



Effective & Efficient Data Collection with REDCap

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# Agenda

- ▶ REDCap Intro
  - ▶ Team Introductions, AIT Services & Support
- ▶ REDCap Basics
  - ▶ Overview & General Terminology
  - ▶ Transitioning into Electronic Data Capture
  - ▶ Longitudinal Data Collection
- ▶ REDCap Maintaining Data Integrity
  - ▶ Validation, Ranges & Ontologies
  - ▶ Removing Ambiguity in Answering Choices
- ▶ REDCap Auditing & Data Security
  - ▶ User Privileges, De-identification & Logging
- ▶ Data Exports

# Introductions

- ▶ Yvonne Watson, Project Manager
- ▶ REDCap Admin Team
  - ▶ Kim Kaukeinen
  - ▶ Sampson Abiola
  - ▶ Amanda Davin

# Research & Academic IT Services

- ▶ Research & Academic IT provides a broad range of IT services including: desktop support, application development, systems administration, server and web hosting, IT consulting, and project management for the University of Rochester School of Medicine and Dentistry and other affiliated organizations.
- ▶ More information: [www.urmc.rochester.edu/smd/it](http://www.urmc.rochester.edu/smd/it)



## In-Person Appointment

- [Schedule Now](#)



## Upcoming Training Sessions

- [Survey Basics](#)
- [Data Quality](#)

*Class size is limited. Additional offerings will be coming soon!*

# REDCap Support

- ▶ Office Hours
  - ▶ By appointment during the designated times listed on the survey.
  - ▶ Typically 30 minutes to 1 hour long.
  - ▶ Can be for anything related to REDCap or research data capture: brainstorming, learning, how-to, problem solving or consulting.
- ▶ Training Classes
  - ▶ Focused on a particular REDCap topic.
  - ▶ Usually a two-part program, a lecture component combined with a hands-on component.
  - ▶ Can be requested for personalized groups.
  - ▶ Posted on REDCap main website. (General classes will appear as links once they have been created/scheduled.)
- ▶ Email
  - ▶ [REDCapAdmin@urmc.Rochester.edu](mailto:REDCapAdmin@urmc.Rochester.edu)



# What is REDCap?

## Research Electronic Data CAPture

**REDCap is a secure web-based application that supports data capture and data management for research studies.**

- Data entry operators or people taking an online survey enter data in a web browser, either locally or from remote locations. The data is stored centrally in a secure MySQL database.
- REDCap should be considered for any research study in which web-based data entry is desired. It can accommodate multiple-site studies.
- Over 6,500 people have used REDCap here at the University of Rochester, either using it here on campus or from any other location where they have an internet connection.



# REDCap Account Setup

- ▶ **URMC users** - login using URMC username and password
- ▶ **External users** (multi-site studies) – fill out survey to register for access – **red** link at top of Log In page



## Log In

[REDCap v9.3.0 Release Notes](#) | [REDCap Boilerplate Grant Language](#) | [REDCap Service Description](#)

If you are an **external user**, please click [here](#) to register for access

**URMC users should enter their URMC username and password for automatic access.**



### Maintenance Notice

- REDCap will be unavailable Saturday, February 22nd from 10am to noon in order to perform system maintenance. We will be upgrading REDCap's version to 9.5.3; release notes will be posted to the REDCap homepage.

As always, you can contact [REDCapAdmin@urmc.rochester.edu](mailto:REDCapAdmin@urmc.rochester.edu) if you have any questions.



### In-Person Appointment

- [Schedule Now](#)



### Upcoming Training Sessions

- [Survey Basics](#) \*\*\* Now accepting registrations \*\*\*
- [Data Quality](#)

Class size is limited. Additional offerings will be coming soon!

Please log in with your user name and password. If you are having trouble logging in, please contact [REDCap Administrator](#).

Username:

Password:

Log In

[Forgot your password?](#)







# REDCap Project Types

- ▶ Data Entry Instruments
  - ▶ Surveys – can have multiple per project
    - ▶ Completed by participant
    - ▶ Emailed as link or link on website
    - ▶ Automated invitations
    - ▶ Survey Queue
  - ▶ Forms
    - ▶ Completed by study staff logged in to REDCap
- ▶ Repeated visits over time
  - ▶ Longitudinal
    - ▶ Defined number of events
  - ▶ Repeated forms or events
    - ▶ Undefined number of events such as Adverse Events



# Longitudinal Data Collection

- ▶ Use a form or survey a finite number of times – for example, a follow-up form over 3 visits for the same subject.
- ▶ Allows for use of scheduling module.

	Event #	Days Offset	Offset Range Min / Max	Event Name	Custom Event Label (optional)	Unique event name (auto-generated)
 	1	0	-0/+0	Baseline		baseline_arm_1
 	2	7	-0/+0	Week 1 Follow up		week_1_follow_up_arm_1
 	3	14	-0/+0	Week 2 Follow up		week_2_follow_up_arm_1

Add new event	<input type="text"/> Days	- <input type="text"/> + <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<a href="#">Convert from</a>		Descriptive name for this event	Custom	

<input type="button" value="Begin Editing"/>	<input type="button" value="Save"/>			
Data Collection Instrument	Baseline (1)	Week 1 Follow up (2)	Week 2 Follow up (3)	
Demographics	✓			
Follow-up form	✓	✓	✓	

# Example of Advanced Project Setup

- ▶ Screening Project
- ▶ Enrolled Project
- ▶ Use Auto Record Generation module to automatically push eligible subject information to enrollment project
  - ▶ Any field from screening can automatically be populated in enrolled project
  - ▶ All enrolled subject IDs will be chronological

Editing existing Record ID 1

Record ID	1
Is the subject eligible?	<input checked="" type="radio"/> Yes <input type="radio"/> No
Push	<input checked="" type="radio"/> Yes <span style="color: red;">← trigger to push subject to enrollment project</span>
<b>Form Status</b>	
Complete?	<input type="text" value="Complete"/>
Lock this record for this form?	<input type="checkbox"/> Lock

If locked, no user will be able to edit this record on this form until someone with Lock/Unlock privileges unlocks it.

Save & Exit Form   Save & ...

# General REDCap Design/Terms




- ▶ Project
  - ▶ Contains all of your instruments, settings and general template design.
- ▶ Instrument (aka Form/Survey)
  - ▶ Unique forms used to hold the fields, “questions”, to collect your data.
- ▶ Field
  - ▶ Individual questions that are designed to collect a singular point of data.

- ▶ Multiple field types.
- ▶ Unique variable name.
- ▶ Optional validation.
- ▶ Identifier?
- ▶ Required?






Text	-single line box for free text
Notes	-larger, expandable box for free text
Dropdown	-dropdown menu with answering options
Radio	-selectable buttons for single answer options
Checkbox	-selectable boxes for multiple answer options
File	-file upload for capturing documents
Calc	-calculating field to display results
Yes/No or True/False	-radio buttons hardcoded to yes and no

# General REDCap Design/Terms cont'd

## ▶ Matrix of Fields

   Matrix group: pt\_satisfaction

Please answer the following questions.

	Completely Agree	Slightly Agree	Neutral	Slightly Disagree	Completely Disagree	
 Variable: pt_career_health						
I am happy with my career choices.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	reset
 Variable: pt_boss_state						
I think my boss is qualified for their position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	reset
 Variable: pt_life_state						
I think my life is going well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	reset
 Variable: pt_relationship						
I have a great relationship with my peers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	reset
 Variable: pt_mood_monday						
Waking up on Monday does not fill me with dread.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	reset

# Codebook

Print page

## Data Dictionary Codebook

^ Collapse all instruments

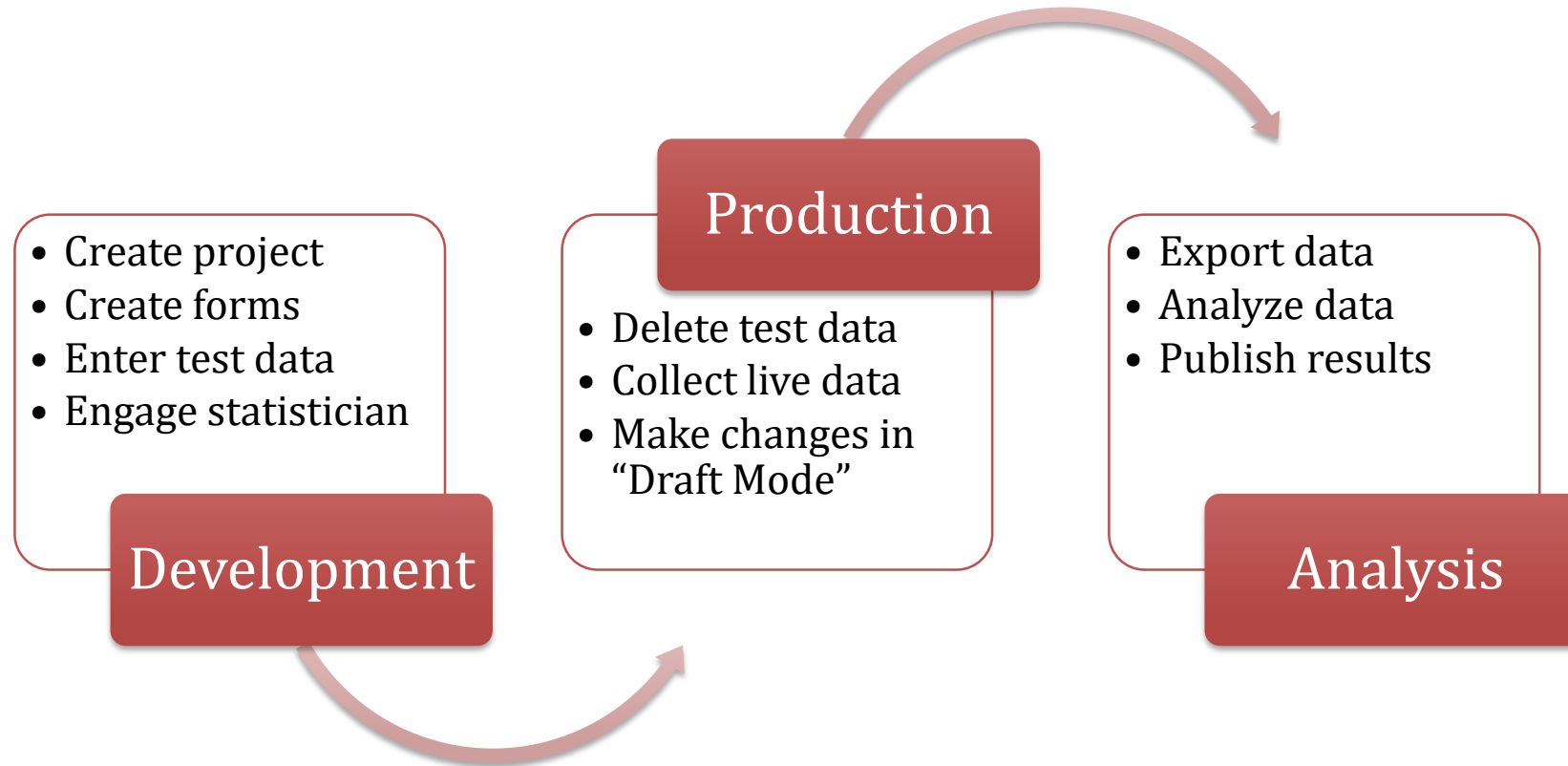
Collapse all instruments

#	Variable / Field Name	Field Label <i>Field Note</i>	Field Attributes (Field Type, Validation, Choices, Calculations, etc.)									
Instrument: <b>Survey Basics Registration</b> (survey_basics_registration) <span style="float: right;">^ Collapse Collapse</span>												
1	record_id	Record ID	text									
2	intro	Research & Academic IT presents: REDCap Survey Basics This class covers how to setup and run surveys in REDCap. A simple survey example will be presented in class. Attend this class if you wish to learn about how to best setup surveys, denote fields as identifiers, apply branching logic and field validations, use the Participant List, and export your data. REDCap administrators will be available to help guide users through basic survey project setup. Laptops are required for this session. It is highly recommended that users already have a REDCap account before coming to class. Also, if not familiar with REDCap users should watch this video prior to attending the training. Hosted by Research & Academic IT.	descriptive									
3	fname	First Name	text, Required									
4	lname	Last Name	text, Required									
5	email	Email	text (email), Required									
6	training_date	Please select a training date for the Survey Basics training session.  If the class is grayed out, registration has closed.	radio <table border="1"> <tr> <td>2019_10</td> <td>(SRB 4.412) Lecture: 10/21 from 10-11am (SRB 4.412) Lab: 10/25 from 1-2pm (Laptop required)</td> </tr> <tr> <td>2020_02</td> <td>(SRB 1.412) 2/25/2020 from 10-11:30am (Laptop required)</td> </tr> </table> Custom alignment: LV Field Annotation: @HIDECHOICE='2019_10'	2019_10	(SRB 4.412) Lecture: 10/21 from 10-11am (SRB 4.412) Lab: 10/25 from 1-2pm (Laptop required)	2020_02	(SRB 1.412) 2/25/2020 from 10-11:30am (Laptop required)					
2019_10	(SRB 4.412) Lecture: 10/21 from 10-11am (SRB 4.412) Lab: 10/25 from 1-2pm (Laptop required)											
2020_02	(SRB 1.412) 2/25/2020 from 10-11:30am (Laptop required)											
7	accommodations	Do you require any special accommodations?	notes Custom alignment: LH									
8	survey_basics_registration_complete	Section Header: <i>Form Status</i> Complete?	dropdown <table border="1"> <tr> <td>0</td> <td>Incomplete</td> </tr> <tr> <td>1</td> <td>Unverified</td> </tr> <tr> <td>2</td> <td>Complete</td> </tr> </table>	0	Incomplete	1	Unverified	2	Complete			
0	Incomplete											
1	Unverified											
2	Complete											
Instrument: <b>Survey Basics Eval</b> (survey_basics_satisfaction) <span style="float: right;">^ Collapse Collapse</span>												
9	which_session	Which Survey Basics session(s) did you attend?	checkbox, Required <table border="1"> <tr> <td>1</td> <td>which_session__1</td> <td>Lecture</td> </tr> <tr> <td>2</td> <td>which_session__2</td> <td>Hands-on lab</td> </tr> <tr> <td>3</td> <td>which_session__3</td> <td>None</td> </tr> </table> Stop actions on 3	1	which_session__1	Lecture	2	which_session__2	Hands-on lab	3	which_session__3	None
1	which_session__1	Lecture										
2	which_session__2	Hands-on lab										
3	which_session__3	None										
10	improved  Show the field ONLY if: [which_session(1)] = '1' or [which_session(2)] = '1' <b>branching logic</b>	Section Header: <i>Please consider the overall course when answering these questions.</i> This course improved my ability to develop surveys in REDCap.	radio (Matrix) <table border="1"> <tr> <td>1</td> <td>Strongly Disagree</td> </tr> <tr> <td>2</td> <td>Disagree</td> </tr> <tr> <td>3</td> <td>Neutral</td> </tr> </table>	1	Strongly Disagree	2	Disagree	3	Neutral			
1	Strongly Disagree											
2	Disagree											
3	Neutral											

# Preparing for Data Collection

- ▶ Review how fields are worded for clarity
- ▶ Choose appropriate field type for data being collected
- ▶ Decide which validation should be used
- ▶ Determine ranges
- ▶ Identify fields to be branched
- ▶ Note which fields should be required
- ▶ Identify PHI fields
- ▶ Use field note to show example
- ▶ Field vs. Matrix
- ▶ Check for duplicate fields (especially when using multiple forms)
- ▶ Avoid textboxes – instead try to categorize answers
- ▶ Explore the use of ontologies when appropriate

# Project Workflow



# Data Integrity - Validation Types

- ▶ Field Formats
- ▶ Ranges
  - ▶ Min
  - ▶ Max
- ▶ Ontologies
  - ▶ ICD-9/ICD-10
  - ▶ RxNorm

Date (D-M-Y)	Time (HH:MM)
Date (M-D-Y)	Email
Date (Y-M-D)	Integer
Datetime (D-M-Y H:M)	Letters only
Datetime (M-D-Y H:M)	MRN (10 digits)
Datetime (Y-M-D H:M)	Number
Datetime w/ seconds (M-D-Y H:M:S)	Number (1 decimal place)
Datetime w/ seconds (Y-M-D H:M:S)	Number (2 decimal places)
Phone (North America)	Zipcode (U.S.)
Time (MM:SS)	



# Data Integrity – Response Options

## ▶ Avoid Ambiguity

- ▶ Use finite answering options wherever possible, e.g drop downs, radio buttons, checkboxes.
- ▶ Add options for unknown, N/A, refused to answer and so on.
- ▶ Consider standardizing “data missingness” - (e.g., '-999, Not asked' or 'UNK, Unknown')
- ▶ New missing data codes functionality coming with upgrade this Saturday!

Fields that have a blank/missing value may be marked with a custom 'Missing Data Code' to note why the value is blank. These missing codes may be used to aid in data analysis by specifying why a field lacks a value. Users may enable custom missing data codes at the project-level in the Additional Customizations popup on the Project Setup page. The missing codes should be coded just like the choices of a multiple choice field with code + comma + label, in which the codes can only have letters, numbers, dots, dashes, and underscores (e.g., '-999, Not asked' or 'UNK, Unknown'). If no codes are entered, this feature will remain disabled. After missing data codes have been set up in a project, you will see an 'M' icon next to each field when viewing a data entry form. Click the icon to open your list of missing data codes, and select one. Once selected, it will save the missing code as the literal data value for the field. Missing data codes can be used for any field type (e.g., date, slider, file upload fields).

# Data Integrity – Required Fields

- ▶ Surveys

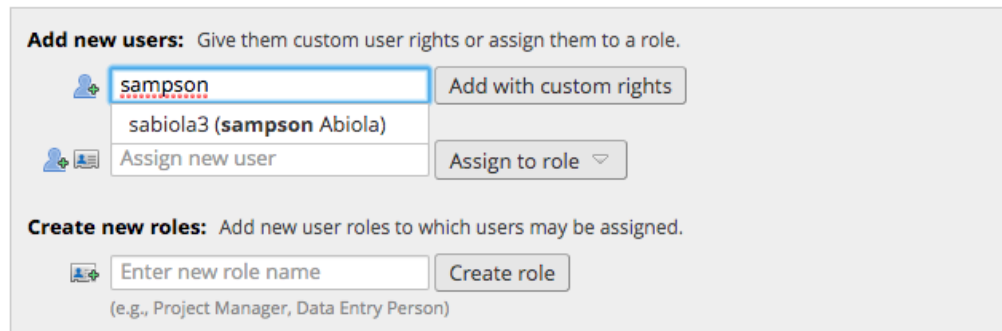
- ▶ Enforceable, participant cannot proceed until they provide an answer.
- ▶ Use when appropriate, don't make all fields required if they are truly not.

- ▶ Data Collection Instruments

- ▶ Non-enforceable, it will prompt the user but will not constrain them.
- ▶ Great for reminding or indicating a situation where later data may be invalid due to dependencies.

# Data Security – User Privileges

- ▶ Controlled by anyone who has the “User Rights” privilege assigned to them.
- ▶ New users can be added by typing their name or username but must be selected from the drop down list. (Pre-requisite – user being added must have REDCap account)
- ▶ Granular options to control almost all aspects of REDCap and provide only needed access for each individual user.
- ▶ Use roles/groups to make managing large amounts of users easier.
- ▶ As an owner you can be removed, there is no default prevention against this.



**Add new users:** Give them custom user rights or assign them to a role.

**Create new roles:** Add new user roles to which users may be assigned.

(e.g., Project Manager, Data Entry Person)

# Data Security – Logging

- ▶ All actions from the start of project creation are logged.
- ▶ Logs cannot be deleted directly, however certain actions can cause logged events to be deleted such as moving to production.
- ▶ Can be sorted by record, project user, time stamp and type of action such as update/create/delete.
- ▶ Can be exported for storage or providing to regulatory agencies.
- ▶ Also can be used to track down errors or inexplicable events within your data.

# Data Security – De-Identification

- ▶ REDCap will only remove identifiers if the fields which contain them have been specifically indicated as identifier fields.
- ▶ Enforceable through user privileges as well as an available option for everyone in the data export tool.

Privileges for data exports (including PDFs and API exports), reports, and stats:

## Data Exports

\* De-identified means that all free-form text fields will be removed, as well as any date/time fields and Identifier fields.

- No Access
- De-Identified\*
- Remove all tagged Identifier fields
- Full Data Set

The screenshot shows the configuration for a variable named 'fname'. The 'Variable Name' field contains 'fname' and is marked as 'ONLY letters, numbers, and underscores'. A checkbox 'Enable auto naming of variable based upon its Field Label?' is checked. Below this, there are buttons for 'Smart Variables' and 'Piping'. The 'Validation?' section has a dropdown menu set to '---- None ----' and an option to 'select ontology service'. The 'Required?\*' section has radio buttons for 'No' and 'Yes', with 'Yes' selected. The 'Identifier?' section has radio buttons for 'No' and 'Yes', with 'Yes' selected and a red arrow pointing to it. The 'Custom Alignment' section has a dropdown menu set to 'Right / Vertical (RV)'. The text 'Align the position of the field on the page' is visible below the alignment dropdown.

# Data Security – De-Identification

- ▶ Use Check for Identifiers module to ensure all identifier fields have been tagged.

## Check For Identifiers

This module will help you assess whether or not some fields may be identifiers, and then allows you to easily tag identifiers for greater data security. While this same process can be accomplished in the Data Dictionary or Online Designer page provides a streamlined way of tagging fields as identifiers very quickly. Based off the variable name or field listed below may possibly contain identifiers (e.g., name, phone number, address). Please review the entries and tag where appropriate. Any fields already tagged as identifiers will already be checked below.

## Basic Demography Form

### Variable Name

record\_id  
first\_name  
last\_name  
address  
telephone  
email  
dob  
age

### Field Label

Study ID  
First Name  
Last Name  
Street, City, State, ZIP  
Phone number  
E-mail  
Date of birth  
Age (years)

### Identifier?



Not started

I'm done!

### Design your data collection instruments

Add or edit fields on your data collection instruments. This may be done by either using the Online Designer (online method) or by uploading a Data Dictionary (offline method). Quick links: [Download PDF of all instruments](#) OR [Download the current Data Dictionary](#)

Go to [Online Designer](#) or [Data Dictionary](#) Explore the [REDCap Shared Library](#)

Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?

Learn how to use [Smart Variables](#) [Piping](#) [Action Tags](#)

# Data Security – Miscellaneous

- ▶ **Date Shifting**
  - ▶ All dates are shifted by the same amount of random days, maintaining their relative importance but obscuring their identification properties.
  - ▶ Available as an option during data export.
- ▶ **Locking Records**
  - ▶ Allows those with specific privileges to lock or unlock records.
  - ▶ Can be implemented with a e-signature requirement.








# Data Exports

- ▶ Export to variety of formats (1.)
- ▶ Specify de-identification options to remove PHI (2.)

### Exporting "All data (all records and fields)"

Select your export settings, which includes the export format (Excel/CSV, SAS, SPSS, R, Stata) and if you wish to perform de-identification on the data set.

**Choose export format** 1.

-  CSV / Microsoft Excel (raw data)
-  CSV / Microsoft Excel (labels)
-  SPSS Statistical Software
-  SAS Statistical Software
-  R Statistical Software
-  Stata Statistical Software
-  CDISC ODM (XML)

**De-identification options** (optional)

The options below allow you to limit the amount of sensitive information that you are exporting out of the project. Check all that apply.

**Known Identifiers:** 2.

- Remove all tagged Identifier fields (tagged in Data Dictionary)
- Hash the Record ID field (converts record name to an unrecognizable value)

**Free-form text:**

- Remove unvalidated Text fields (i.e. Text fields other than dates, numbers, etc.)
- Remove Notes/Essay box fields

**Date and datetime fields:**

- Remove all date and datetime fields
- OR —
- Shift all dates by value between 0 and 364 days (shifted amount determined by algorithm for each record) [What is date shifting?](#)
  - Also shift all survey completion timestamps by value between 0 and 364 days (shifted amount determined by algorithm for each record)

[Deselect all options](#)

**Additional export options**

- Export survey identifier field and survey timestamp field(s)

**Advanced data formatting options**

**Set CSV delimiter character**

Set the delimiter used to separate values in the CSV data file (only valid for CSV Raw Data and CSV Labels export formats):

**Force all numbers into a specified decimal format?**

You may choose to force all data values containing a decimal to have a specified decimal character (comma or period/full stop). This will be applied to all calculations and number-validated text values in the export file.

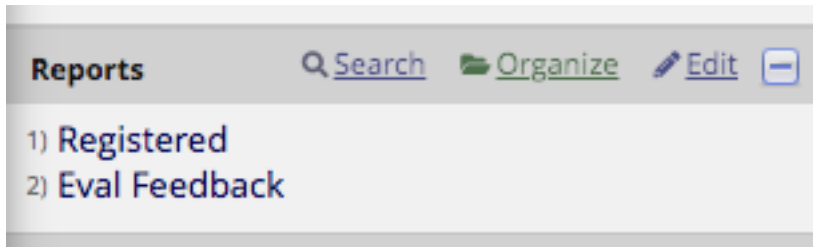
**NOTE:** Your data formatting selections above will be remembered in the future and will be pre-selected upon your next export.

**Export Data** **Cancel**



# Reports

- ▶ Easy to build simple reports
  - ▶ Choose fields
  - ▶ Add filters
  - ▶ Save
- ▶ Always up to date – under Reports in left menu



**STEP 1**

**User Access:** Choose who can edit and view this report

**View Access:** Choose who sees this report on their left-hand project menu [?](#)

All users – OR –  Custom user access (Choose specific users, roles, or data access groups who will have access)

**Edit Access:** Choose who can edit, copy, or delete this report (requires user to have 'Add/Edit/Organize Reports' privileges)

All users – OR –  Custom user access (Choose specific users, roles, or data access groups who will have access)

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**STEP 2**

**Fields to include in report** [+ Quick Add](#) Add all fields from selected instrument:

Field	Field Name	Instrument
Field 1	record_id "Record ID"	Survey Basics Registration
Field 2	Type variable name or field label	Instrument:

**Additional report options (optional)**

Include the survey identifier field and survey timestamp field(s)

Combine checkbox options into single column of only the checked-off options (will be formatted as a text field when exported to stats packages)

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**STEP 3**

[How to use filters and AND/OR logic](#)

**Filters (optional)** **Operator / Value**

Filter	Field Name	Operator	Value
Filter 1	Type variable name or field label	=	

Switch format: [Use advanced logic](#)

**Live Filters (optional)** Live Filters can be selected on the report page for dynamically filtering data in real time. With the exception of the Record ID field, only multiple choice fields can be used as Live Filters (as well as Events, if longitudinal, and Data Access Groups, if any exist).

Live Filter 1	-- select a field --
Live Filter 2	-- select a field --
Live Filter 3	-- select a field --