

Starting
shortly

Please
wait!

Bridging the gap

between **databases** and **mobile
data collection** in Monitoring &
Evaluation

February 3rd, 2022

Outline

1. The Relational Model
2. Importance for M&E
3. Mobile Data collection models
4. Bridging the gap with ActivityInfo



What is a relational database?

Relational Model

Introduced in 1971, by E.F. Codd

A collection of tables consisting of rows and columns, with relationships between those tables.



Information Retrieval

P. BAXENDALE, Editor

A Relational Model of Data for Large Shared Data Banks

E. F. Codd
IBM Research Laboratory, San Jose, California

Future users of large data banks must be protected from having to know how the data is organized in the machine (the internal representation). A prompting service which supplies such information is not a satisfactory solution. Activities of users at terminals and most application programs should remain unaffected when the internal representation of data is changed and even when some aspects of the external representation are changed. Changes in data representation will often be needed as a result of changes in query, update, and report traffic and natural growth in the types of stored information. Existing noninferential, formatted data systems provide users

The relational view (or model) of data described in Section 1 appears to be superior in several respects to the graph or network model [3, 4] presently in vogue for non-inferential systems. It provides a means of describing data with its natural structure only—that is, without superimposing any additional structure for machine representation purposes. Accordingly, it provides a basis for a high level data language which will yield maximal independence between programs on the one hand and machine representation and organization of data on the other.

A further advantage of the relational view is that it forms a sound basis for treating derivability, redundancy, and consistency of relations—these are discussed in Section 2. The network model, on the other hand, has spawned a number of confusions, not the least of which is mistaking the derivation of connections for the derivation of relations (see remarks in Section 2 on the “connection trap”).

Finally, the relational view permits a clearer evaluation of the scope and logical limitations of present formatted data systems, and also the relative merits (from a logical

Key concepts

- Table
- Column
- Row
- Primary Key
- Foreign Key
- Normal Form



Tables and Columns

Training Attendance

ID	Training	Date	Beneficiary ID
1	Seeds	2022-01-16	1
2	Seeds	2022-01-16	2
3	Int'l Standards	2022-02-15	2
4	Int'l Standards	2022-02-15	3

Beneficiary

ID	Name	Province ID
1	Alex	1
2	Fay	1
3	Jeric	2

Province

ID	Name
1	Nord Kivu
2	Sud Kivu

Columns

In the relational model, columns have a **type**:

- Text
- Integer (1, 2, 3...)
- Decimal (3.14, 5.5)
- Boolean (Yes/No)
- Date
- Binary (images, PDFs ,etc)



Primary Keys

Training Attendance

ID	Training	Date	Beneficiary ID
1	Seeds	2022-01-16	1
2	Seeds	2022-01-16	2
3	Int'l Standards	2022-02-15	2
4	Int'l Standards	2022-02-15	3

Beneficiary

ID	Name	Province ID
1	Alex	1
2	Fay	1
3	Jeric	2

Province

ID	Name
1	Nord Kivu
2	Sud Kivu

Foreign Keys

Training Attendance

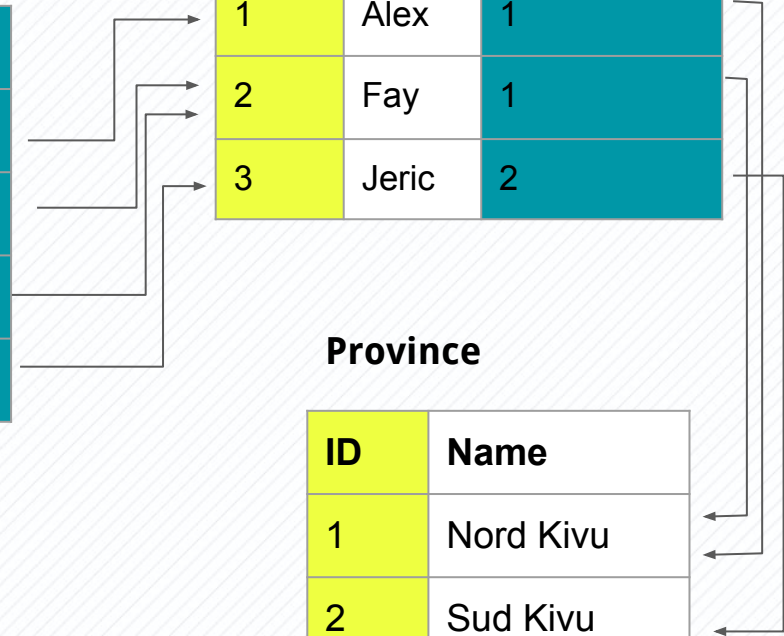
ID	Training	Date	Beneficiary ID
1	Seeds	2022-01-16	1
2	Seeds	2022-01-16	2
3	Int'l Standards	2022-02-15	2
4	Int'l Standards	2022-02-15	3

Beneficiary

ID	Name	Province ID
1	Alex	1
2	Fay	1
3	Jeric	2

Province

ID	Name
1	Nord Kivu
2	Sud Kivu



Types of Primary Key

Natural Key:

A unique ID that exists outside of the database.

Examples: First+Last+DOB, National ID

Surrogate Key:

“Internal” database ID

Examples: serial number



De-Normal Form

Training Attendance

ID	Training	Date	Name	Ben. ID
1	Seeds	2022-01-16	Alexander	1
2	Seeds	2022-01-16	Fay	2
3	Standards	2022-02-15	Alex	1
4	Standards	2022-02-15	Jeric	3

Beneficiary

ID	Name	Gender
1	Alex	Male
2	Fay	Female
3	Jeric	Male



Normalizing...

Training Attendance

ID	Training	Date	Ben. ID
1	Seeds	2022-01-16	1
2	Seeds	2022-01-16	2
3	Standards	2022-02-15	1
4	Standards	2022-02-15	3

Beneficiary

ID	Name	Gender
1	Alex	Male
2	Fay	Female
3	Jeric	Male



Normal Form

Training Session

ID	Name	Date
1	Seeds	2022-01-16
2	Standards	2022-02-15

Training Attendance

Training ID	Ben. ID
1	1
1	2
2	1
2	3

Beneficiary

ID	Name	Gender
1	Alex	Male
2	Fay	Female
3	Jeric	Male



Comparing Excel

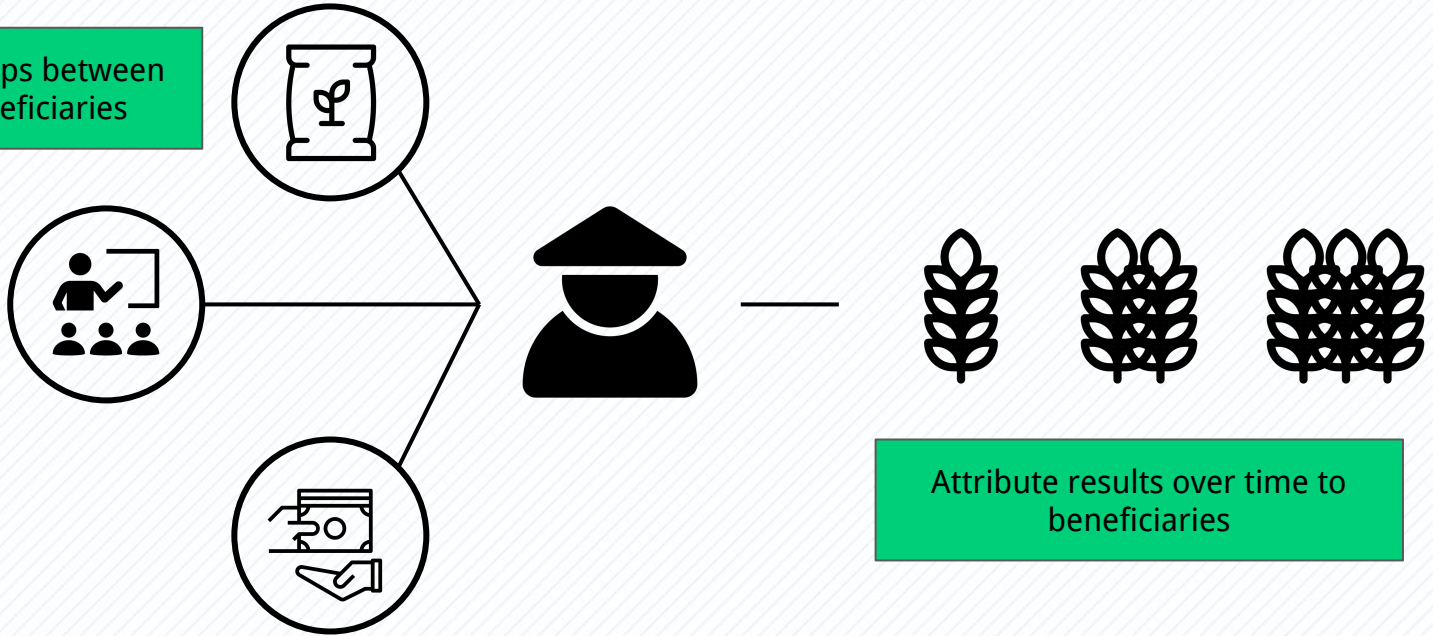
- Data quality rules enforced by the database
- Designed to accommodate a larger volume of data than Excel



Importance of the relational model for Monitoring & Evaluation

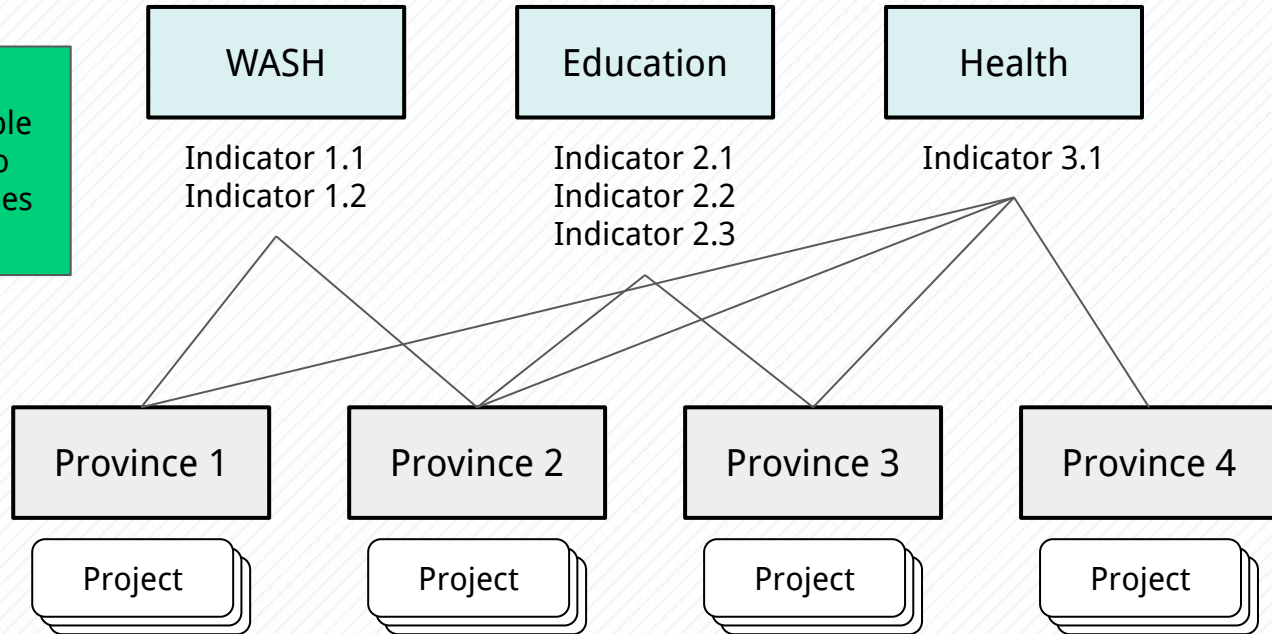
A relational database helps you build a complete picture of your beneficiaries

Establish relationships between activities and beneficiaries

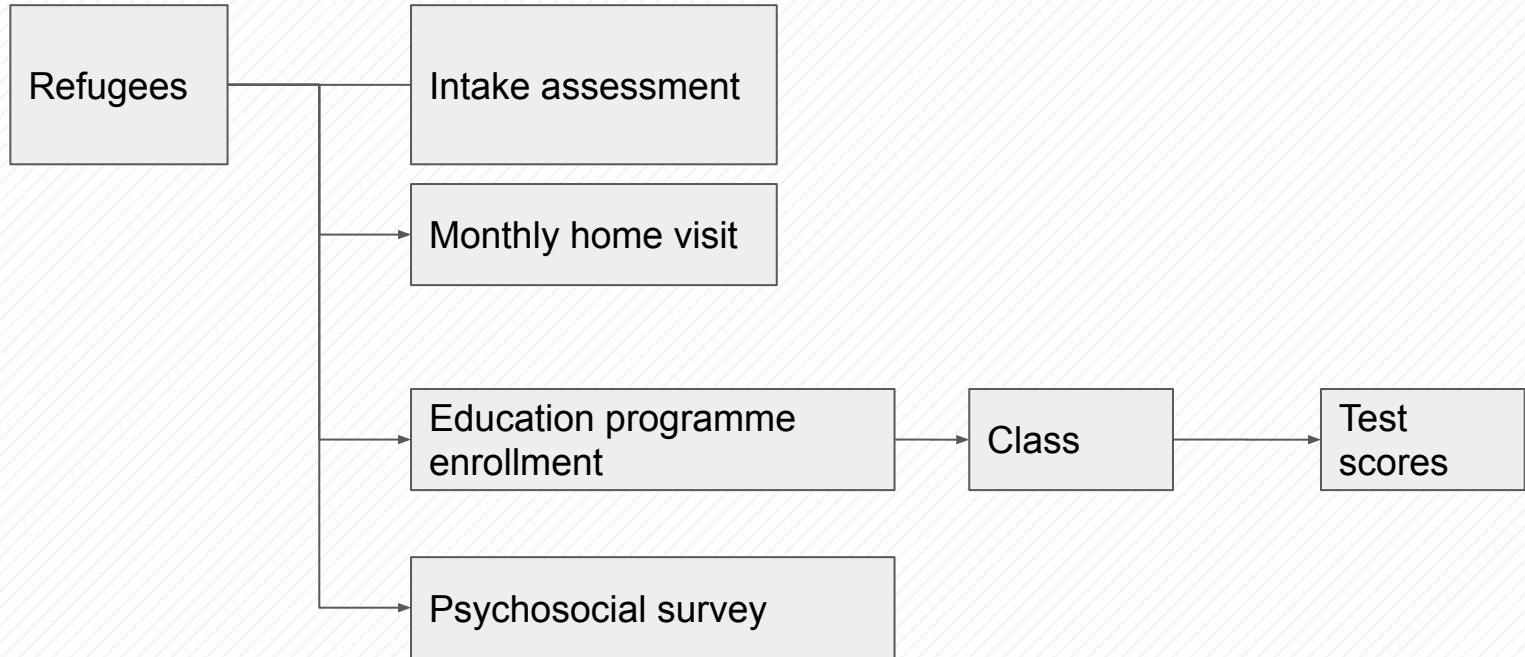


A relational database helps you organize the results your team has achieved

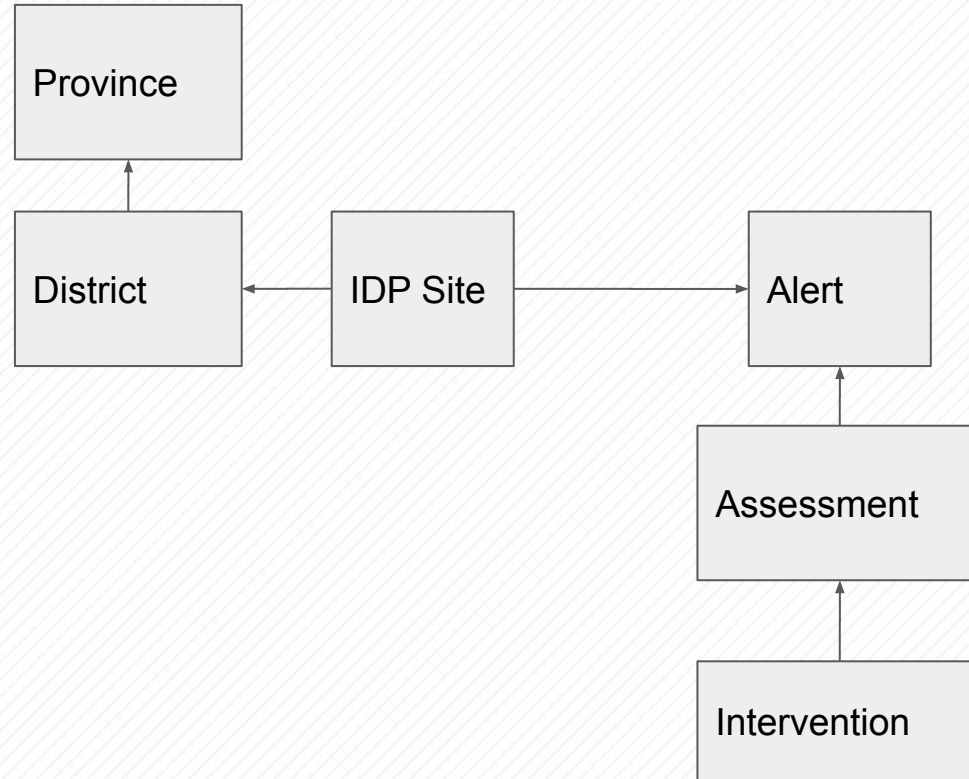
Aggregate multiple data points into relevant categories



Flexible model - Refugee Programme



Flexible model - Rapid response mechanism



(Mobile) Data Collection

Examples of Relational Databases



ORACLE

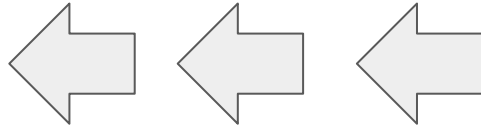


ActivityInfo

Getting data into a database

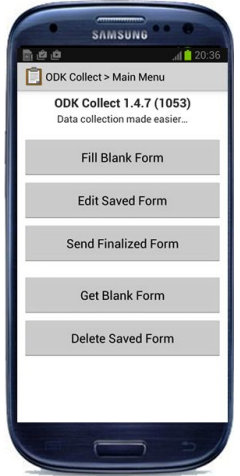
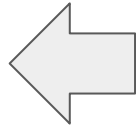


Custom developed application
(PHP, Python, etc)



Load Transform Export

ODK Aggregate Server



Mobile Data Collection: XForm

Many mobile collection apps (ODK, Kobo, etc) are based on the XForms standard.

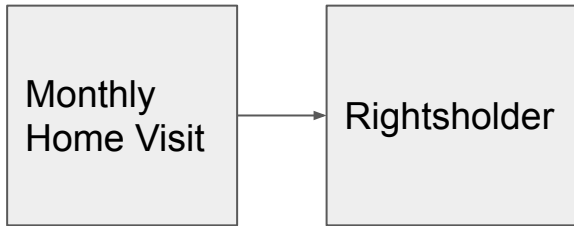
XForms is an XML format for collecting inputs from web forms.

XForms is a **document model**, not a **relational model**.



Relational vs Document Model

Relational Model



Document Model

Monthly Home Visit

Rightsholder ID

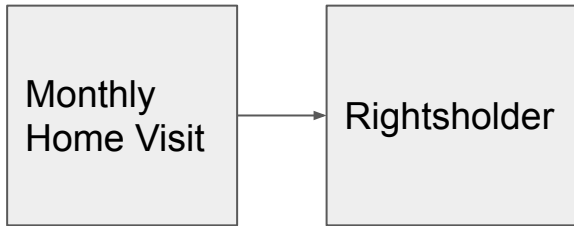
Rightsholder Name

Issues reported

- Stress
- Illness

Relational vs Document Model

Relational Model



Document Model

Monthly Home Visit

Rightsholder

- Alex (1)
- Fay (2)
- Jeric (3)

Issues reported

- Stress
- Illness

Relational <> Document Mismatch

5:41

Collect v1.29

1 2 3 4

01:22

Knowledge assessment

Start the recording before proceeding. When the knowledge assessment is complete, stop the recording before going to the next question.

01:22

"What is the case definition for AFP?"

Select each answer mentioned.

- Under 15
- Sudden onset
- Floppy, flaccid
- Weakness, paralysis

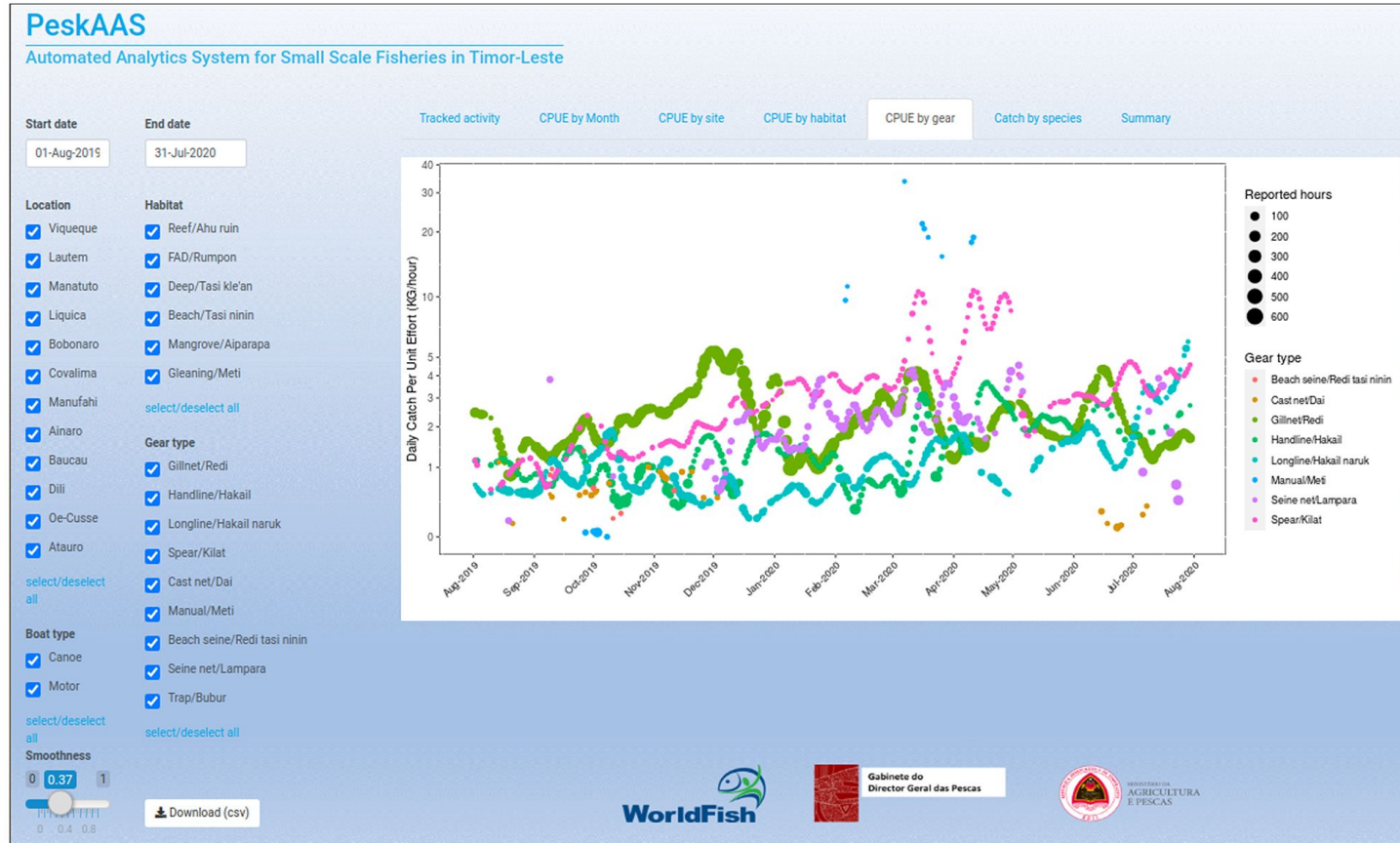
< BACK NEXT >

Database table

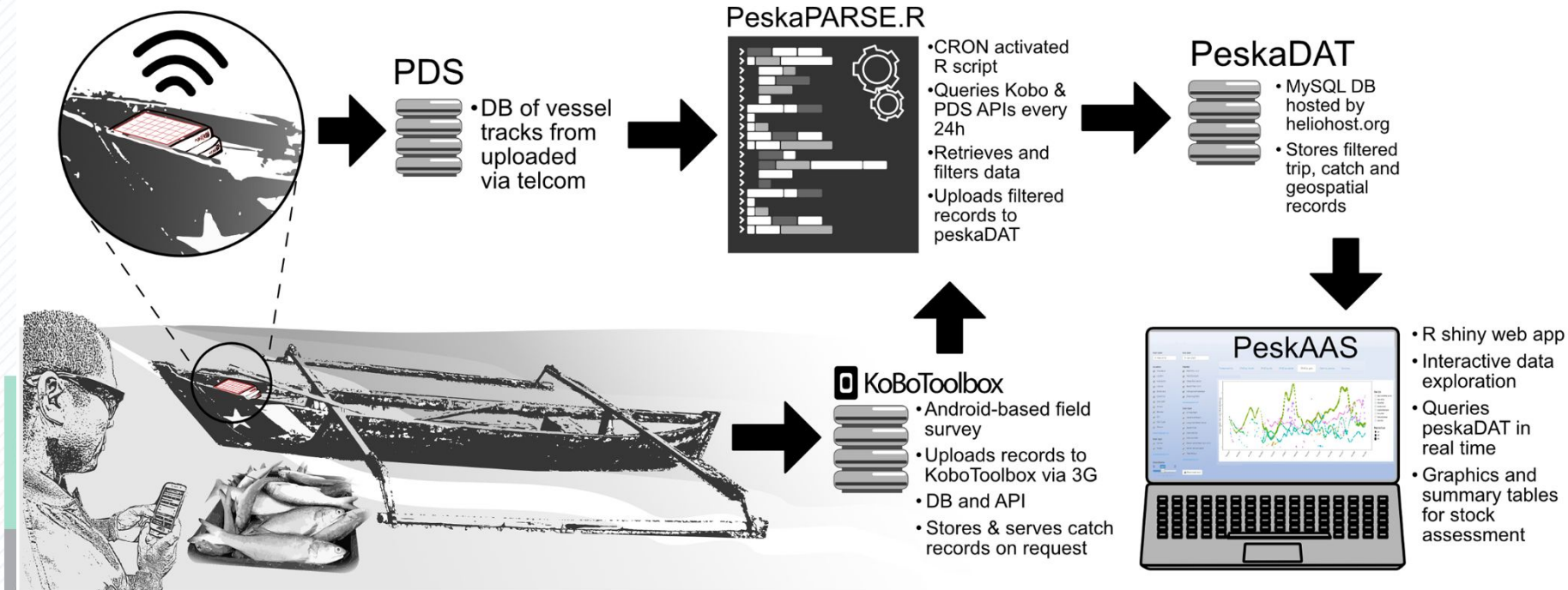
Under_15	Sudden_Onset	Floppy_Flacid	Weakness_P analysis
1	0	0	0
0	1	1	0
0	1	0	0
0	0	0	0



Analyzing small-scale fisheries in Timor Leste: PeskAAS



PeskaAAS



Info

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0234760>

ActivityInfo: Bridging the Gap

Combining the Document and Relational Models



Edit form

Form name

Beneficiaries

TEXT
Name

Select field type

Serial number

Quantity

Text

Multi-line text

Date

Week

Fortnight

Month

Single selection

Multiple selection

Attachments

Calculated

Subform

Reference

Geographic point

User

Section header

Barcode

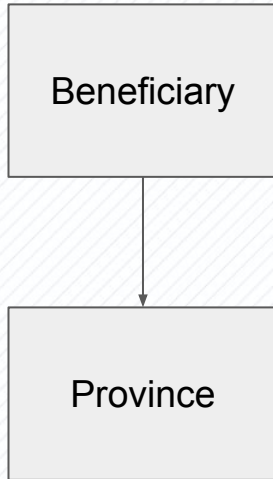
[Paste field list from spreadsheet](#)

Reference Field Type

- Establishes a link between forms
- Allows user-friendly selection of related record
- Behind the scenes, stores the related record's unique primary key



From model to user interface



Add record

Name* REQUIRED

Province* REQUIRED

- Nord Kivu
- Sud Kivu

* Cancel

From model to (mobile) user interface

TRAINING SESSIONS CANCEL RECORD ENTRY

FIELD 1 OF 3
Name* REQUIRED

Previous Next

SUBFORM: ATTENDEES CANCEL RECORD ENTRY

FIELD 1 OF 1
Beneficiary* REQUIRED

Name

Alex

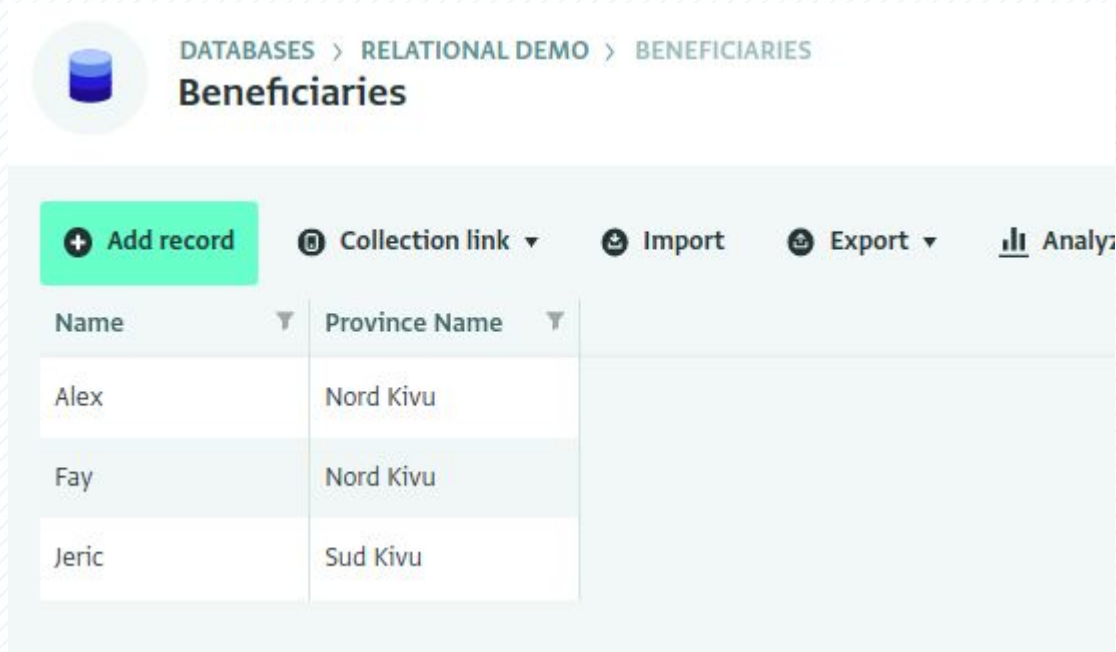
Fay

Jeric

Previous Submit record



Display Natural Keys for users...




The screenshot shows a database management interface for a table named "Beneficiaries". The breadcrumb navigation is "DATABASES > RELATIONAL DEMO > BENEFICIARIES". The table has two columns: "Name" and "Province Name". The data rows are:

Name	Province Name
Alex	Nord Kivu
Fay	Nord Kivu
Jeric	Sud Kivu

Below the table, there is a sidebar with the "Activity Info" logo, which consists of a green square with a white stylized 'G' and a grey square with the text "Activity Info".

Surrogate IDs for data integrity

 DATABASES > RELATIONAL DEMO > BENEFICIARIES

Beneficiaries

[+ Add record](#) [Collection link](#) [Import](#) [Export](#) [Analyze](#) [Select columns](#)

Record ID	Name	Province ID	Province Name
c4id52ekz6zjukep	Alex	cx5j07kz6zig9td	Nord Kivu
cr364htkz6zmf20q	Fay	cx5j07kz6zig9td	Nord Kivu
cff3ukjkz6zmix4r	Jeric	crprn86kz6zixqe	Sud Kivu



Activity
Info

From Offline Collection to Replication

Old: Offline collection

1. Download form
2. Complete form offline
3. Submit form to server when online

ActivityInfo: Offline Replication

1. Synchronize entire database to offline replica on mobile phone or web browser
2. View, edit, add, change while offline and disconnected
3. Synchronize automatically when a connection becomes available.



Thank you!

Questions?

Please add your questions to the Q&A section!

[Self-paced course on ActivityInfo](#)

[Free trial of ActivityInfo](#)

Schedule a call with me!

