"> 123 </sumStat>
        <sumStat type="invd"> 456 </sumStat>
        <catgry>
          <catValu> 1 </catValu>
          <catStat type="freq"> 234 </catStat>
        </catgry>
```

* All values are fake

Expanded DDI attributes

Standard DDI

Fragment of variable description*

```
<!--var ID="V1" dcml="0" files="F1" intrvl="discrete"
 name="cur_end mar_flag">
    <location width="12"/>
      <labl>Flag: Linked marriage ended</labl -->
        <valrng>
          <range UNITS="REAL" max="2" min="0"/>
        </valrng>
        <!-- sumStat type="vald"> 123 </sumStat>
        <sumStat type="invd"> 456 </sumStat>
        <catgry>
          <catValu> 1 </catValu>
          <catStat type="freq"> 234 </catStat>
        </catgry -->
```

* All values are fake

Expanded DDI attributes

Standard DDI

Fragment of variable description*

```
<!--var ID="V1" dcml="0" files="F1" intrvl="discrete"
 name="cur_end mar_flag">
    <location width="12"/>
      <labl>Flag: Linked marriage ended</labl>
        <valrng>
          <range UNITS="REAL" max="2" min="0"/>
        </valrng -->
        <sumStat type="vald"> 123 </sumStat>
        <sumStat type="invd"> 456 </sumStat>
        <!-- catgry>
          <catValu> 1 </catValu>
          <catStat type="freq"> 234 </catStat>
        </catgry -->
```

* All values are fake

Expanded DDI attributes

Enhanced DDI

Re-using existing attribute, but expanding scope.*

```
<var ID="V1" dcml="0" files="F1" intrvl="discrete"
 name="cur_end mar_flag">
    <location width="12"/>
      <labl>Flag: Linked marriage ended</labl>
        <valrng access="release">
          <range UNITS="REAL" max="2" min="0"/>
        </valrng>
        <sumStat access="restricted" type="vald"> 123 </sum
        <sumStat access="restricted" type="invd"> 456 </sum
        <catgry access="release">
          <catValu access="release"> 1 </catValu>
          <catStat type="freq" access="restricted">
               234
          </catStat>
        </catgry>
```

* All values are fake

Expanded DDI attributes

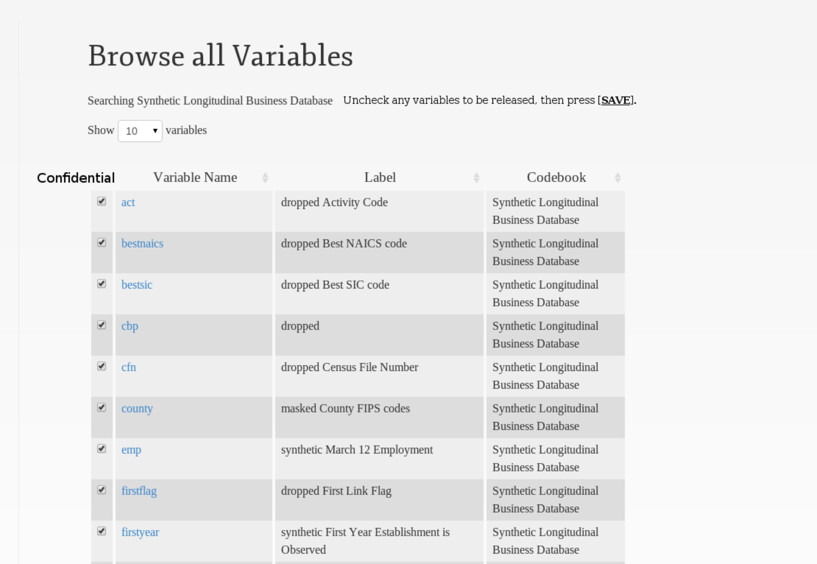
Enhanced DDI

Allows for verifiable filtering*

```
<var ID="V1" dcml="0" files="F1" intrvl="discrete"
 name="cur_end mar_flag">
    <location width="12"/>
      <labl>Flag: Linked marriage ended</labl>
        <valrng access="release">
          <range UNITS="REAL" max="2" min="0"/>
        </valrng>
        <!-- sumStat suppressed -->
        <!-- sumStat suppressed -->
        <catgry access="release">
          <catValu access="release"> 1 </catValu>
          <catStat type="freq" access="restricted">
               [suppressed]
          </catStat>
        </catgry>
```

* All values are fake

Application to confidentiality protection



Browse all Variables

Searching Synthetic Longitudinal Business Database   Uncheck any variables to be released, then press [SAVE].

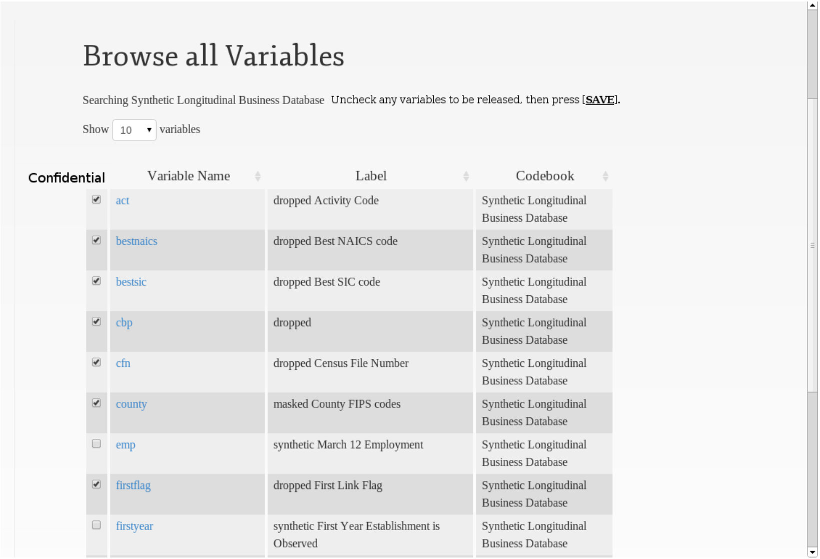
Show 10 ▾ variables

Confidential	Variable Name	Label	Codebook
☑	act	dropped Activity Code	Synthetic Longitudinal Business Database
☑	bestnaics	dropped Best NAICS code	Synthetic Longitudinal Business Database
☑	bestsic	dropped Best SIC code	Synthetic Longitudinal Business Database
☑	cbp	dropped	Synthetic Longitudinal Business Database
☑	cfn	dropped Census File Number	Synthetic Longitudinal Business Database
☑	county	masked County FIPS codes	Synthetic Longitudinal Business Database
☑	emp	synthetic March 12 Employment	Synthetic Longitudinal Business Database
☑	firstflag	dropped First Link Flag	Synthetic Longitudinal Business Database
☑	firstyear	synthetic First Year Establishment is Observed	Synthetic Longitudinal Business Database

Options

- Variable is suppressed, including all subordinate elements
- Variable description is released, but all subordinate statistical elements are suppressed (attribute of $< var >$ set to ”released”) [default]
- Expand all existing attributes, individually select subordinate elements to suppress (attribute of sub-element is set to ”suppressed”, content suppressed)

Application to confidentiality protection



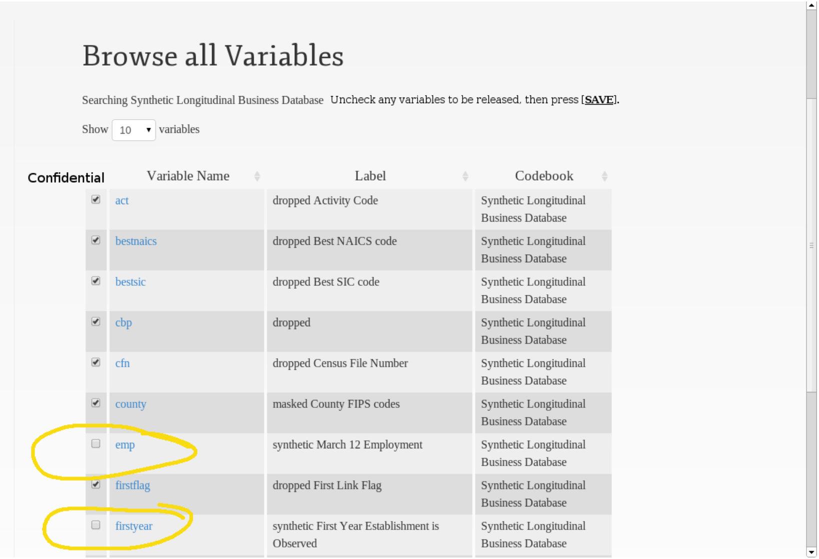
Browse all Variables

Searching Synthetic Longitudinal Business Database Uncheck any variables to be released, then press [SAVE].

Show 10 ▾ variables

Confidential	Variable Name	Label	Codebook
☑	act	dropped Activity Code	Synthetic Longitudinal Business Database
☑	bestnaics	dropped Best NAICS code	Synthetic Longitudinal Business Database
☑	bestsic	dropped Best SIC code	Synthetic Longitudinal Business Database
☑	cbp	dropped	Synthetic Longitudinal Business Database
☑	cfn	dropped Census File Number	Synthetic Longitudinal Business Database
☑	county	masked County FIPS codes	Synthetic Longitudinal Business Database
☐	emp	synthetic March 12 Employment	Synthetic Longitudinal Business Database
☑	firstflag	dropped First Link Flag	Synthetic Longitudinal Business Database
☐	firstyear	synthetic First Year Establishment is Observed	Synthetic Longitudinal Business Database

Application to confidentiality protection



Browse all Variables

Searching Synthetic Longitudinal Business Database Uncheck any variables to be released, then press [SAVE].

Show 10 ▾ variables

Confidential	Variable Name	Label	Codebook
☑	act	dropped Activity Code	Synthetic Longitudinal Business Database
☑	bestnaics	dropped Best NAICS code	Synthetic Longitudinal Business Database
☑	bestsic	dropped Best SIC code	Synthetic Longitudinal Business Database
☑	cbp	dropped	Synthetic Longitudinal Business Database
☑	cfn	dropped Census File Number	Synthetic Longitudinal Business Database
☑	county	masked County FIPS codes	Synthetic Longitudinal Business Database
□	emp	synthetic March 12 Employment	Synthetic Longitudinal Business Database
☑	firstflag	dropped First Link Flag	Synthetic Longitudinal Business Database
□	firstyear	synthetic First Year Establishment is Observed	Synthetic Longitudinal Business Database

Implementation

Definitions

- First draft of specification in test use by our team

Implementation

Definitions

- First draft of specification in test use by our team
- Full enhanced specification (based on DDI-Codebook 2.5) published on CED^{2}AR

Implementation

Definitions

- First draft of specification in test use by our team
- Full enhanced specification (based on DDI-Codebook 2.5) published on CED^{2}AR
- Enhanced specification proposed to DDI Alliance

Implementation

Definitions

- First draft of specification in test use by our team
- Full enhanced specification (based on DDI-Codebook 2.5) published on CED^{2}AR
- Enhanced specification proposed to DDI Alliance
- Expand to DDI-Lifecycle

Provenance

The provenance problem

“data provenance, one kind of metadata, pertains to the derivation history of a data product starting from its original sources” [...] “from it, one can ascertain the quality of the data base and its ancestral data and derivations, track back sources of errors, allow automated reenactment of derivations to update the data, and provide attribution of data sources”

Simmhan, Plale, and Gannon, “A survey of data provenance in e-science,” ACM Sigmod Record, 2005

Support in DDI

Provenance and Metadata

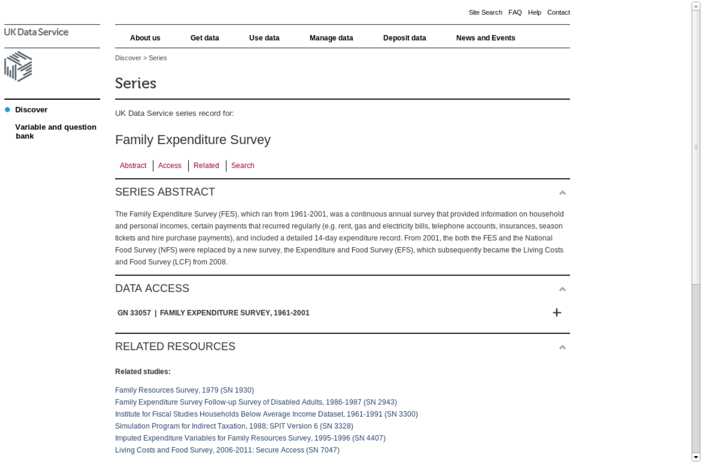
Not (currently) a “native” component of DDI, closest thing is:

```
<xs:complexType name="othrStdyMatType">
   <xs:complexContent>
      <xs:extension base="baseElementType">
         <xs:sequence>
            <xs:element ref="relMat" minOccurs="0" maxOccurs="unbounded"/>
            <xs:element ref="relStdy" minOccurs="0" maxOccurs="unbounded"/>
            <xs:element ref="relPubl" minOccurs="0" maxOccurs="unbounded"/>
            <xs:element ref="othRefs" minOccurs="0" maxOccurs="unbounded"/>
         </xs:sequence>
      </xs:extension>
   </xs:complexContent>
</xs:complexType>
```

Downside

No structure. Mostly verbose entries.

Only a verbose description



Site Search FAQ Help Contact

UK Data Service

About us | Get data | Use data | Manage data | Deposit data | News and Events

Discover > Series

- Discover
- Variable and question bank

Series

UK Data Service series record for:

Family Expenditure Survey

Abstract | Access | Related | Search

SERIES ABSTRACT

The Family Expenditure Survey (FES), which ran from 1961-2001, was a continuous annual survey that provided information on household and personal incomes, certain payments that recurred regularly (e.g. rent, gas and electricity bills, telephone accounts, insurances, season tickets and hire purchase payments), and included a detailed 14-day expenditure record. From 2001, the both the FES and the National Food Survey (NFS) were replaced by a new survey, the Expenditure and Food Survey (EFS), which subsequently became the Living Costs and Food Survey (LCF) from 2008.

DATA ACCESS

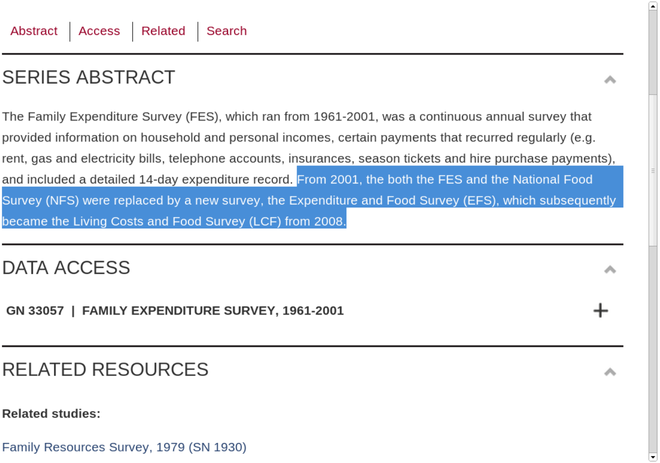
GN 33057 | FAMILY EXPENDITURE SURVEY, 1961-2001 +

RELATED RESOURCES

Related studies:

Family Resources Survey, 1979 (SN 1930)
Family Expenditure Survey Follow-up Survey of Disabled Adults, 1986-1987 (SN 2943)
Institute for Fiscal Studies Households Below Average Income Dataset, 1961-1991 (SN 3300)
Simulation Program for Indirect Taxation, 1988; SPIT Version 6 (SN 3328)
Imputed Expenditure Variables for Family Resources Survey, 1995-1996 (SN 4407)
Living Costs and Food Survey, 2006-2011: Secure Access (SN 7047)

UK Data Archive example



SERIES ABSTRACT

The Family Expenditure Survey (FES), which ran from 1961-2001, was a continuous annual survey that provided information on household and personal incomes, certain payments that recurred regularly (e.g. rent, gas and electricity bills, telephone accounts, insurances, season tickets and hire purchase payments), and included a detailed 14-day expenditure record. From 2001, the both the FES and the National Food Survey (NFS) were replaced by a new survey, the Expenditure and Food Survey (EFS), which subsequently became the Living Costs and Food Survey (LCF) from 2008.

DATA ACCESS

GN 33057 | FAMILY EXPENDITURE SURVEY, 1961-2001 +

RELATED RESOURCES

Related studies:

Family Resources Survey, 1979 (SN 1930)

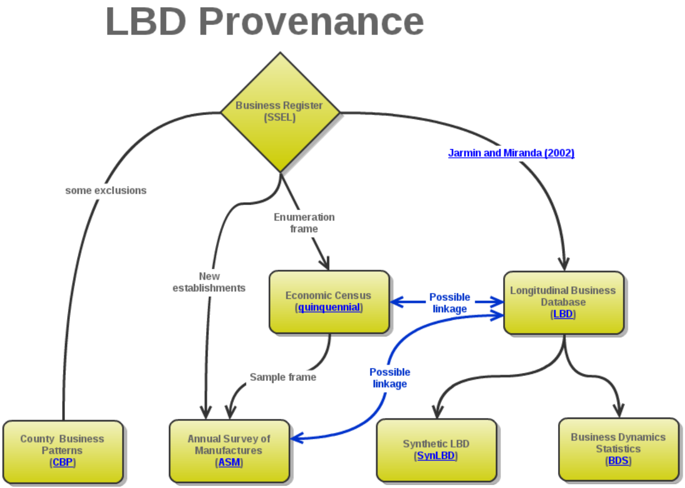
Provenance (cont)

PROV model

W3C PROV Model based in the notions of

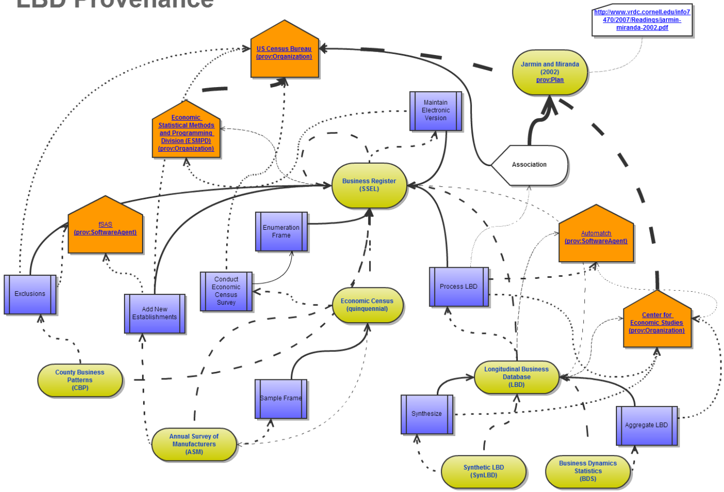
1. **entities** that are physical, digital, and conceptual things in the world;
2. **activities** that are dynamic aspects of the world that change and create entities; and
3. **agents** that are responsible for activities.
4. a set of **relationships** that can exist be- tween them that express attribution,. delegation, derivation, etc.

Incorporating PROV (LBD)

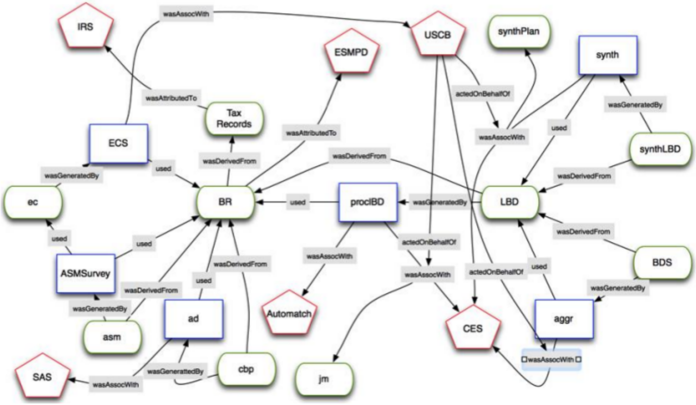

LBD Provenance
Business Register (SSEL)
some exclusions
New establishments
Enumeration frame
Jarmin and Miranda (2002)
Economic Census (quinquennial)
Possible linkage
Longitudinal Business Database (LBD)
Sample frame
Possible linkage
County Business Patterns (CBP)
Annual Survey of Manufactures (ASM)
Synthetic LBD (SynLBD)
Business Dynamics Statistics (BDS)

Incorporating PROV (LBD)

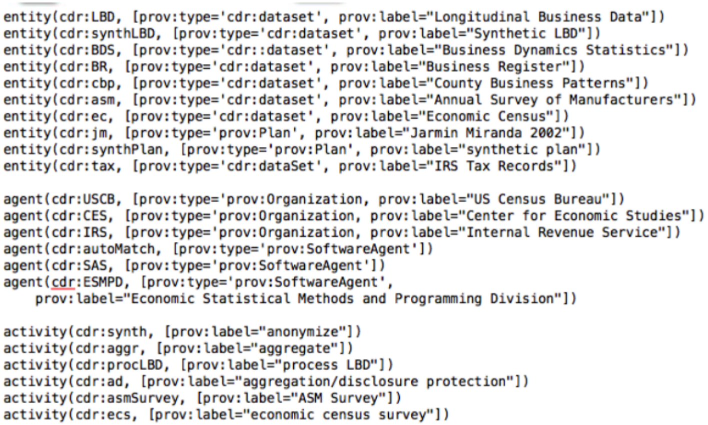
LBD Provenance


http://www.vrdc.cornell.edu/info7470/2007/Readings/jarmin-miranda-2002.pdf
US Census Bureau (prov:Organization)
Jarmin and Miranda (2002) prov:Plan
Maintain Electronic Version
Economic Statistical Methods and Programming Division (ESMPD) (prov:Organization)
Association
Business Register (SSEL)
fSAS (prov:SoftwareAgent)
Enumeration Frame
Automatch (prov:SoftwareAgent)
Exclusions
Add New Establishments
Conduct Economic Census Survey
Economic Census (quinquennial)
Process LBD
Center for Economic Studies (prov:Organization)
County Business Patterns (CBP)
Sample Frame
Longitudinal Business Database (LBD)
Synthesize
Aggregate LBD
Annual Survey of Manufacturers (ASM)
Synthetic LBD (SynLBD)
Business Dynamics Statistics (BDS)

Incorporating PROV (LBD)



PROV as RDF



```
entity(cdr:LBD, [prov:type='cdr:dataset', prov:label="Longitudinal Business Data"])
entity(cdr:synthLBD, [prov:type='cdr:dataset', prov:label="Synthetic LBD"])
entity(cdr:BDS, [prov:type='cdr::dataset', prov:label="Business Dynamics Statistics"])
entity(cdr:BR, [prov:type='cdr:dataset', prov:label="Business Register"])
entity(cdr:cbp, [prov:type='cdr:dataset', prov:label="County Business Patterns"])
entity(cdr:asm, [prov:type='cdr:dataset', prov:label="Annual Survey of Manufacturers"])
entity(cdr:ec, [prov:type='cdr:dataset', prov:label="Economic Census"])
entity(cdr:jm, [prov:type='prov:Plan', prov:label="Jarmin Miranda 2002"])
entity(cdr:synthPlan, [prov:type='prov:Plan', prov:label="synthetic plan"])
entity(cdr:tax, [prov:type='cdr:dataSet', prov:label="IRS Tax Records"])

agent(cdr:USCB, [prov:type='prov:Organization, prov:label="US Census Bureau"])
agent(cdr:CES, [prov:type='prov:Organization, prov:label="Center for Economic Studies"])
agent(cdr:IRS, [prov:type='prov:Organization, prov:label="Internal Revenue Service"])
agent(cdr:autoMatch, [prov:type='prov:SoftwareAgent'])
agent(cdr:SAS, [prov:type='prov:SoftwareAgent'])
agent(cdr:ESMPD, [prov:type='prov:SoftwareAgent',
    prov:label="Economic Statistical Methods and Programming Division"])

activity(cdr:synth, [prov:label="anonymize"])
activity(cdr:aggr, [prov:label="aggregate"])
activity(cdr:procLBD, [prov:label="process LBD"])
activity(cdr:ad, [prov:label="aggregation/disclosure protection"])
activity(cdr:asmSurvey, [prov:label="ASM Survey"])
activity(cdr:ecs, [prov:label="economic census survey"])
```

The key PROV element embedded as DDI/XML

```
<stdyDscr> <!-- Standard DDI 2.5 -->
 <othrStdyMat> <!-- Standard DDI 2.5 -->
  <relStdy>  <!-- Standard DDI 2.5 -->
     <!-- From here, PROV additions -->
    <prov:wasDerivedFrom>
        <prov:generatedEntity prov:ref="cdr:LBD"/>
        <prov:usedEntity prov:ref="cdr:BR"/>
    </prov:wasDerivedFrom>
     <prov:wasAssociatedWith>
          <prov:activity prov:ref="cdr:procLBD"/>
          <prov:agent prov:ref="cdr:CES"/>
          <prov:plan prov:ref="cdr:procLBDPlan"/>
        </prov:wasAssociatedWith>
  </relStdy> <!-- Standard DDI 2.5 -->
 </othrStdyMat> <!-- Standard DDI 2.5 -->
</stdyDscr><!-- Standard DDI 2.5 -->
```

Additional PROV elements

These could be derived from existing DDI elements (still being developed)

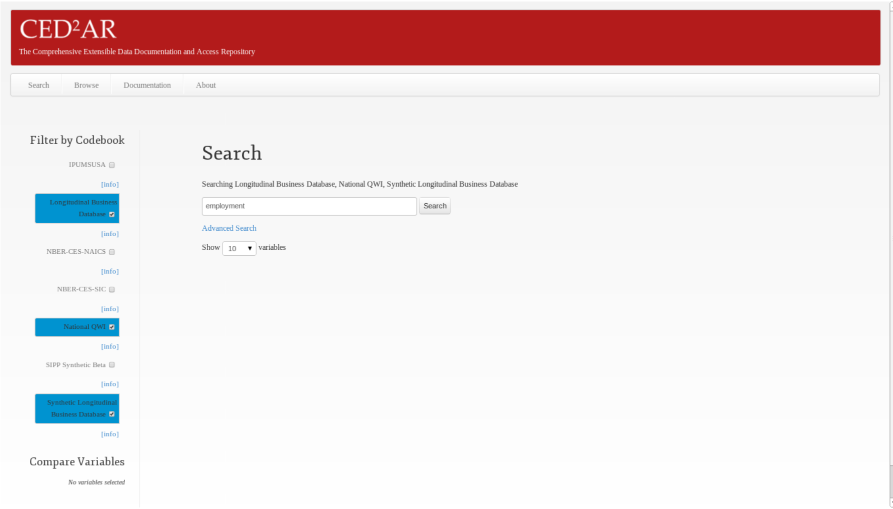
```
 <!-- Entities -->
<prov:entity prov:id="cdr:BR">
    <dct:title>Business Register</dct:title>
</prov:entity>
<!-- Plans = Methodology -->
 <prov:plan prov:id="cdr:procLBDPlan">
    <prov:location
    xsi:type="xsd:anyURI">
    http://ideas.repec.org/p/cen/wpaper/02-17.html
    </prov:location>
    <prov:type>prov:Plan</prov:type>
</prov:plan>
```

Work on PROV

More details forthcoming

- Lagoze, Williams, Vilhuber “Encoding Provenance Metadata for Social Science Datasets”, submitted to Metadata and Semantics Research Conference (November 2013)
- Lagoze, Williams, Vilhuber, Block “Encoding Provenance of Social Science Data: Integrating PROV with DDI”, accepted for 5th Annual European DDI User Conference (December 2013)

Usage scenario



CED²AR

The Comprehensive Extensible Data Documentation and Access Repository

Filter by Codebook

IPUMSUSA □ [info]

Longitudinal Business Database ☑ [info]

NBER-CES-NAICS □ [info]

NBER-CES-SIC □ [info]

National QWI ☑ [info]

SIPP Synthetic Beta □ [info]

Synthetic Longitudinal Business Database ☑ [info]

Compare Variables

No variables selected

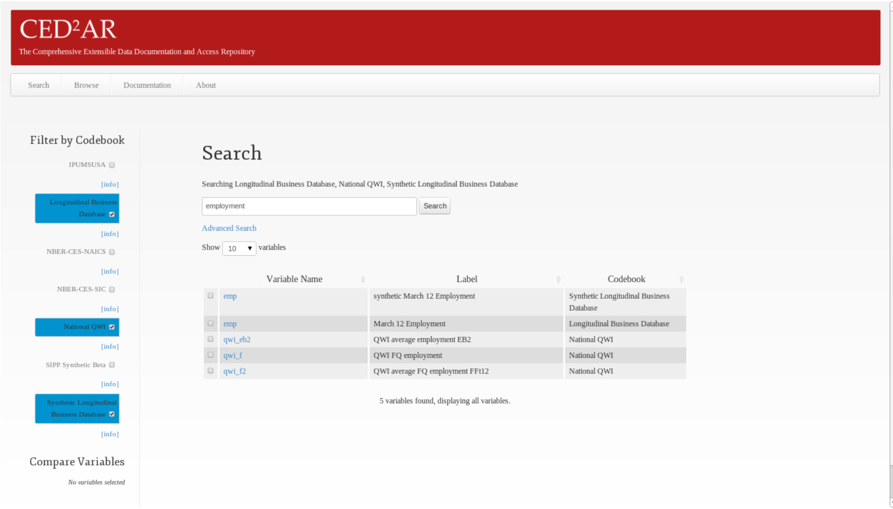
Search

Searching Longitudinal Business Database, National QWI, Synthetic Longitudinal Business Database

employment

Show 10 ▾ variables

Usage scenario



CED²AR

The Comprehensive Extensible Data Documentation and Access Repository

Filter by Codebook

- IPUMSUSA □ [info]
- Longitudinal Business Database ☑ [info]
- NBER-CES-NAICS □ [info]
- NBER-CES-SIC □ [info]
- National QWI ☑ [info]
- SIPP Synthetic Beta □ [info]
- Synthetic Longitudinal Business Database ☑ [info]

Compare Variables

No variables selected

Search

Searching Longitudinal Business Database, National QWI, Synthetic Longitudinal Business Database

employment [Search]

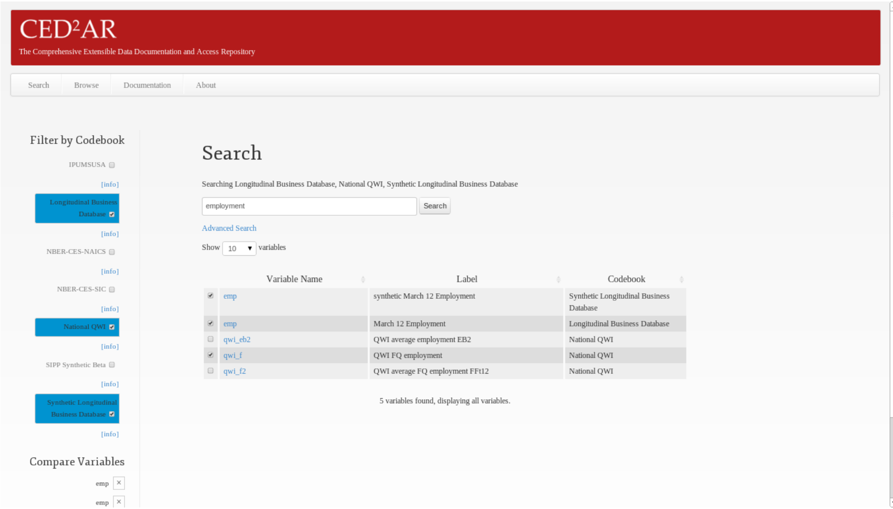
Advanced Search

Show 10 ▾ variables

	Variable Name	Label	Codebook
□	emp	synthetic March 12 Employment	Synthetic Longitudinal Business Database
□	emp	March 12 Employment	Longitudinal Business Database
□	qwi_eb2	QWI average employment EB2	National QWI
□	qwi_f	QWI FQ employment	National QWI
□	qwi_f2	QWI average FQ employment FFt12	National QWI

5 variables found, displaying all variables.

Usage scenario



CED²AR

The Comprehensive Extensible Data Documentation and Access Repository

Filter by Codebook

- IPUMSUSA □ [info]
- Longitudinal Business Database ☑ [info]
- NBER-CES-NAICS □ [info]
- NBER-CES-SIC □ [info]
- National QWI ☑ [info]
- SIPP Synthetic Beta □ [info]
- Synthetic Longitudinal Business Database ☑ [info]

Compare Variables

- emp ×
- emp ×

Search

Searching Longitudinal Business Database, National QWI, Synthetic Longitudinal Business Database

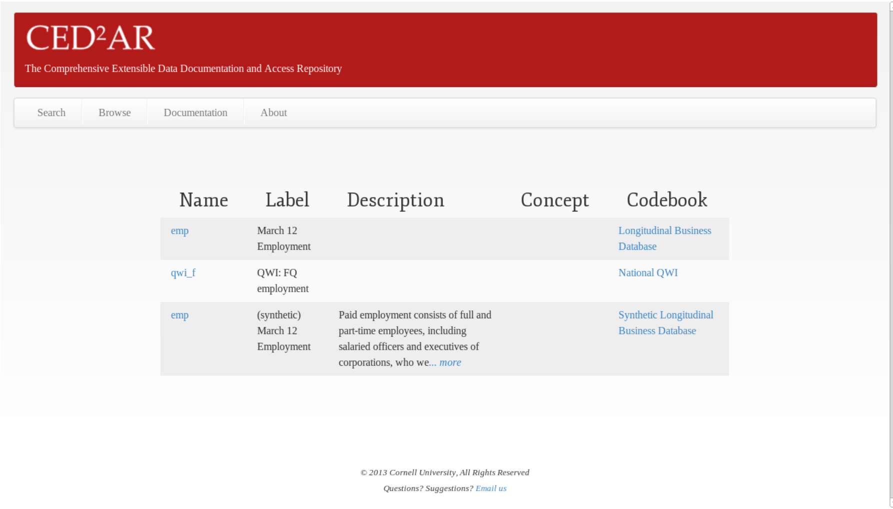
employment

Show 10 ▾ variables

	Variable Name	Label	Codebook
☑	emp	synthetic March 12 Employment	Synthetic Longitudinal Business Database
☑	emp	March 12 Employment	Longitudinal Business Database
□	qwi_eb2	QWI average employment EB2	National QWI
☑	qwi_f	QWI FQ employment	National QWI
□	qwi_f2	QWI average FQ employment FFt12	National QWI

5 variables found, displaying all variables.

Usage scenario



CED²AR

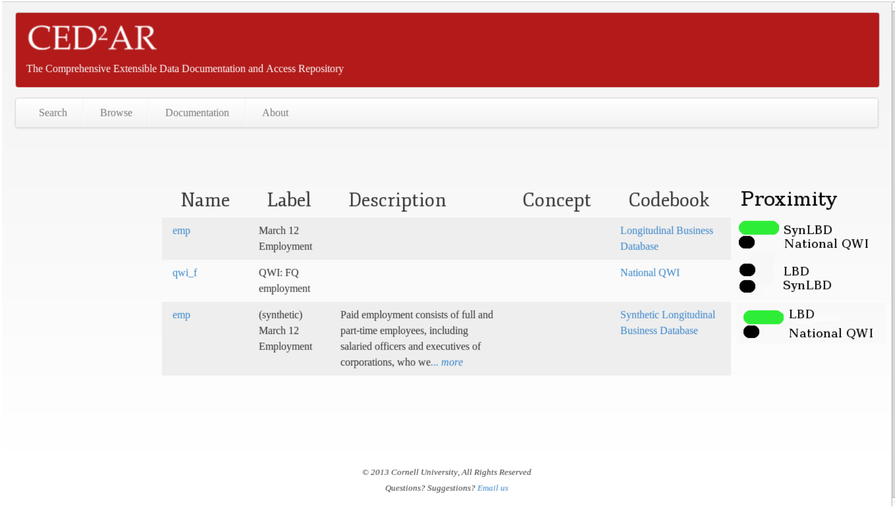
The Comprehensive Extensible Data Documentation and Access Repository

Name	Label	Description	Concept	Codebook
emp	March 12 Employment			Longitudinal Business Database
qwi_f	QWI: FQ employment			National QWI
emp	(synthetic) March 12 Employment	Paid employment consists of full and part-time employees, including salaried officers and executives of corporations, who we... *more*		Synthetic Longitudinal Business Database

© 2013 Cornell University, All Rights Reserved

Questions? Suggestions? Email us

Highlighting provenance



CED^{2}AR

The Comprehensive Extensible Data Documentation and Access Repository

Name	Label	Description	Concept	Codebook	Proximity
emp	March 12 Employment			Longitudinal Business Database	🟩 SynLBD ● National QWI
qwi_f	QWI: FQ employment			National QWI	● LBD ● SynLBD
emp	(synthetic) March 12 Employment	Paid employment consists of full and part-time employees, including salaried officers and executives of corporations, who we... *more*		Synthetic Longitudinal Business Database	🟩 LBD ● National QWI

© 2013 Cornell University, All Rights Reserved

Questions? Suggestions? Email us

CED^{2}AR next steps

- Formalize the DDI extension

CED^{2}AR next steps

- Formalize the DDI extension
- Provide implementation outside of Census Bureau

CED^{2}AR next steps

- Formalize the DDI extension
- Provide implementation outside of Census Bureau
- Test implementation within the Census RDC

The end

Thank you

- [3] for more details
- Labor Dynamics Institute
- VirtualRDC @ Cornell
- NCRN Cornell website

```
$Id: Presentation-FCSM2013-subdoc.tex 405 2013-11-0
```

Extra slides

- Census Bureau
- IRS
- BLS
- CDER
- CRDC
- France

Dataset usage in Census RDC

1,505 project-dataset pairs

Many projects use multiple datasets.

Economic (business) datasets

- 71% of datasets are business (economic) datasets
- Primarily establishment-based records from the Economic Censuses and Surveys, the Business Register, and the Longitudinal Business Database (LBD)
- They form the core of the modern industrial organization studies [5, 11] as well as modern gross job creation and destruction in macroeconomics [4, 6].
- But there are no public-use micro-data for these establishment-based products
- Exception: recently-released Synthetic LBD [2, 7]
- Currently no active curation (of derived datasets) [a], no way to reference [b], convoluted way to learn about the data structure [c*]

LEHD data

Linked employer-employee data

- Longitudinal and cross-sectional detail
- New confidentiality protection methodologies [1, 10] have unlocked large amounts of data for public-use: highly detailed local area tabulations exist based on the LEHD data
- But: no public-use micro-data exist for this longitudinal job frame or any of its derivative files.
- Confidential data are dynamic (quarterly changes)
- Currently some active curation (archiving, 10-yr!) [a*], no way to reference (publicly) [b*], convoluted way to learn about the data structure [c*]

Not unique to Census Bureau

Internal Revenue Service/ Social Security Administration

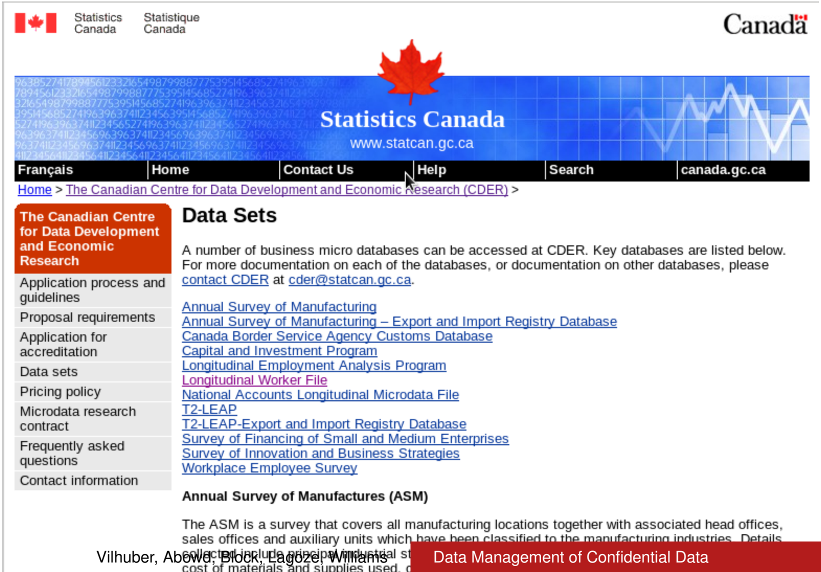
- New projects (Chetty et al, 2012; von Wachter and co-authors) have created and/or used linked longitudinal data at the IRS or the Social Security Administration.
- Neither agency has long-run experience at the statistical data curation function [a], (meta)data dissemination [b,c].
- Although both IRS and SSA have produced statistical tables for a long time.

Not unique to Census Bureau

Bureau of Labor Statistics

- Long history of making time-series available
- Limited access to microdata at the BLS
- Unknown curation [a]
- Even for public-use data, no way to reference specific releases [b]
- No well-established way to learn about microdata [c]

Canadian Centre for Data Development and Economic Research



Statistics Canada | Statistique Canada

Français | Home | Contact Us | Help | Search | canada.gc.ca

Home > The Canadian Centre for Data Development and Economic Research (CDER) >

The Canadian Centre for Data Development and Economic Research

- Application process and guidelines
- Proposal requirements
- Application for accreditation
- Data sets
- Pricing policy
- Microdata research contract
- Frequently asked questions
- Contact information

Data Sets

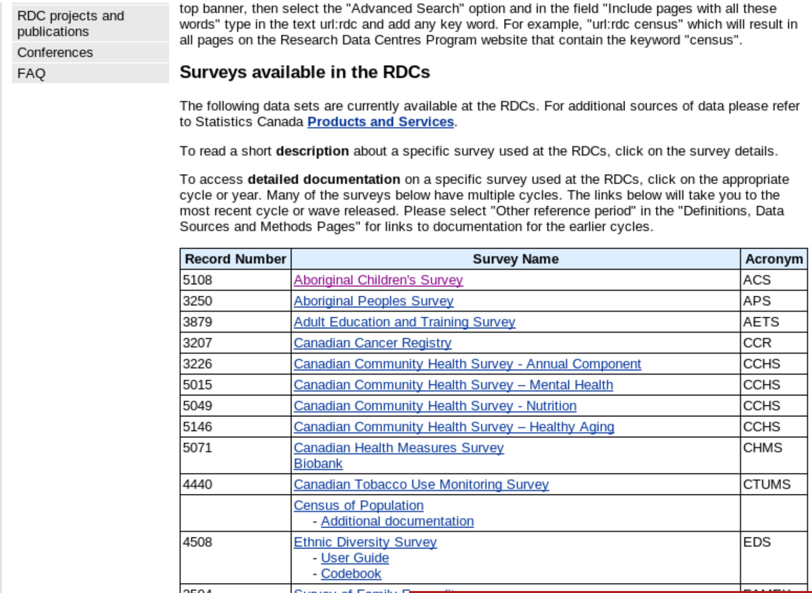
A number of business micro databases can be accessed at CDER. Key databases are listed below. For more documentation on each of the databases, or documentation on other databases, please contact CDER at cder@statcan.gc.ca.

Annual Survey of Manufacturing
Annual Survey of Manufacturing – Export and Import Registry Database
Canada Border Service Agency Customs Database
Capital and Investment Program
Longitudinal Employment Analysis Program
Longitudinal Worker File
National Accounts Longitudinal Microdata File
T2-LEAP
T2-LEAP-Export and Import Registry Database
Survey of Financing of Small and Medium Enterprises
Survey of Innovation and Business Strategies
Workplace Employee Survey

Annual Survey of Manufactures (ASM)

The ASM is a survey that covers all manufacturing locations together with associated head offices, sales offices and auxiliary units which have been classified to the manufacturing industries. Details collected include principal industrial st
cost of materials and supplies used, c

Canadian Research Data Centres



RDC projects and publications

Conferences

FAQ

top banner, then select the "Advanced Search" option and in the field "Include pages with all these words" type in the text url:rdc and add any key word. For example, "url:rdc census" which will result in all pages on the Research Data Centres Program website that contain the keyword "census".

Surveys available in the RDCs

The following data sets are currently available at the RDCs. For additional sources of data please refer to Statistics Canada **Products and Services**.

To read a short **description** about a specific survey used at the RDCs, click on the survey details.

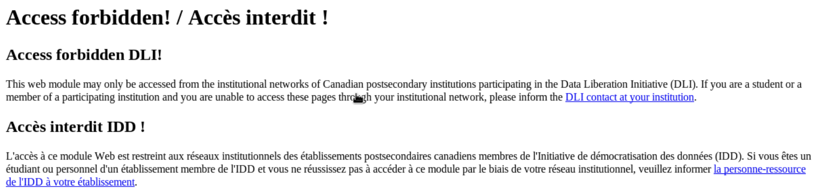
To access **detailed documentation** on a specific survey used at the RDCs, click on the appropriate cycle or year. Many of the surveys below have multiple cycles. The links below will take you to the most recent cycle or wave released. Please select "Other reference period" in the "Definitions, Data Sources and Methods Pages" for links to documentation for the earlier cycles.

Record Number	Survey Name	Acronym
5108	Aboriginal Children's Survey	ACS
3250	Aboriginal Peoples Survey	APS
3879	Adult Education and Training Survey	AETS
3207	Canadian Cancer Registry	CCR
3226	Canadian Community Health Survey - Annual Component	CCHS
5015	Canadian Community Health Survey – Mental Health	CCHS
5049	Canadian Community Health Survey - Nutrition	CCHS
5146	Canadian Community Health Survey – Healthy Aging	CCHS
5071	Canadian Health Measures Survey Biobank	CHMS
4440	Canadian Tobacco Use Monitoring Survey	CTUMS
	Census of Population - Additional documentation	
4508	Ethnic Diversity Survey - User Guide - Codebook	EDS
3504	Survey of Family E	FAMEX

Canadian Research Data Centres

... but also not perfect

Attempt to access data information on General Social Survey



Access forbidden! / Accès interdit !

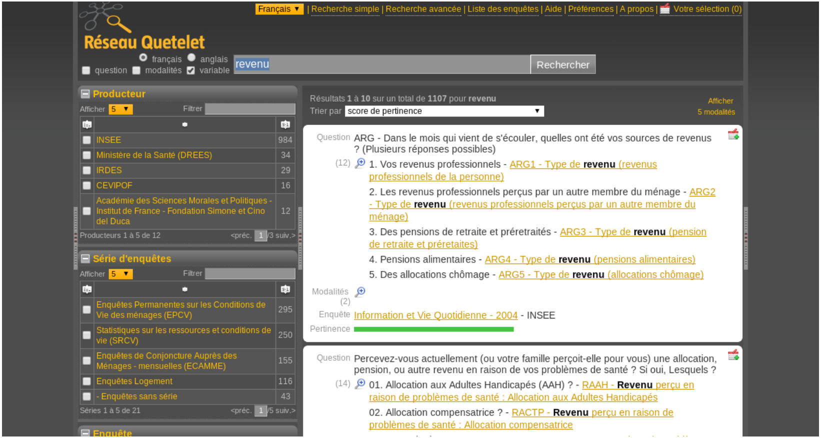
Access forbidden DLI!

This web module may only be accessed from the institutional networks of Canadian postsecondary institutions participating in the Data Liberation Initiative (DLI). If you are a student or a member of a participating institution and you are unable to access these pages through your institutional network, please inform the DLI contact at your institution.

Accès interdit IDD !

L'accès à ce module Web est restreint aux réseaux institutionnels des établissements postsecondaires canadiens membres de l'Initiative de démocratisation des données (IDD). Si vous êtes un étudiant ou personnel d'un établissement membre de l'IDD et vous ne réussissez pas à accéder à ce module par le biais de votre réseau institutionnel, veuillez informer la personne-ressource de l'IDD à votre établissement.

Réseau Quetelet



Français ▼ | Recherche simple | Recherche avancée | Liste des enquêtes | Aide | Préférences | A propos | Votre sélection (0)

Réseau Quetelet

○ français ○ anglais

□ question □ modalités ☑ variable

revenu

Rechercher

Producteur

Afficher 5 ▼ Filtrer

□	INSEE	984
□	Ministère de la Santé (DREES)	34
□	IRDES	29
□	CEVIPOF	16
□	Académie des Sciences Morales et Politiques - Institut de France - Fondation Simone et Cino del Duca	12

Producteurs 1 à 5 de 12 <préc. 1 /3 suiv.>

Série d'enquêtes

Afficher 5 ▼ Filtrer

□	Enquêtes Permanentes sur les Conditions de Vie des ménages (EPCV)	295
□	Statistiques sur les ressources et conditions de vie (SRCV)	250
□	Enquêtes de Conjoncture Auprès des Ménages - mensuelles (ECAMME)	155
□	Enquêtes Logement	116
□	- Enquêtes sans série	43

Séries 1 à 5 de 21 <préc. 1 /5 suiv.>

Enquête

Résultats **1** à **10** sur un total de **1107** pour **revenu**

Trier par score de pertinence ▼

Afficher 5 modalités

Question ARG - Dans le mois qui vient de s'écouler, quelles ont été vos sources de revenus ? (Plusieurs réponses possibles)

(12) 1. Vos revenus professionnels - ARG1 - Type de **revenu** (revenus professionnels de la personne)

2. Les revenus professionnels perçus par un autre membre du ménage - ARG2 - Type de **revenu** (revenus professionnels perçus par un autre membre du ménage)

3. Des pensions de retraite et préretraités - ARG3 - Type de **revenu** (pension de retraite et préretaites)

4. Pensions alimentaires - ARG4 - Type de **revenu** (pensions alimentaires)

5. Des allocations chômage - ARG5 - Type de **revenu** (allocations chômage)

Modalités (2)

Enquête Information et Vie Quotidienne - 2004 - INSEE

Pertinence 🟩

Question Percevez-vous actuellement (ou votre famille perçoit-elle pour vous) une allocation, pension, ou autre revenu en raison de vos problèmes de santé ? Si oui, Lesquels ?

(14) 01. Allocation aux Adultes Handicapés (AAH) ? - RAAH - **Revenu** perçu en raison de problèmes de santé : Allocation aux Adultes Handicapés

02. Allocation compensatrice ? - RACTP - **Revenu** perçu en raison de problèmes de santé : Allocation compensatrice

J. M. Abowd, K. Gittings, K. L. McKinney, B. E. Stephens, L. Vilhuber, and S. Woodcock, “Dynamically consistent noise infusion and partially synthetic data as confidentiality protection measures for related time-series,” Federal Committee on Statistical Methodology, Tech. Rep., January 2012. [Online]. Available: http://www.fcsm.gov/events/papers2012.html

J. M. Abowd and L. Vilhuber. (2010) Synthetic data server. [Online]. Available: http://www.vrdc.cornell.edu/sds/

J. M. Abowd, L. Vilhuber, and W. Block, “A proposed solution to the archiving and curation of confidential scientific inputs,” in *Privacy in Statistical Databases*, ser. Lecture Notes in Computer Science, J. Domingo-Ferrer and I. Tinnirello, Eds., vol. 7556. Springer, 2012, pp. 216–225. [Online]. Available: http://dx.doi.org/10.1007/978-3-642-33627-0_17

S. J. Davis, J. C. Haltiwanger, and S. Schuh, *Job creation and destruction*. Cambridge, MA: MIT Press, 1996.

T. Dunne, M. J. Roberts, and L. Samuelson, “The Growth and Failure of U.S. Manufacturing Plants,” *Quarterly Journal of Economics*, vol. 104, no. 4, pp. 671–698, 1989.

J. Haltiwanger, R. S. Jarmin, and J. Miranda, “Who creates jobs? Small vs. large vs. young,” Center for Economic Studies, U.S. Census Bureau, Working Papers 10-17, Aug. 2010. [Online]. Available: http://ideas.repec.org/p/cen/wpaper/10-17.html

S. K. Kinney, J. P. Reiter, A. P. Reznek, J. Miranda, R. S. Jarmin, and J. M. Abowd, “Towards unrestricted public use business microdata: The synthetic longitudinal business database,” *International Statistical Review*, vol. 79, no. 3, pp. 362–384, December 2011. [Online]. Available: http://ideas.repec.org/a/bla/istatr/v79y2011i3p362-384.html

C. Lagoze, W. C. Block, J. Williams, J. M. Abowd, and L. Vilhuber, “Data management of confidential data,” *International Journal of Digital Curation*, vol. 8, no. 1, pp. 265–278, 2013, presented at 8th International Digital Curation Conference 2013, Amsterdam. See also http://hdl.handle.net/1813/30924.

C. Lagoze, W. C. Block, J. Williams, and L. Vilhuber, “Encoding provenance of social science data: Integrating prov with ddi,” in *5th Annual European DDI User Conference*, accepted.

A. Machanavajjhala, D. Kifer, J. M. Abowd, J. Gehr