Optimizing Study Management Using REDCap™: A secure web application for building and managing surveys and databases

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Rehabilitation Sciences Research Roundtable
Department of Rehabilitation Sciences, College of Allied Health
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Presentation Outline

REDCap Overview and OUHSC History

Scenarios Favoring REDCap

Accessing REDCap at OUHSC

Security Practices and Policies

Citing REDCap in grants/IRB/manuscripts

Advanced Uses of REDCap: Time Permitting

Reports for Project Management

Reports for Outcomes

Replicable Research & Literate Programming

REDCap overview (http://project-redcap.org/)

- Secure web application for building and managing surveys and databases.
  - Developed by informatics core at Vanderbilt with support from NCRR and NIH.
    - Designed for academic biomedical researchers.
- Provides:
  - A centralized, back-end storage component.
  - Tools to create an interactive front-end html GUI.
  - An API to import & export data.
  - Example templates.
  - Instructional videos for training.
  - User-group network of institutional researchers.
  - Also included: built-in project calendar, scheduling module, ad hoc reporting tools, and advanced features, such as branching logic, file uploading, and calculated fields.
- It can reduce
  - Developing a lot of new software applications.
  - Anxieties related to security of home-grown software.

A Brief History of REDCap

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

REDCap Project History

- 2004 Needs Assessment
  - Researchers needed help managing data for small/medium sized non-trial research projects (pilot, R01, PPG)
- Hypothesis
  - Researchers will do the right thing (secure, audit trails, etc) if provided an easy way to get needed tools
- Problem
  - Many projects, few resources

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

REDCap Project History

- Solution:
  - Metadata-driven application
    (no per-project programming)
- 2004 - First REDCap project operational at Vanderbilt
- 2006 - REDCap Consortium
  - Launched REDCap Consortium to share with other universities and foster collaboration for future development

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

REDCap Project History

REDCap™
Research Electronic Data Capture

Consortium Wiki (Login Required)

Upcoming Events:
• Weekly All-Hands Consortium Meeting - Every Friday, 1-2PM Central

Introduction | Software | Consortium Partners | Become a Partner | Video Resources | Citing REDCap | Library

The **REDCap Consortium** is composed of **812 active institutional partners** from CTSA, GCRC, RCMI and other institutions in **64 countries**. The consortium supports a secure web application (REDCap) designed exclusively to support data capture for research studies.

The REDCap application allows users to build and manage online surveys and databases quickly and securely, and is currently in production use or development build-status for more than **85,000 projects** with over **111,000 users** spanning numerous research focus areas across the consortium. To find out if your institution is already running REDCap, you will find contact information on the Consortium Partners page. Learn more about REDCap by watching a brief summary video (4 min).

Map of REDCap Consortium Partners

View fullscreen map

Recent publications using REDCap:

Preoperative B-type natriuretic peptide levels are associated with outcome after total cavopulmonary connection (Fontan). *J Thorac Cardiovasc Surg. 2013 Sep 27. pii: S0022-5223(13)00922-7. doi: 10.1016/j.jtcvs.2013.08.009. [Epub ahead of print].*

Impact of Guideline Implementation on Transfusion Practices in a Surgical Intensive Care Unit. *J Cardiothorac Vasc Anesth. 2013 Sep 21. pii: S1053-0770(13)00315-7. doi: 10.1053/j.jvca.2013.05.040. [Epub ahead of print].*

The Usefulness of a Yearly Head and Neck Surgery Trip to Rural Kenya. *Otolaryngol Head Neck Surg. 2013 Sep 17. [Epub ahead of print].*

A History of Smoking is Associated with Improved Survival in Patients Treated with Mild Therapeutic Hypothermia Following Cardiac Arrest. *Resuscitation. 2013 Sep 12;*

Vancomycin-Resistant Enterococci (VRE) Infection: Not Just for the Transplanted. *Leuk Lymphoma. 2013 Sep 11. [Epub ahead of print].*

Mechanical Pain Sensitivity and the Severity of Chronic Neck Pain and Disability Are Not Modulated Across the Menstrual Cycle. *J Pain. 2013 Sep 7. pii: S1526-5900(13)01128-0. doi: 10.1016/j.jpain.2013.07.008. [Epub ahead of print].*

View all 753 articles

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A Brief Perspective: *Why REDCap?*

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Why REDCap?

- Designed for the Researcher

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Why REDCap?

- Easy way for researchers to do the right thing (e.g. compliance, security)

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

Why REDCap?

- **But Powerful!**

e.g.

Data De-Identification Services
Participant Scheduling Support
Data Transfer Services & API
Graphical Data Review
Double-Data Entry
Full audit trails and logging
Shared Library (efficiency, standardization)
Multi-site Collection (sequestered access)
Data quality reports

… **Constantly Evolving** …

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

Why REDCap?

- REDCap is easily configured to support a variety of single- and multi-site study needs.

Setup can be accomplished in hours if data collection plan is in order.

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

Why REDCap?

- Improves science

Workflow for creating projects includes all research team members and helps solidify the data management plan before enrolling the first patient.

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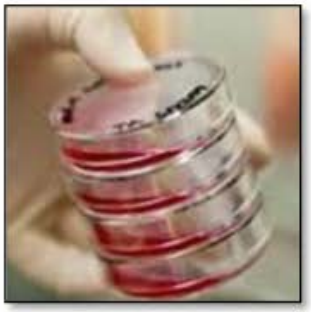
Why REDCap?

- Diversity of Supported Research

  Proven Track Record in:



Basic Research

Clinical Research

Global Health

Community Research

Research Operations and Quality

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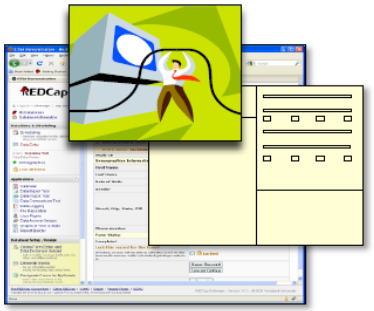
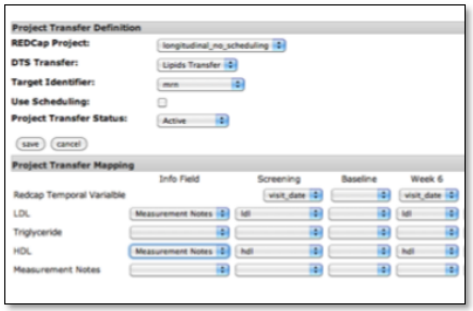
Why REDCap?

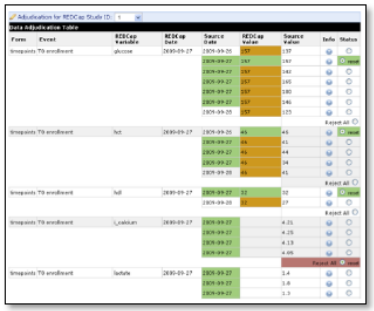
- **Promotes Standards and Standardization …**



Interface with External Clinical Systems

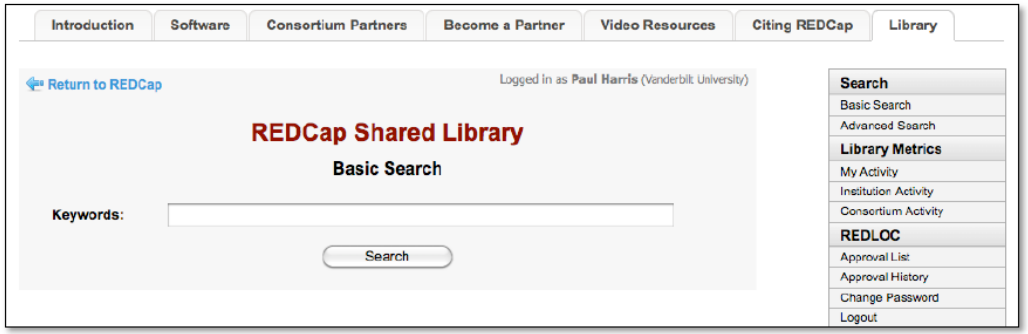


Data Transfer Service: Variable Mapping



Data Transfer Service: Adjudication

… to support de-centralized data collection (multi-center studies)



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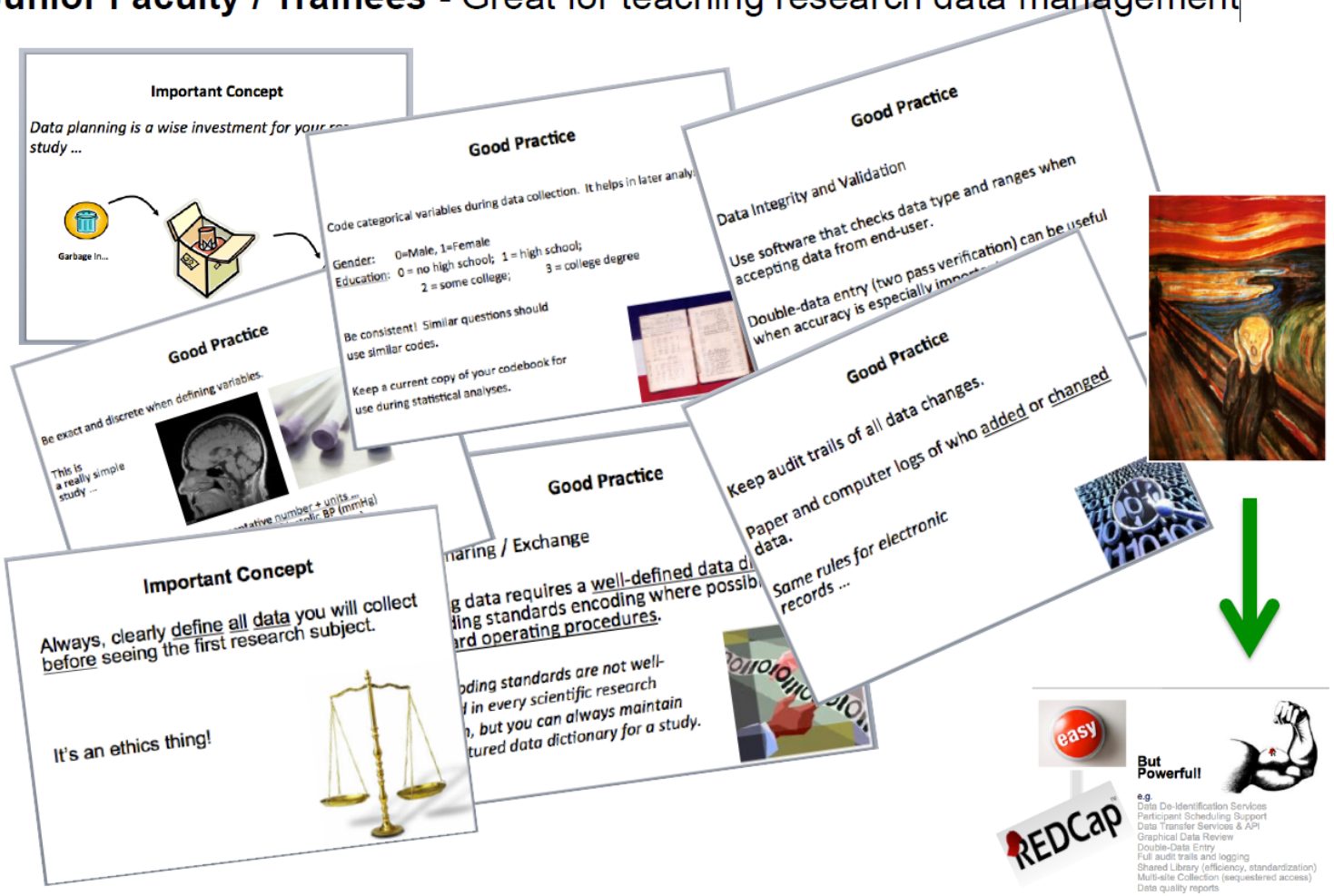
Why REDCap?

Junior Faculty / Trainees - Great for teaching research data management



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Why REDCap?

- **Flexible:** REDCap doesn't know or care if a record represents a patient, mouse, cage …

  (solid tools + smart people… amazing things happen)

- **Great for Multi-Center Studies**
  - Centralized: Use Data Access Groups to Sequester
  - De-Centralized:

    Metadata = Metadata (ad hoc standards)

- **Writing a grant or going to IRB?**

  Boilerplate language & create a REDCap shell project for screenshot

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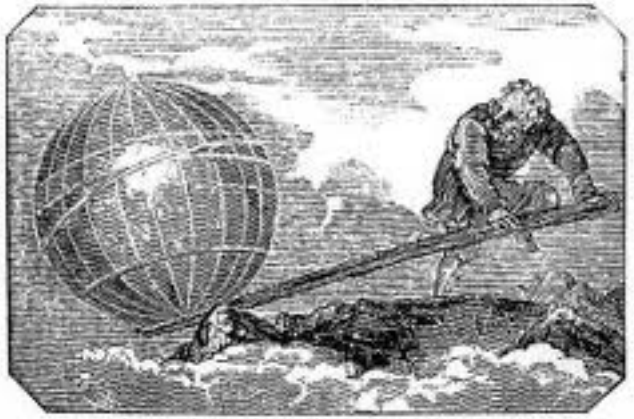
Why REDCap?

Cost Effective



Setup Infrastructure is minimal

Most sites using REDCap leverage 1-2 personnel to support entire research enterprise

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

A Brief History of OUHSC REDCap

Slide Courtesy of: Paul Harris, PhD, Associate Professor of Biomedical Informatics, Biomedical Engineering, Vanderbilt University

REDCap Software Features

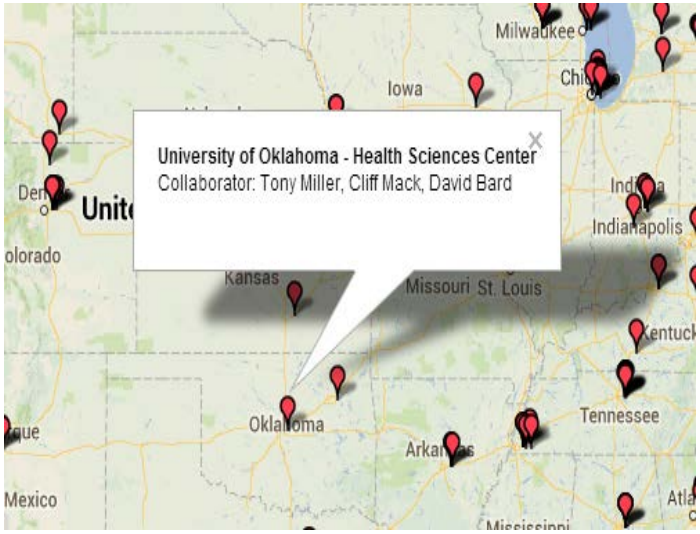
Availability - Software available at no cost for REDCap partners.

Secure and web-based - Input data or build online survey anywhere in the world over secure web connection with authentication and data logging.

Multi-site access - REDCap databases/surveys can be used by researchers from multiple sites and institutions.

OUHSC Becomes REDCap Partner

- MIECHV grant (DBP) requests REDCap (Nov. 2011)
  - IT installs “DBP” REDCap instance, ver.4 (Jan. 2012)
- New DBP projects move to REDCap (2012-2013)
- Campus REDCap interest rises (2012-2013)
  - IT installs “Enterprise” REDCap instance, ver.5 (Mar. 2013)
  - IT installs “Development box” instance, ver.5 (Apr. 2013)
- Governance body requested (Mar. 2013)
  - Governance body formed (Jun. 2013)
- Funding for REDCap admin requested (Apr. 2013)
  - College of Medicine agrees to fund Dev box and Enterprise instance (Jun. 2013)
- **REDCap freely available to all**



REDCap Project Types

https://redcap1.mayo.edu/redcap/index.php?action=training

1. Traditional Database
   classic model

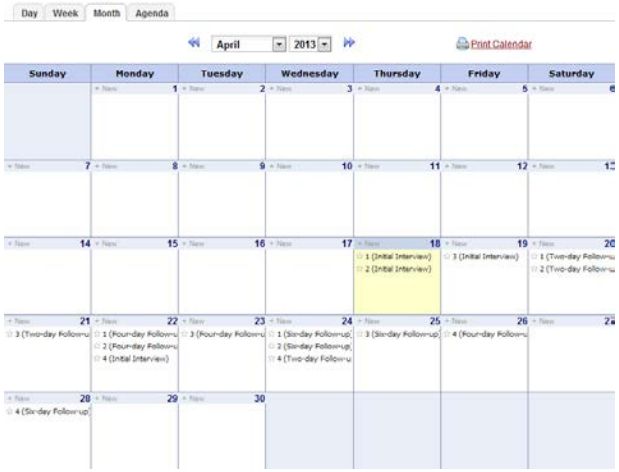
2. Parent-Child Linking
   linking together multiple databases

3. Operations
   use case for non-study/non-trial

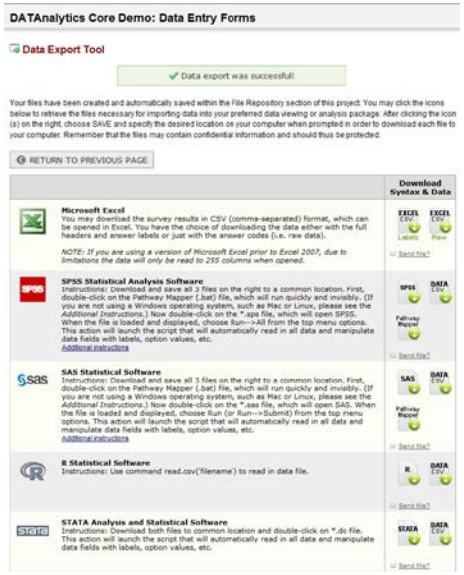
4. Longitudinal Database
   multi-use forms with time points

REDCap Software Highlights: At a Glance

Built-in project Calendar

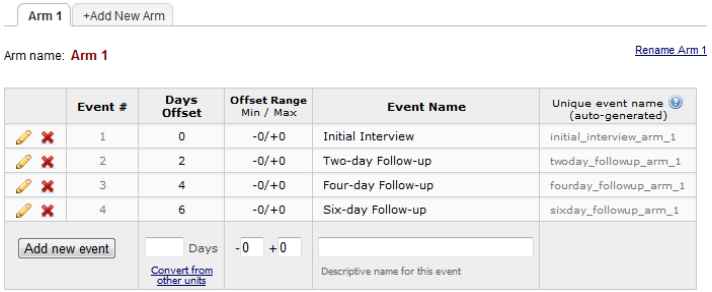


Built-in Export Formats

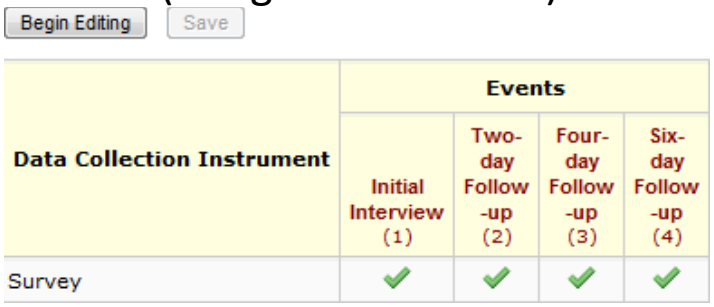


Scheduling Module

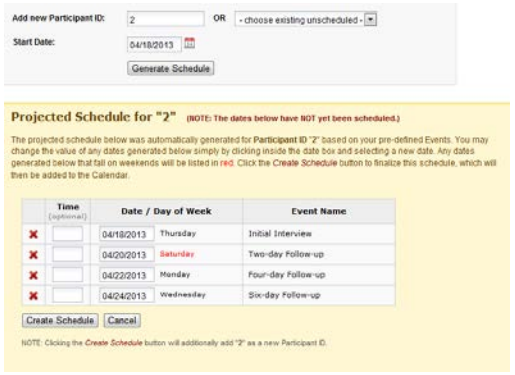
(Define Events)



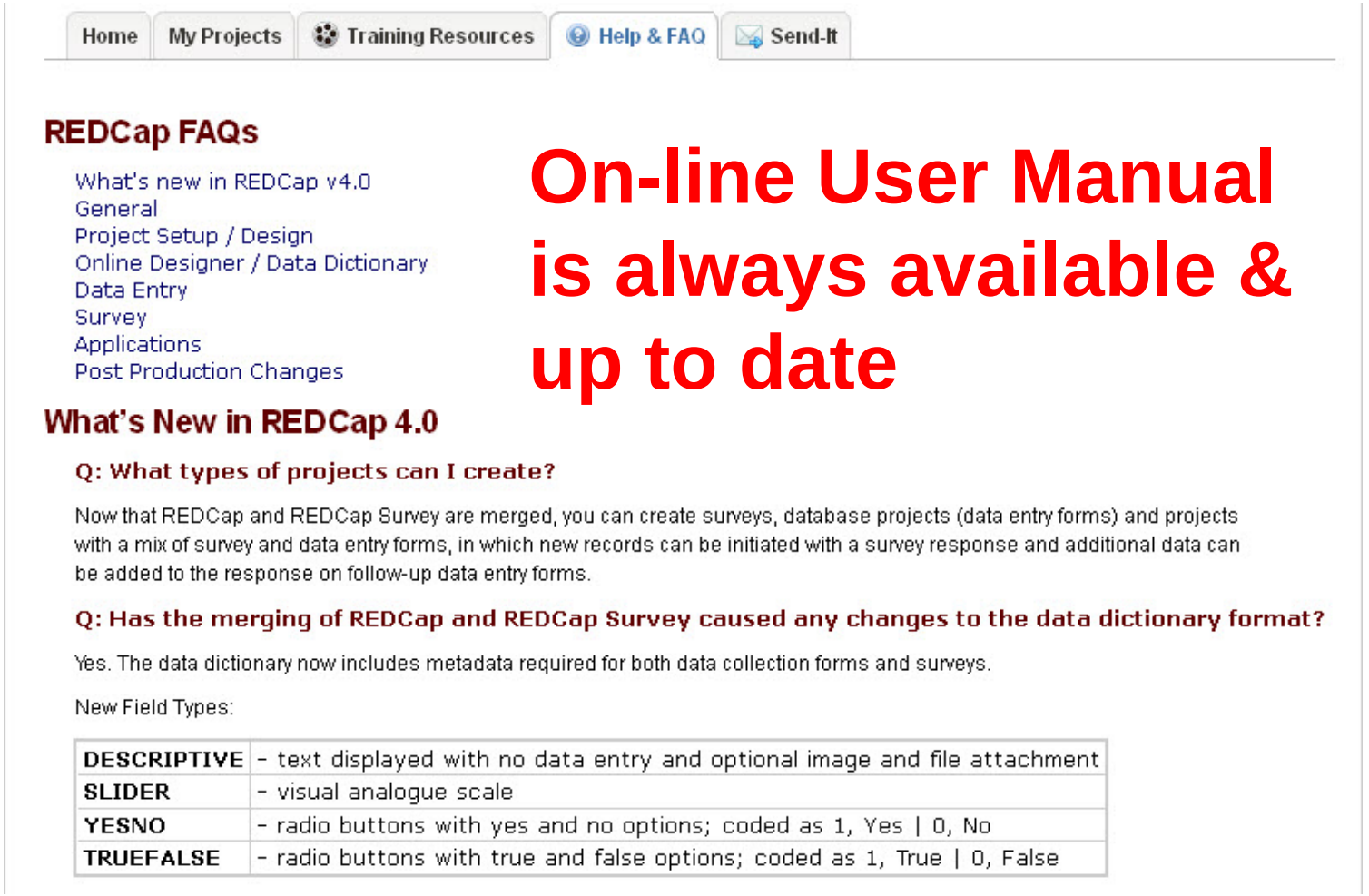
(Assign Instruments)



(Schedule Participant)



REDCap Help & FAQ



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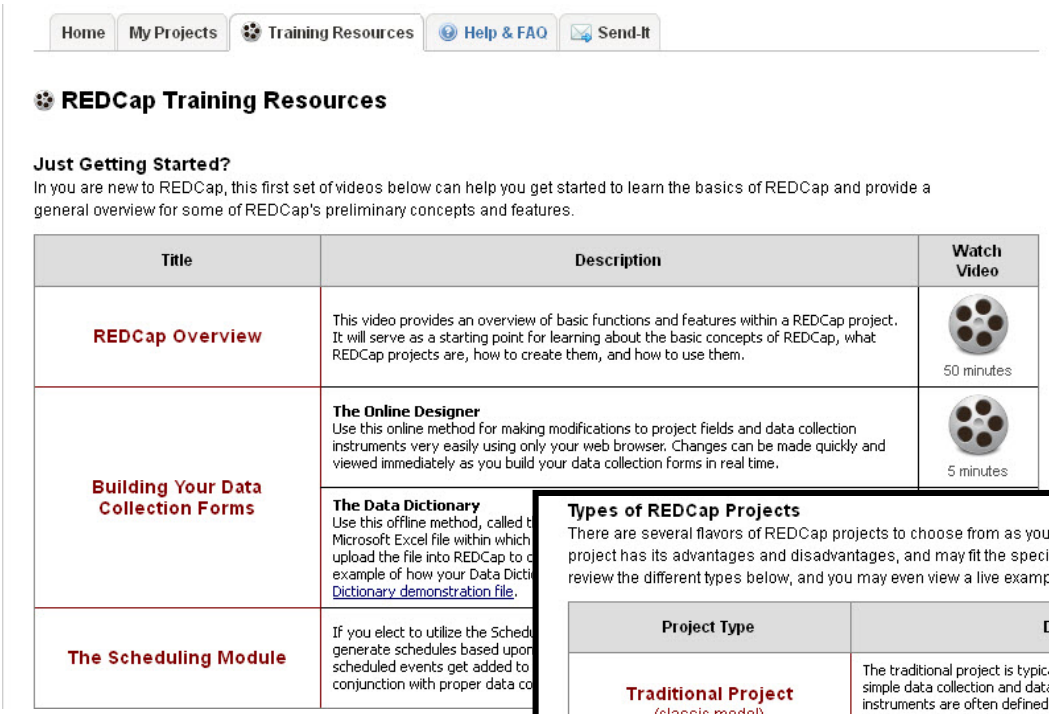
Training

Videos & examples also have links on screens where you need them

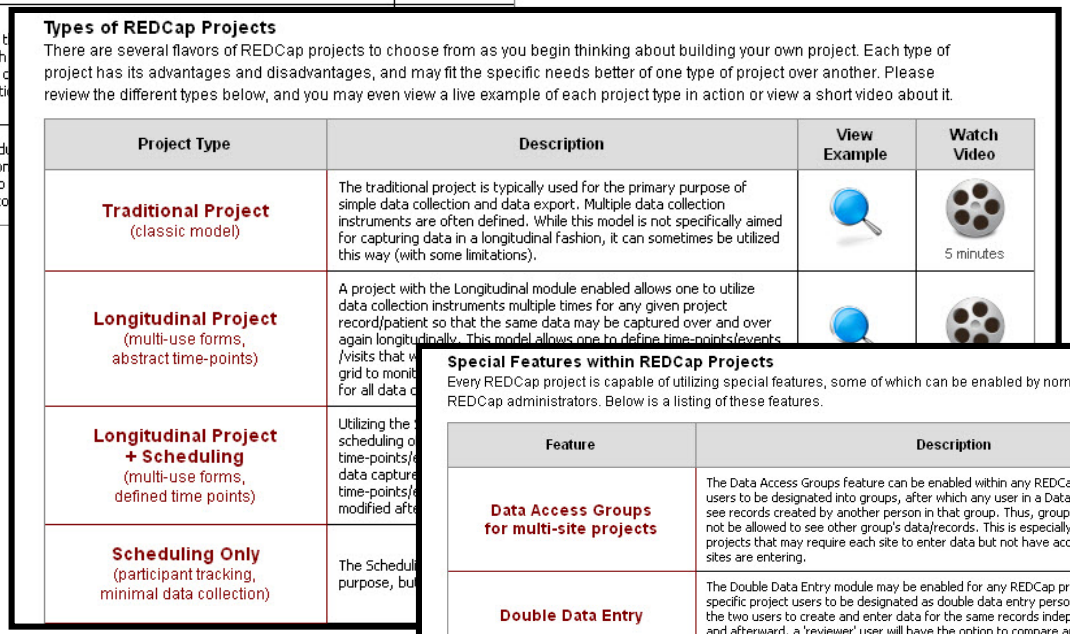

Home | My Projects | Training Resources | Help & FAQ | Send-It

REDCap Training Resources

Just Getting Started?

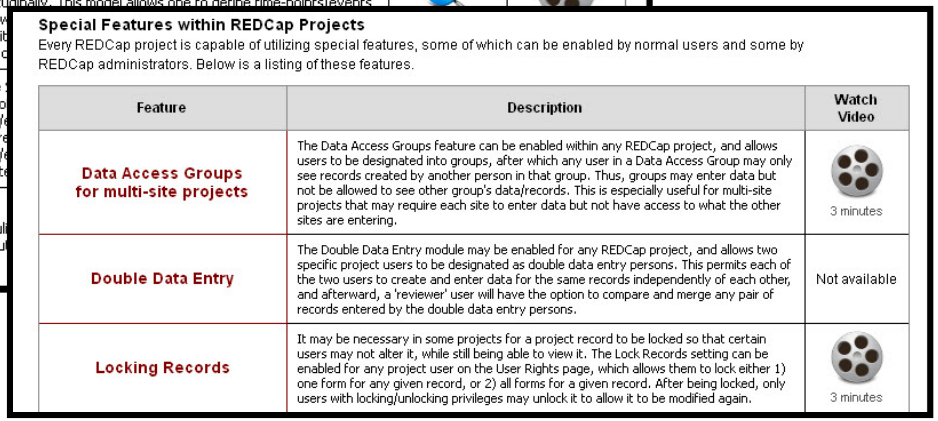
In you are new to REDCap, this first set of videos below can help you get started to learn the basics of REDCap and provide a general overview for some of REDCap's preliminary concepts and features.

Title	Description	Watch Video
REDCap Overview	This video provides an overview of basic functions and features within a REDCap project. It will serve as a starting point for learning about the basic concepts of REDCap, what REDCap projects are, how to create them, and how to use them.	50 minutes
Building Your Data Collection Forms	**The Online Designer** Use this online method for making modifications to project fields and data collection instruments very easily using only your web browser. Changes can be made quickly and viewed immediately as you build your data collection forms in real time.	5 minutes
	The Data Dictionary Use this offline method, called t... Microsoft Excel file within which... upload the file into REDCap to c... example of how your Data Dicti... Dictionary demonstration file.	
The Scheduling Module	If you elect to utilize the Schedu... generate schedules based upon... scheduled events get added to... conjunction with proper data co...	


Types of REDCap Projects

There are several flavors of REDCap projects to choose from as you begin thinking about building your own project. Each type of project has its advantages and disadvantages, and may fit the specific needs better of one type of project over another. Please review the different types below, and you may even view a live example of each project type in action or view a short video about it.

Project Type	Description	View Example	Watch Video
Traditional Project (classic model)	The traditional project is typically used for the primary purpose of simple data collection and data export. Multiple data collection instruments are often defined. While this model is not specifically aimed for capturing data in a longitudinal fashion, it can sometimes be utilized this way (with some limitations).		5 minutes
Longitudinal Project (multi-use forms, abstract time-points)	A project with the Longitudinal module enabled allows one to utilize data collection instruments multiple times for any given project record/patient so that the same data may be captured over and over again longitudinally. This model allows one to define time-points/events /visits that w... grid to monit... for all data c...		
Longitudinal Project + Scheduling (multi-use forms, defined time points)	Utilizing the ... scheduling o... time-points/e... data capture... time-points/e... modified afte...		
Scheduling Only (participant tracking, minimal data collection)	The Schedul... purpose, bu...		


Special Features within REDCap Projects

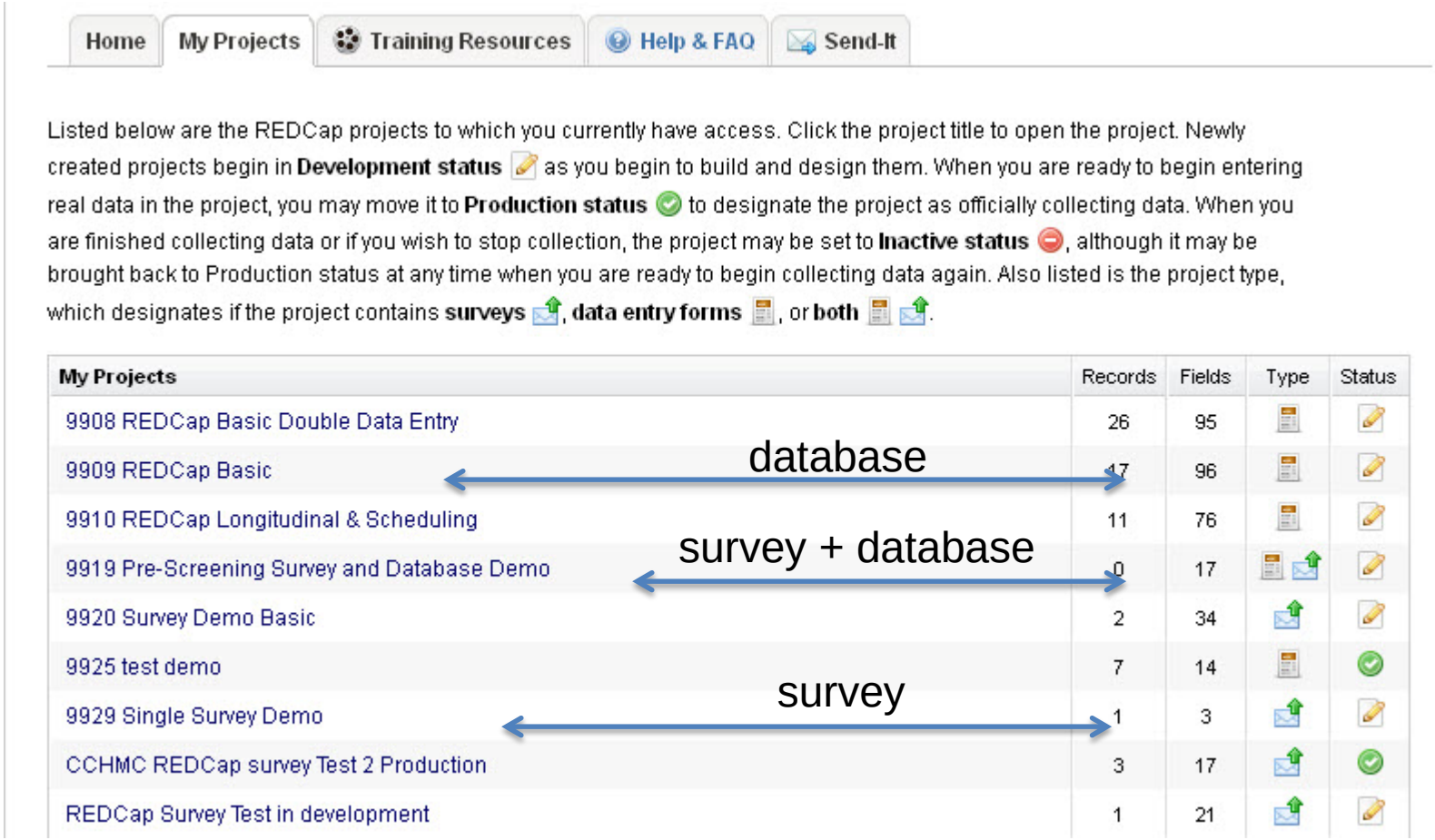
Every REDCap project is capable of utilizing special features, some of which can be enabled by normal users and some by REDCap administrators. Below is a listing of these features.

Feature	Description	Watch Video
Data Access Groups for multi-site projects	The Data Access Groups feature can be enabled within any REDCap project, and allows users to be designated into groups, after which any user in a Data Access Group may only see records created by another person in that group. Thus, groups may enter data but not be allowed to see other group's data/records. This is especially useful for multi-site projects that may require each site to enter data but not have access to what the other sites are entering.	3 minutes
Double Data Entry	The Double Data Entry module may be enabled for any REDCap project, and allows two specific project users to be designated as double data entry persons. This permits each of the two users to create and enter data for the same records independently of each other, and afterward, a 'reviewer' user will have the option to compare and merge any pair of records entered by the double data entry persons.	Not available
Locking Records	It may be necessary in some projects for a project record to be locked so that certain users may not alter it, while still being able to view it. The Lock Records setting can be enabled for any project user on the User Rights page, which allows them to lock either 1) one form for any given record, or 2) all forms for a given record. After being locked, only users with locking/unlocking privileges may unlock it to allow it to be modified again.	3 minutes

Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

Only projects YOU have right to see

My Projects



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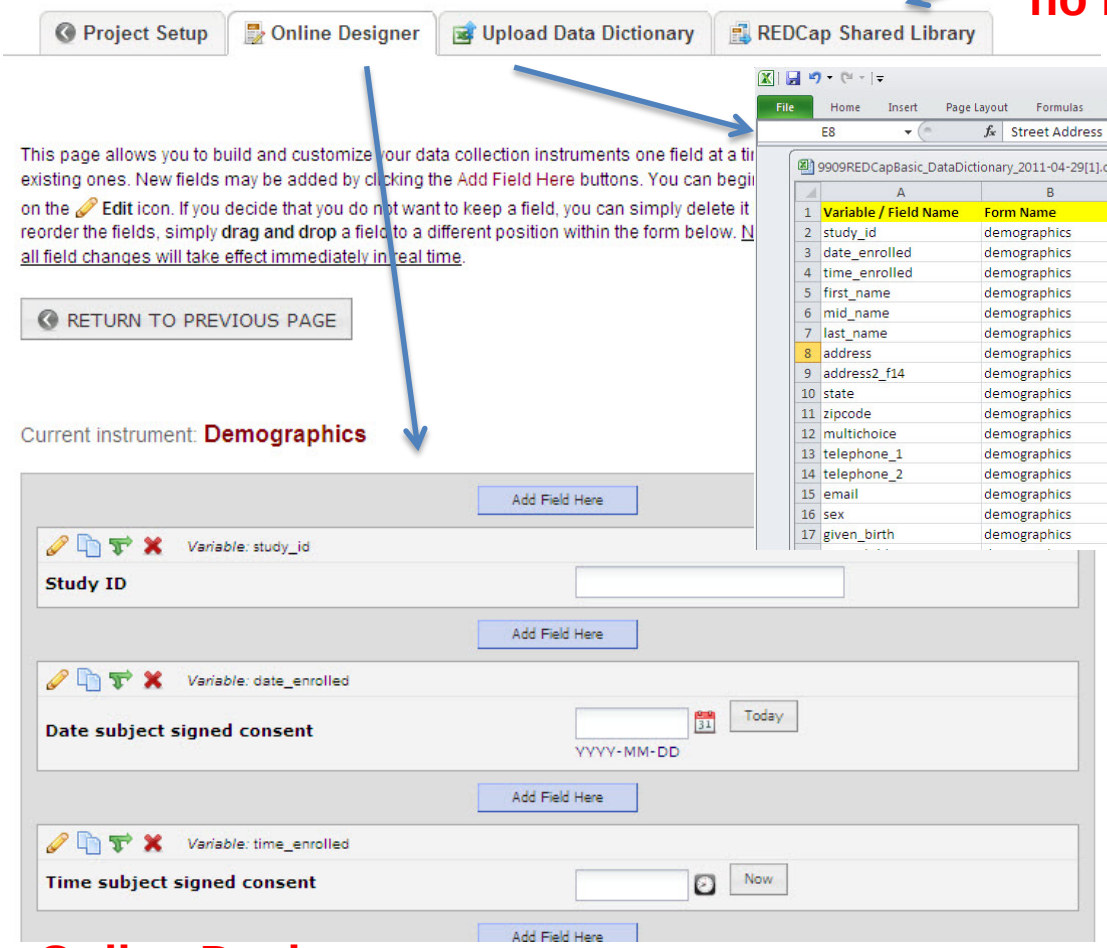
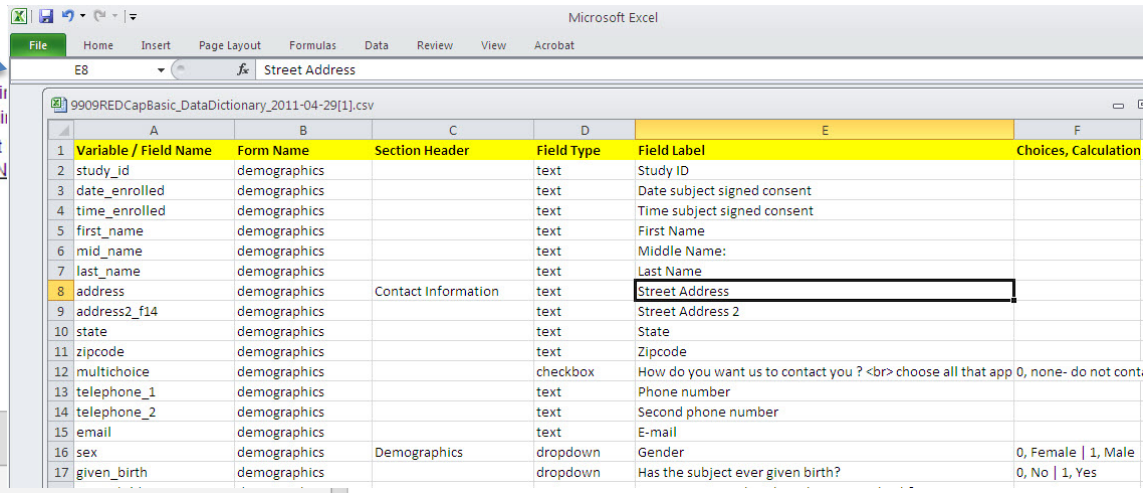
Project Setup leads you through project creation

Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

Project Setup

Library of published, validated instruments, REDCap coded, no license fee





	A	B	C	D	E	F
1	Variable / Field Name	Form Name	Section Header	Field Type	Field Label	Choices, Calculation
2	study_id	demographics		text	Study ID	
3	date_enrolled	demographics		text	Date subject signed consent	
4	time_enrolled	demographics		text	Time subject signed consent	
5	first_name	demographics		text	First Name	
6	mid_name	demographics		text	Middle Name:	
7	last_name	demographics		text	Last Name	
8	address	demographics	Contact Information	text	Street Address	
9	address2_f14	demographics		text	Street Address 2	
10	state	demographics		text	State	
11	zipcode	demographics		text	Zipcode	
12	multichoice	demographics		checkbox	How do you want us to contact you ? choose all that app	0, none- do not cont
13	telephone_1	demographics		text	Phone number	
14	telephone_2	demographics		text	Second phone number	
15	email	demographics		text	E-mail	
16	sex	demographics	Demographics	dropdown	Gender	0, Female | 1, Male
17	given_birth	demographics		dropdown	Has the subject ever given birth?	0, No | 1, Yes

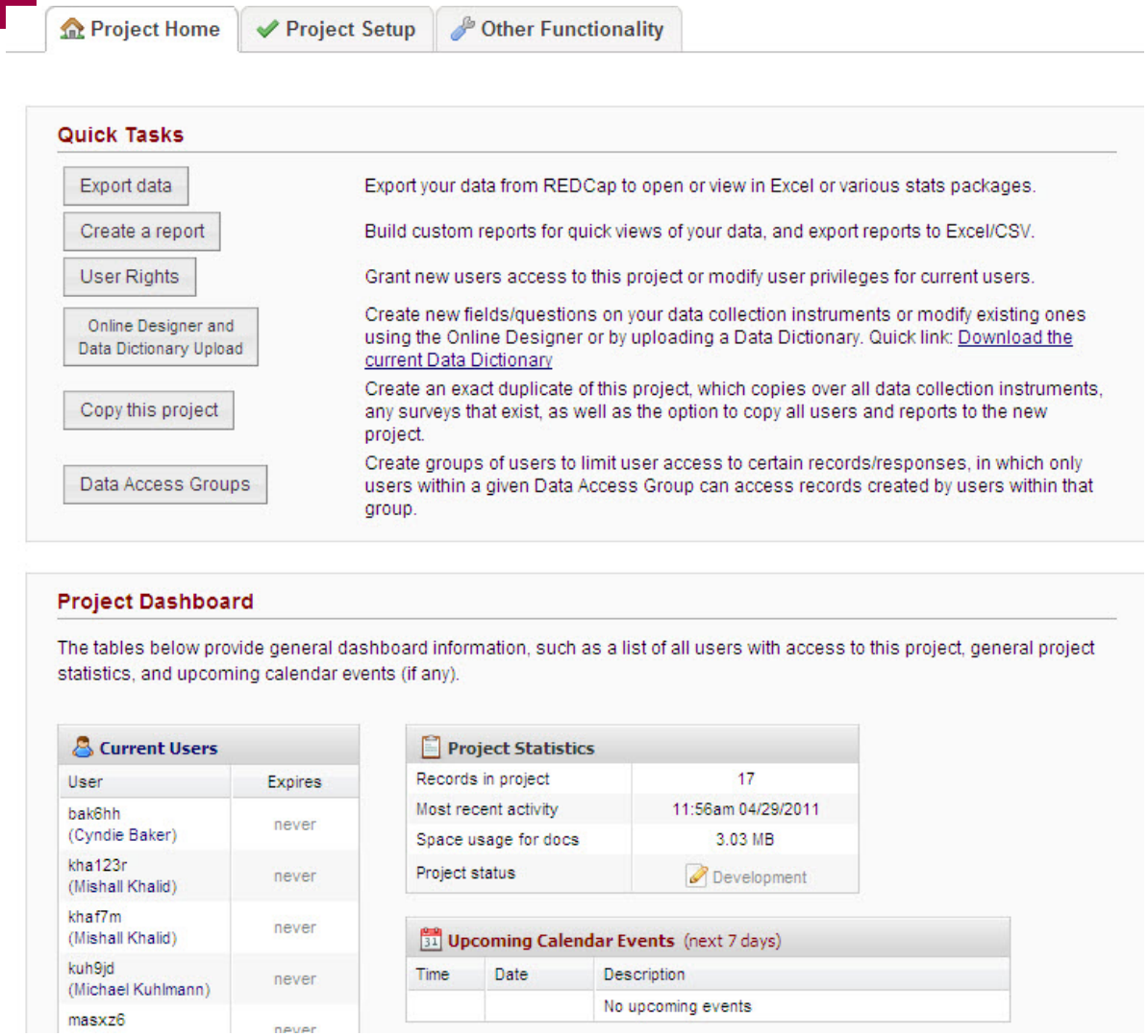
Data Dictionary: design forms off line in Excel grid, upload and view in real time

Online Designer:
Design forms in real time, on screen, while in development status

Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

Project Home

Default for project in production



Links to features used frequently

Information on the project users and recent activity

Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

User Rights

Multi-center data can be limited to members of each group

This page may be used for granting new users access to the project and for editing the rights of current project users. You may edit the rights of a current user by selecting them from the dropdown list below or add a new user by entering their user name in the text box and hitting the Tab key.

Choose existing project user	-- select user --
OR type a new user and hit the TAB key	
New user name	

Must be User who can login to REDCap – has System account

Comprehensive User Rights View

User name	Expiration	Calendar	Data Export Tool	Data Import Tool	Data Comparison Tool	Logging	File Repository	User Rights	Data Access Groups	Graphical Data View & Stats	Reports & Report Builder	Record Locking Customization	Lock/Unlock Records	Project Design and Setup	Create Records
bak6hh	never	✓	De-Identified	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
KHA123R	never	✓	Full Data Set	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓

Project PI controls access to data: grants rights form by form, tool by tool

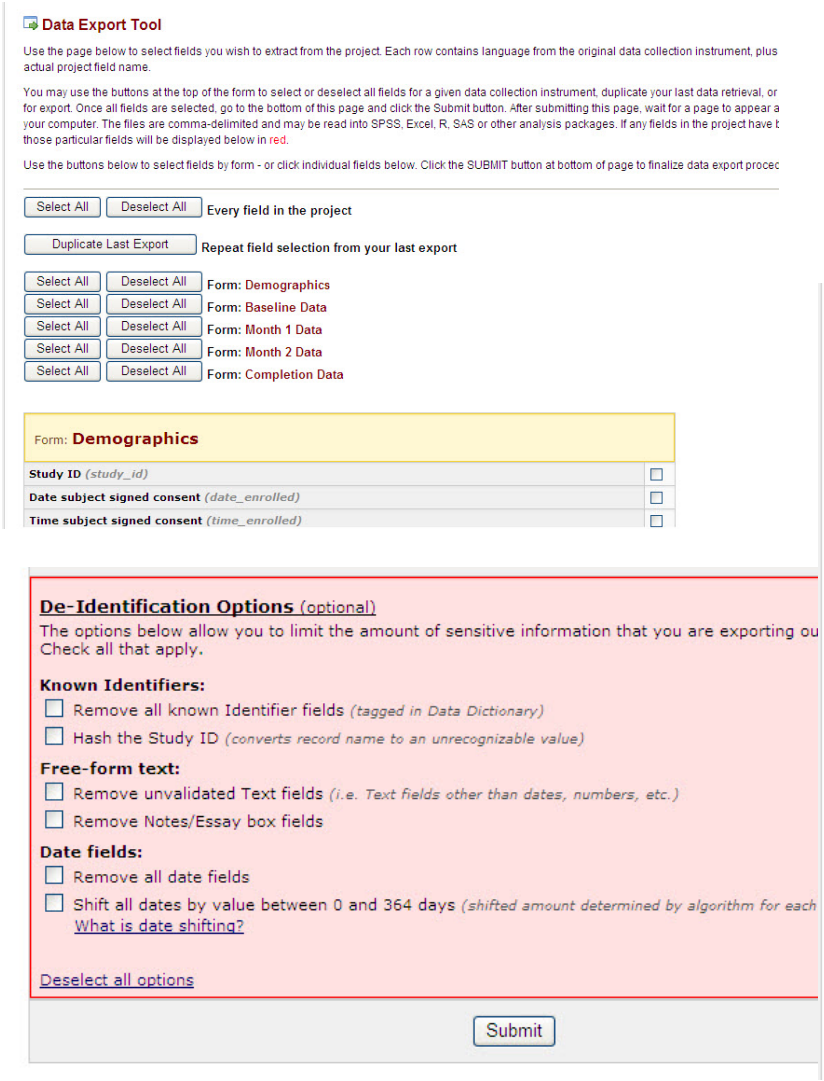
Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

Data Export

Export controlled to field level

Options for de-identified data sets

Includes syntax files for 4 stats packages



Data Export Tool

Use the page below to select fields you wish to extract from the project. Each row contains language from the original data collection instrument, plus actual project field name.

You may use the buttons at the top of the form to select or deselect all fields for a given data collection instrument, duplicate your last data retrieval, or for export. Once all fields are selected, go to the bottom of this page and click the Submit button. After submitting this page, wait for a page to appear a your computer. The files are comma-delimited and may be read into SPSS, Excel, R, SAS or other analysis packages. If any fields in the project have t those particular fields will be displayed below in red.

Use the buttons below to select fields by form - or click individual fields below. Click the SUBMIT button at bottom of page to finalize data export procec

Select All | Deselect All — Every field in the project

Duplicate Last Export — Repeat field selection from your last export

Select All | Deselect All — Form: Demographics
Select All | Deselect All — Form: Baseline Data
Select All | Deselect All — Form: Month 1 Data
Select All | Deselect All — Form: Month 2 Data
Select All | Deselect All — Form: Completion Data

Form: **Demographics**

Study ID *(study_id)*	☐
Date subject signed consent *(date_enrolled)*	☐
Time subject signed consent *(time_enrolled)*	☐

De-Identification Options (optional)

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

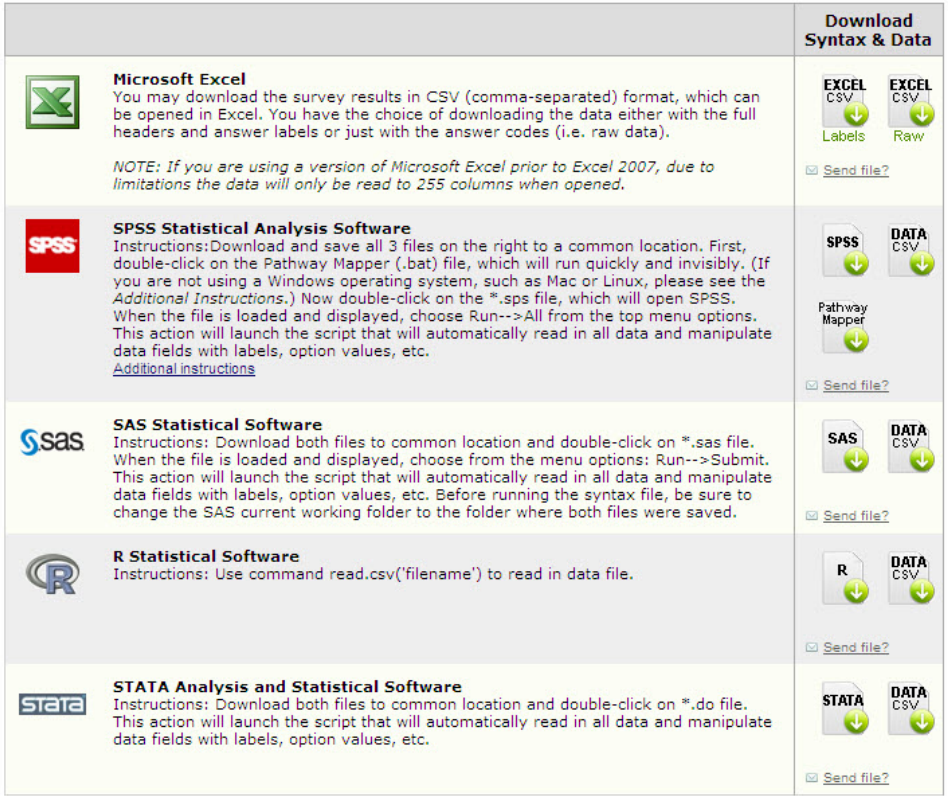
Known Identifiers:
- ☐ Remove all known Identifier fields *(tagged in Data Dictionary)*
- ☐ Hash the Study ID *(converts record name to an unrecognizable value)*

Free-form text:
- ☐ Remove unvalidated Text fields *(i.e. Text fields other than dates, numbers, etc.)*
- ☐ Remove Notes/Essay box fields

Date fields:
- ☐ Remove all date fields
- ☐ Shift all dates by value between 0 and 364 days *(shifted amount determined by algorithm for each*
  What is date shifting?

Deselect all options

Submit



	Download Syntax & Data
Microsoft Excel You may download the survey results in CSV (comma-separated) format, which can be opened in Excel. You have the choice of downloading the data either with the full headers and answer labels or just with the answer codes (i.e. raw data). *NOTE: If you are using a version of Microsoft Excel prior to Excel 2007, due to limitations the data will only be read to 255 columns when opened.*	EXCEL CSV Labels · EXCEL CSV Raw Send file?
SPSS Statistical Analysis Software Instructions:Download and save all 3 files on the right to a common location. First, double-click on the Pathway Mapper (.bat) file, which will run quickly and invisibly. (If you are not using a Windows operating system, such as Mac or Linux, please see the *Additional Instructions*.) Now double-click on the *.sps file, which will open SPSS. When the file is loaded and displayed, choose Run-->All from the top menu options. This action will launch the script that will automatically read in all data and manipulate data fields with labels, option values, etc. Additional instructions	SPSS · DATA CSV · Pathway Mapper Send file?
SAS Statistical Software Instructions: Download both files to common location and double-click on *.sas file. When the file is loaded and displayed, choose from the menu options: Run-->Submit. This action will launch the script that will automatically read in all data and manipulate data fields with labels, option values, etc. Before running the syntax file, be sure to change the SAS current working folder to the folder where both files were saved.	SAS · DATA CSV Send file?
R Statistical Software Instructions: Use command read.csv('filename') to read in data file.	R · DATA CSV Send file?
STATA Analysis and Statistical Software Instructions: Download both files to common location and double-click on *.do file. This action will launch the script that will automatically read in all data and manipulate data fields with labels, option values, etc.	STATA · DATA CSV Send file?

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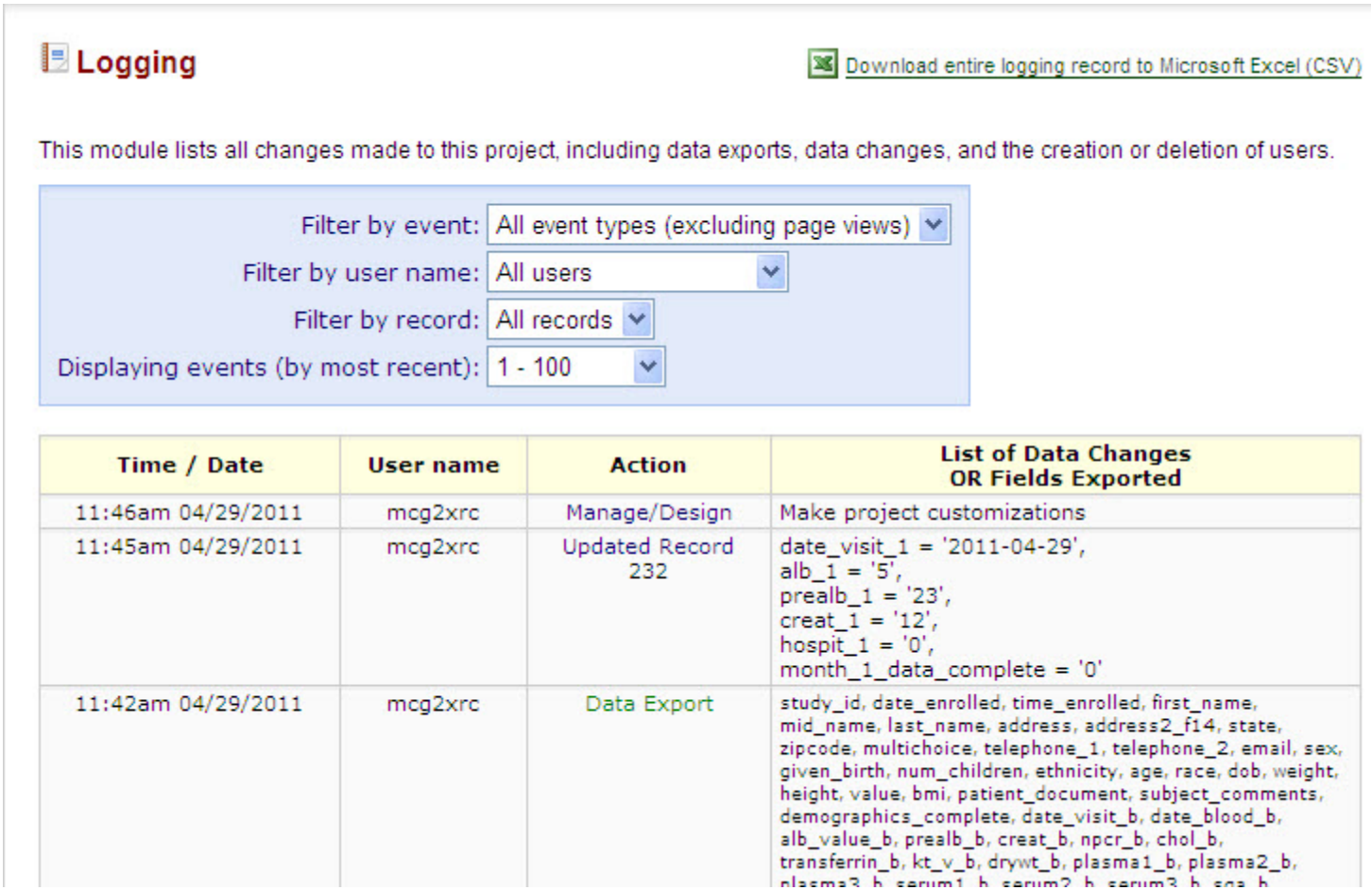
Log (Audit Trail) is HIPAA compliant and Part 11 capable



Logging

Download entire logging record to Microsoft Excel (CSV)

This module lists all changes made to this project, including data exports, data changes, and the creation or deletion of users.

Filter by event: All event types (excluding page views)
Filter by user name: All users
Filter by record: All records
Displaying events (by most recent): 1 - 100

Time / Date	User name	Action	List of Data Changes OR Fields Exported
11:46am 04/29/2011	mcg2xrc	Manage/Design	Make project customizations
11:45am 04/29/2011	mcg2xrc	Updated Record 232	date_visit_1 = '2011-04-29', alb_1 = '5', prealb_1 = '23', creat_1 = '12', hospit_1 = '0', month_1_data_complete = '0'
11:42am 04/29/2011	mcg2xrc	Data Export	study_id, date_enrolled, time_enrolled, first_name, mid_name, last_name, address, address2_f14, state, zipcode, multichoice, telephone_1, telephone_2, email, sex, given_birth, num_children, ethnicity, age, race, dob, weight, height, value, bmi, patient_document, subject_comments, demographics_complete, date_visit_b, date_blood_b, alb_value_b, prealb_b, creat_b, npcr_b, chol_b, transferrin_b, kt_v_b, drywt_b, plasma1_b, plasma2_b, plasma3_b, serum1_b, serum2_b, serum3_b, sga_b

Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

Ad Hoc Report Builder

Report Builder

You may use this page to build and save custom reports, which will query the project in real time and display the resulting data in a table format. Once created, you may view your reports at any time as well as modify or even delete them. Your saved reports be displayed on the right-hand menu as links, which can be clicked to display the report.

My Reports

1.) **BMI for subjects**	[view] [edit] [copy] [delete]
2.) **Study Progress**	[view] [edit] [copy] [delete]
3.) **BMI for Subjects 2**	[view] [edit] [copy] [delete]

Create a New Report

You may create a new report by selecting the fields/variables below that you want to include in the report. You may add as many fields to your report as you wish. You will also need to provide a name for your report, which will then be displayed on the project's right-hand menu. When you are finished selecting the fields you wish to include in the report, click the Save Report button at the bottom. The new report will then be added to your list of reports above.

Name of Report:

	Field Name / Label	Limiters (optional) Operator / Value
Field 1		

Order the Results (optional)

First by		Ascending order
Then by		Ascending order

Save Report

Create / Save / Export Reports using fields, ordering, and filters

9909 REDCap Basic

Download report as: Microsoft Excel (CSV) XML
Print page Edit this report

Number of results returned: 16
Total number of records queried: 17

BMI for subjects

Last Name (last_name)	Date subject signed consent (date_enrolled)	Height (cm) (height)	Weight (kilograms) (weight)	BMI (bmi)	State (state)	Gender (sex)
Bird	2010-01-04	214	125	27.3	OH	Male (1)
Bird	2011-01-04	155	123	51.2	OH	Male (1)
nnn	2011-04-06	130	105	62.1		
Four	2009-10-13	188	97	27.4	ST	Female (0)
Five	2008-08-13	168	66	23.4	state	Female (0)
Three	2008-11-03	178	64	20.2	State	Male (1)
Two	2009-11-01	165	59	21.7	OH	Male (1)
jkjlj		56	56	178.6	j	Male (1)
Mouse	2010-12-29	125	45.8	0.3	FL	Male (1)
	2011-04-26					
Test						
						Female (0)
last						
zzz						
Jones	2011-04-19					
xxxx	2010-11-03					Female (0)

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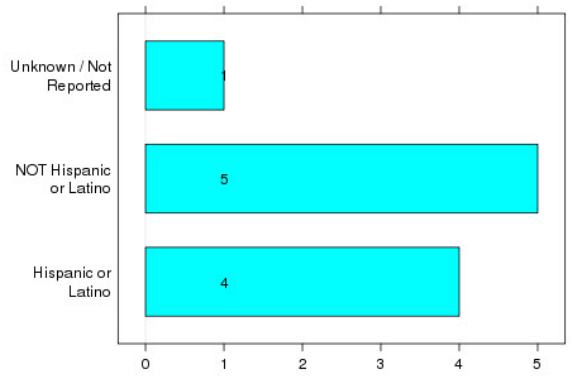
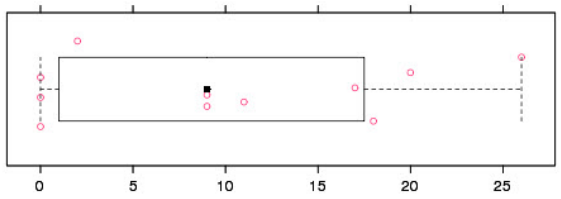
Graphical View and Stats

Ethnicity: Refresh Plot | missing values (41.2%)



Plot Description

Age (years): Refresh Plot | missing values (35.3%) | lowest values | highest values



Plot Description

Real time data

Data Entry Form: Baseline Data

Plots | Descriptive Stats

Total records: 17

Download Expanded Statistics Report as PDF

Field	Missing	Min	Q1	Q2 Median	Q3	Max	Mean	StDev
Date of baseline visit	11							
Date blood was drawn	11							
Serum Albumin (g/dL)	13	3.00	3.75	4.00	4.25	5.00	4.00	0.82
Serum Prealbumin (mg/dL)	13	3.00	25.50	33.50	34.40	35.60	26.40	15.64
Creatinine (mg/dL)	12	0.50	2.00	2.00	2.00	10.00	3.30	3.80
Normalized Protein Catabolic Rate (g/kg/d)	13	1.00	1.00	1.20	1.55	2.00	1.35	0.47
Cholesterol (mg/dL)	13	100.00	108.25	160.00	210.00	213.00	158.25	61.10
Transferrin (mg/dL)	13	100.00	108.25	172.00	237.25	250.00	173.50	78.95
Kt/V	14	3.00	3.00	3.00	52.50	102.00	36.00	57.16
Dry weight (kilograms)	14	34.00	39.00	44.00	89.00	134.00	70.67	55.08
Collected Plasma 1?	13							
Collected Plasma 2?	13							
Collected Plasma 3?	13							
Collected Serum 1?	13							
Collected Serum 2?	13							
Collected Serum 3?	13							
Subject Global Assessment (score = 1-7)	14	2.00	2.00	2.00	2.50	3.00	2.33	0.58
Date patient begins supplement	13							
Complete?	7							

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Longitudinal: Forms can be used multiple times

9910 REDCap Longitudinal & Scheduling

Data Entry: Event Grid

Special note to display at top of all Data Entry pages in database

The grid below displays the form-by-form progress of data entered into the project for one particular
events. You may click on the colored buttons to access that form for that event. If you wish, you may r
navigating to the Define My Events page.

Study ID **2** (enrolled: 2009-06-03), (name: Mouse)

Data Collection Instrument	Events for Arm 1: Scheduled events						
	Baseline (1)	Visit 1 (2)	Visit 2 (3)	Visit 3 (4)	Completion (5)	Followup (6)	2 yr (7)
Demographics	●						
Baseline Data	●				●		●
Month Data	●	●	●	●	●	●	●
Completion Data					●	●	●

Lock all forms across all Events

Unlock all forms across all Events

Generate, edit, export schedule for participant and add to project calendar

Projected Schedule for "333" (NOTE: The dates below have NOT yet been scheduled

The projected schedule below was automatically generated for **Study ID "333"** based on your pre-defined
may change the value of any dates generated below simply by clicking inside the date box and selecting
generated below that fall on weekends will be listed in red. Click the *Create Schedule* button to finalize th
then be added to the Calendar.

	Time (optional)	Date / Day of Week	Event Name
✖		04/29/2011 Friday	Baseline
✖		05/29/2011 Sunday Range: 05/28/2011 - 05/30/2011	Visit 1
✖		06/28/2011 Tuesday Range: 06/27/2011 - 06/29/2011	Visit 2
✖		07/28/2011 Thursday Range: 07/27/2011 - 07/29/2011	Visit 3
✖		10/26/2011 Wednesday Range: 10/23/2011 - 10/29/2011	Completion
✖		04/28/2012 Saturday Range: 04/18/2012 - 05/08/2012	Followup
✖		12/19/2012 Wednesday Range: 11/19/2012 - 01/18/2013	2 yr

Create Schedule | Cancel

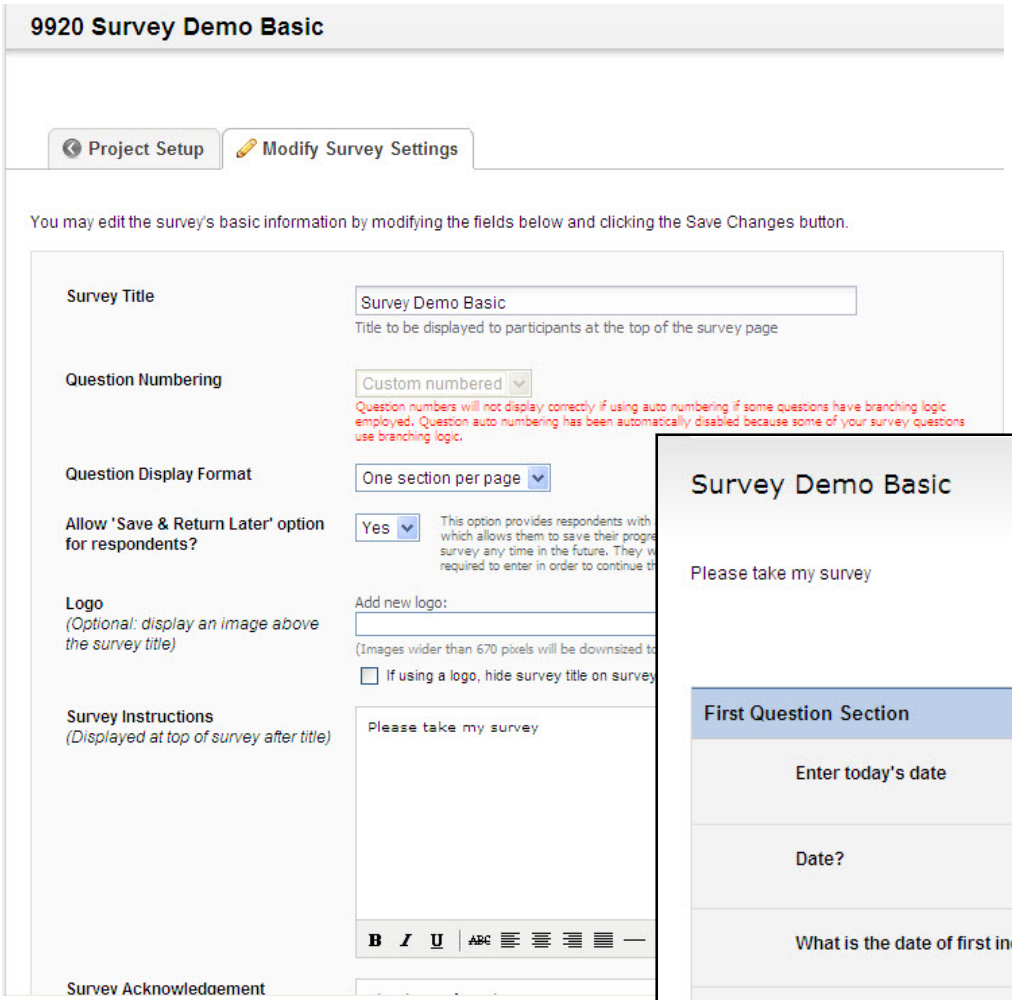
Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

REDCap Front-End Data Entry

- You have 2 options
  - Survey-based data entry
    - “Prettier” interface
    - Public and private audience options
    - Email tracking system
  - Form-based data entry
    - One-stop shop for data entry, scheduling, and data management
    - Familiar interface, resembles most form-based database software (e.g., MS Access)

Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

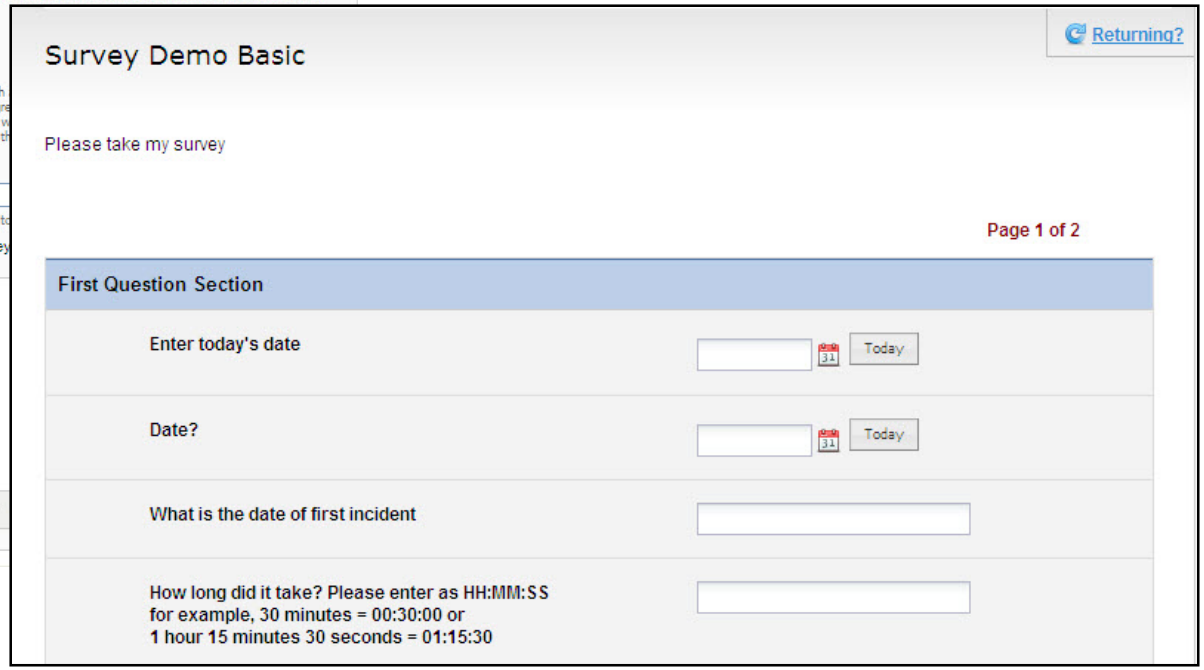
REDCap Survey



Design and data handling same as database

Send link in email or post to webpage

Can invite & manage list of participants

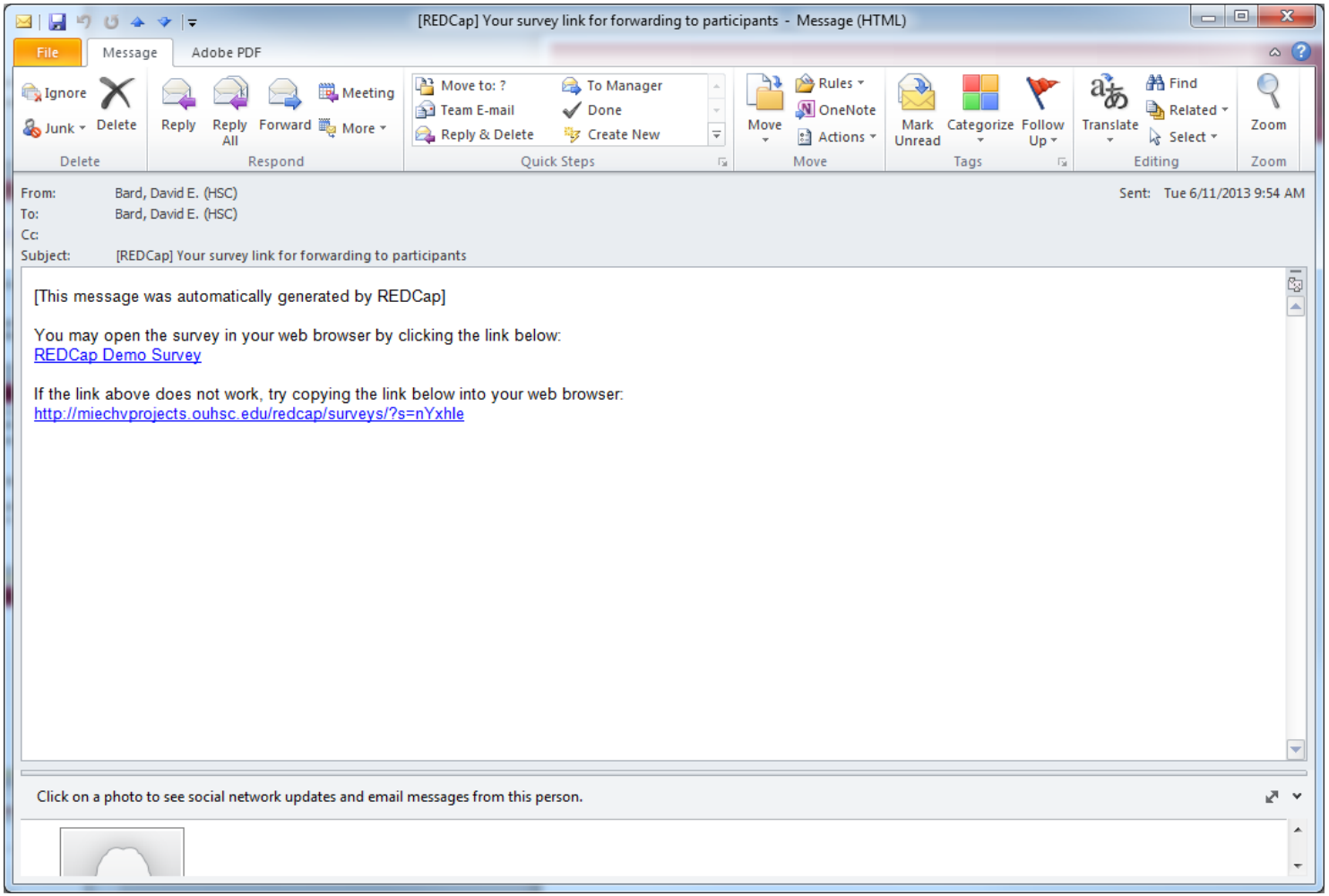


Slide Courtesy of: Cathy McGraw, Cincinnatti Center for Clinical and Translational Science Training

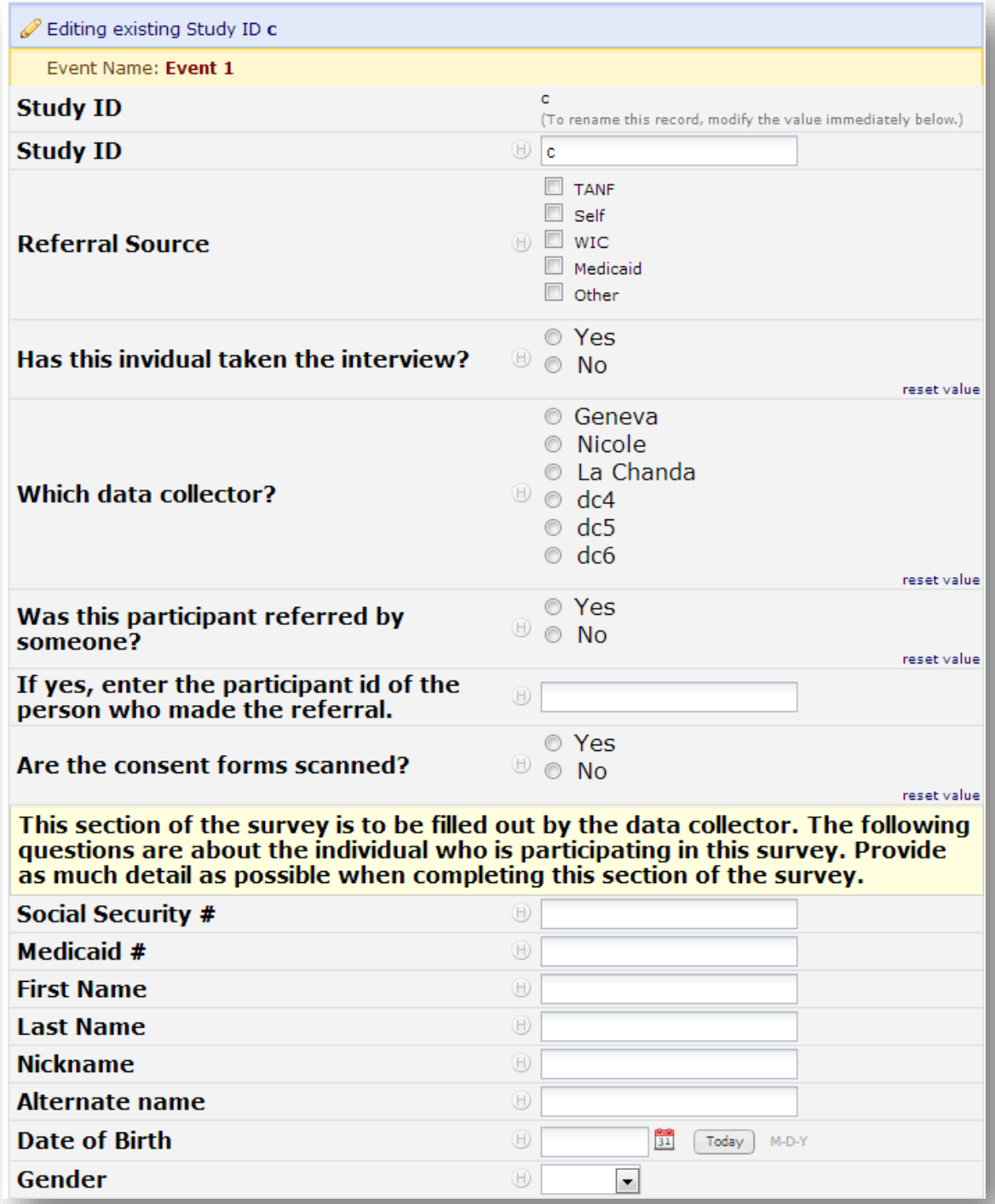
Example: Survey-based Data Entry

- Login to REDCap (all instances use OUHSC username and password authentication)
- Go to My Projects and select BBMC Demo: Survey
  - Click “Manage Survey Participants”
  - Click “Open Survey” button under Public Survey Link tab
  - Click “Add Participants” link under Participant List tab, then click the  icon under the Link field
    - Notice url
  - Click “Compose Survey Invitations”
    - Check email addresses then click “Send Emails”

Example: Survey-based Data Entry



Example Form-based Data Entry



Data Entry Demonstration

1. Go to REDCap
2. Login
3. Select project “testing123”
4. Enter some more test data
5. Create a calendar entry

Data Dictionary Demos

- Can create an entire project by uploading pre-existing data dictionary .csv file
  - Click “My Projects” and select ‘BBMC Demo: Data Dictionary Upload’
  - Click “Upload Data Dictionary” button and select dictionary file
- Change existing field using data dictionary
  - Click “Project Setup” button, then “Upload Data Dictionary”
  - Select new dictionary file and “Commit Changes”
- Add new fields using data dictionary
  - Same as change existing fields

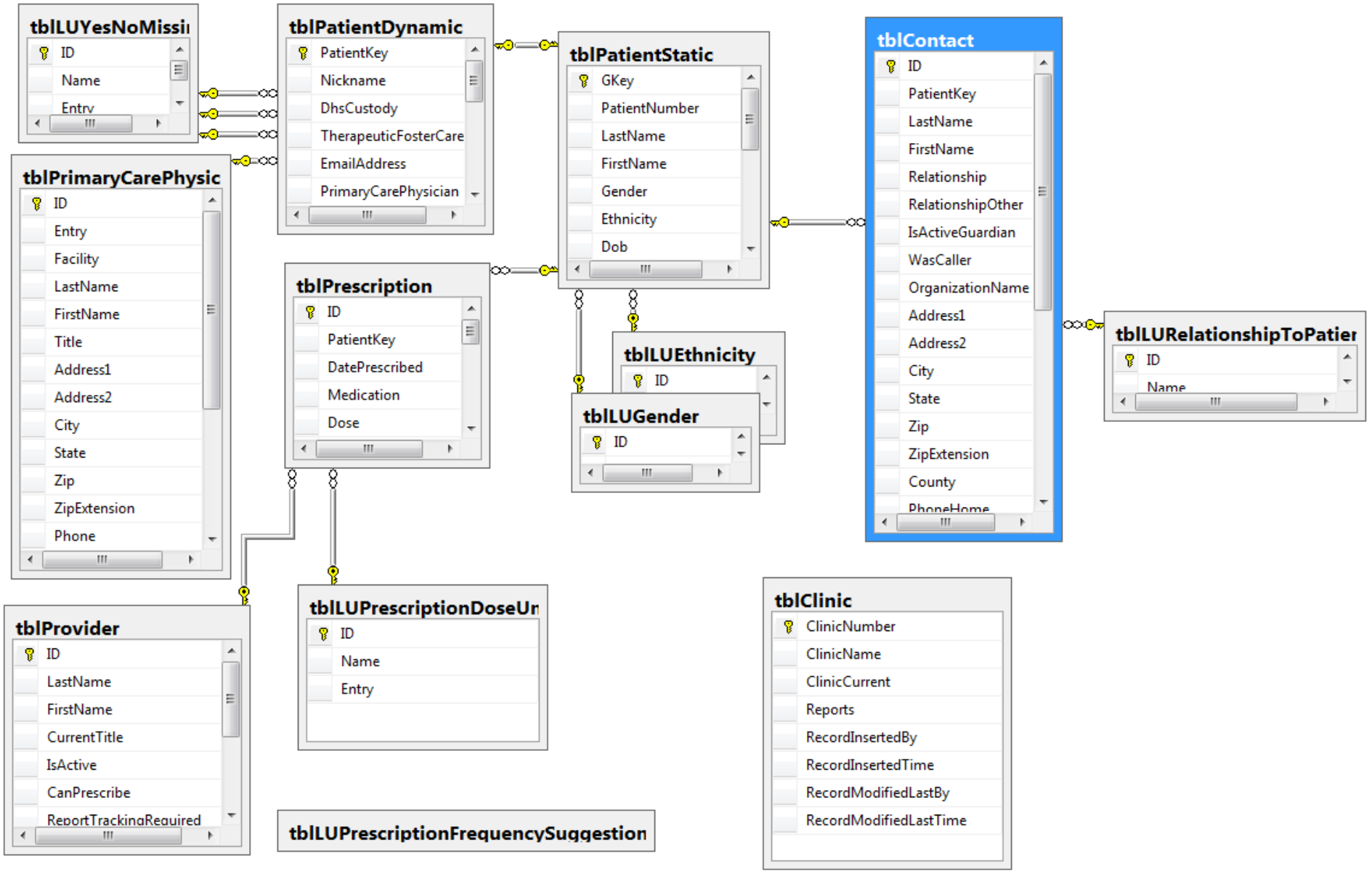
Scenarios Favoring REDCap

- Project requires a centralized data store, but multiple locations for data entry.
  - Avoid syncing different locations manually.

- You want a flexible, universal framework to create consistent data systems for multiple clinical projects (research and possibly operations).
  - Reduces your development time & your staff's training time.
  - Reduces writing new text for grant proposals and IRB?

- Project has a relatively flat data structure.
  - Typically accommodates 2 or 3 levels well, but is clumsy beyond that. County, Practice, Provider, Patient, Time, Family.

Scenario NOT favoring REDCap



Scenarios Favoring REDCap

- No professional software developer on the project
  - There's nothing magical about REDCap; it accommodates the designs and needs of many clinical projects.
  - To develop a comparable system from scratch, you'd need experience with several technologies.

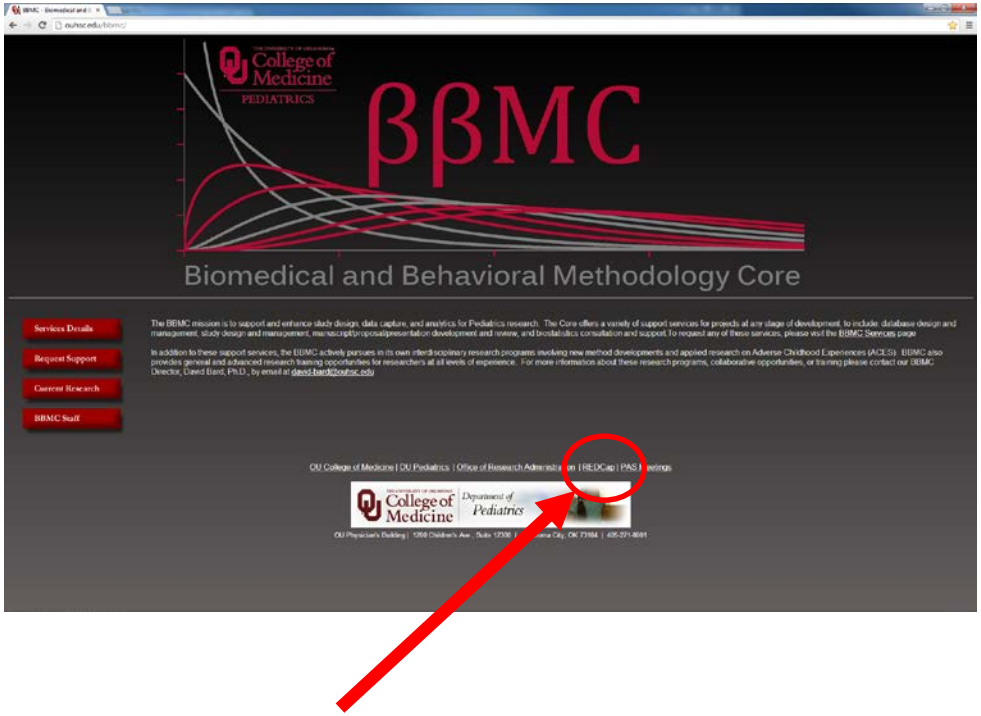
- There are lots of dimensions and trade-offs when designing clinical research, and REDCap is **close to the sweet spot** for most designs.

- Candidate for replacing Access, Survey Monkey, Excel.

Accessing OUHSC REDCap

- OUHSC REDCap website:

  http://ouhsc.edu/bbmc/ and click on REDCap



Accessing OUHSC REDCap

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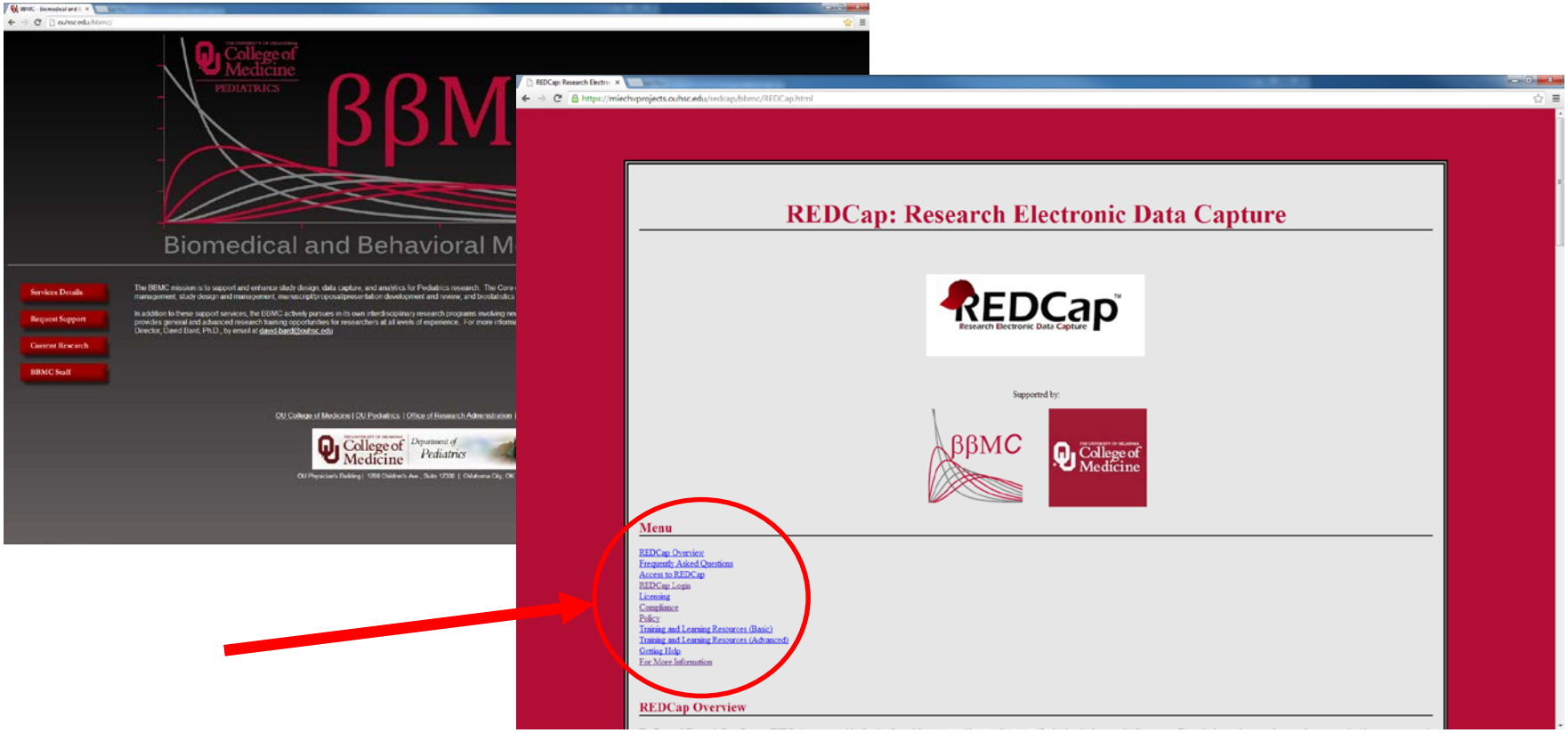


Intro to Security Concepts

- College of Medicine has devised a REDCap governance body to oversee data security concerns
  - In a nut-shell, looking to see if investigators and staff have proper IRB clearances for storing PHI on REDCap.
  - Will provide general advice on secure best practices
  - To gain access to REDCap, you must have seal of approval of this governance body
    - Please visit REDCap website to initiate request and review security policies and procedures under Compliance links

    https://miechvprojects.ouhsc.edu/redcap/BBMC/redcap.html
    - After request is initiated, the REDCap Appropriate Use Policy must be reviewed and the REDCap Data Use Agreement must be signed (BBMC will circulate after request is made)

    https://miechvprojects.ouhsc.edu/redcap

Citing REDCap in Grants/IRB

- How should I describe REDCap in grant or IRB applications?
  - Data for this study will be entered into REDCap, a database software system developed by Vanderbilt University for electronic collection and management of research and clinical trial data. REDCap uses a MySQL database via secure web interface with data checks used during data entry to ensure data quality. REDCap includes a complete suite of features to support HIPAA and FERPA compliance, including a full audit trail, user-based privileges, and integration with the institutional LDAP server. REDCap also enables automated export mechanism to common statistical packages (SPSS, SAS, Stata, R/S-Plus), simultaneous multi-user and multi-site access, full control over individual-level data access permissions, and remote survey and form-based data capture methods. REDCap technical support is provided by the Biomedical and Behavioral Methodology Core of the Department of Pediatrics, College of Medicine. The MySQL database and the web server will both be housed on secure servers operated by the University of Oklahoma Health Sciences Center Information Technology. The servers are in a physically secure data center on campus and are backed up nightly, with backups stored in accordance with the OUHSC IT schedule of daily, weekly, and monthly tape retentions of 1 month, 3 months, and 6 months, respectively. Weekly backup tapes are stored offsite. The OUHSC IT servers provide a stable, secure, well-maintained high-capacity data storage environment, and both REDCap and MySQL are widely-used, powerful, reliable, well-supported systems. Access to the study's data in REDCap will be restricted to the members of the study team by username and password.

Citing REDCap in Manuscripts

- How should I cite REDCap in study manuscripts?
  - Study data were collected and managed using REDCap electronic data capture tools hosted at the University of Oklahoma Health Sciences Center.[1] REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

[1] Paul A. Harris, Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, Jose G. Conde, Research electronic data capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support, J Biomed Inform. 2009 Apr; 42(2): 377-81. Link to article: http://dx.doi.org/10.1016/j.jbi.2008.08.010

Feature	REDCap	Qualtrics
Data Dictionary	**Y**	?
Data Import	**Y**	n
Data Export & Summaries	**Y**	**Y**
E-mail survey	Only using a survey form, not a data collection form.	**Y**
Copy other surveys	**Y**	n
Survey templates	n	**Y**
Branching logic	Branching logic for individual Qs.	Branching for individual Qs and for groups of Qs.
Audio capabilities	Done via html	?
Expiration capabilities: (eg, 1 week to respond)	n	**Y**
Spell check	n	**Y**
API	**Y**	n
Free to academic institutions	**Y**	n?
Offline data capture	Currently, there is not an official REDCap offline data capture component. However, CCAN has created an "in-house" off-line version of REDCap that is currently in use.	

Our exposure to Qualtrics is limited.

Please don't interpret this as the authoritative guide.

Project Management with REDCap

While the original intent of the development of REDCap was to provide researchers with a secure web application for research, a REDCap project can be designed to simultaneously aid in project management and productivity monitoring.

Productivity Monitoring

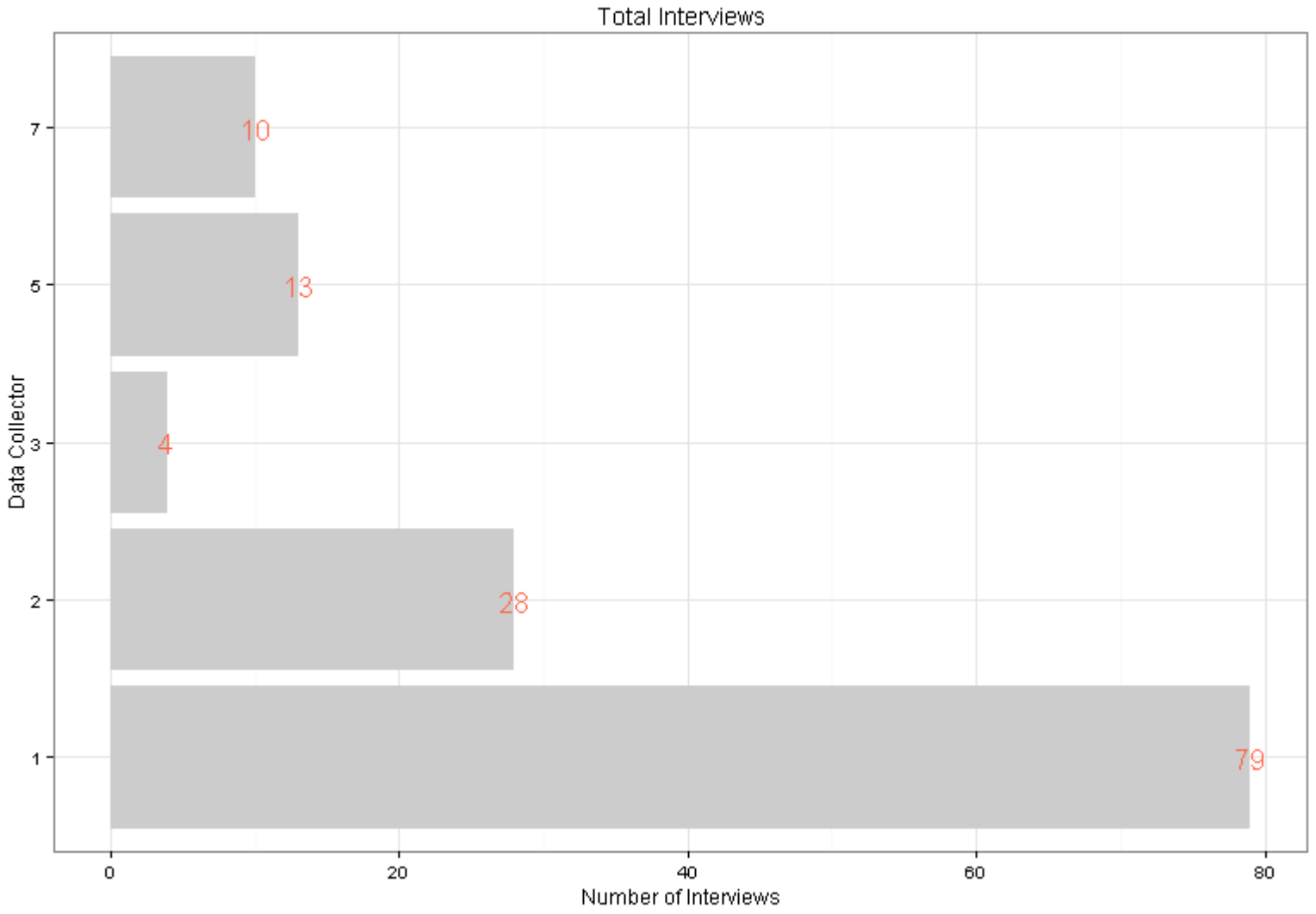
What do you want to monitor?

Productivity indicators can be incorporated in the original design phase of a REDCap project, or added to an existing project.

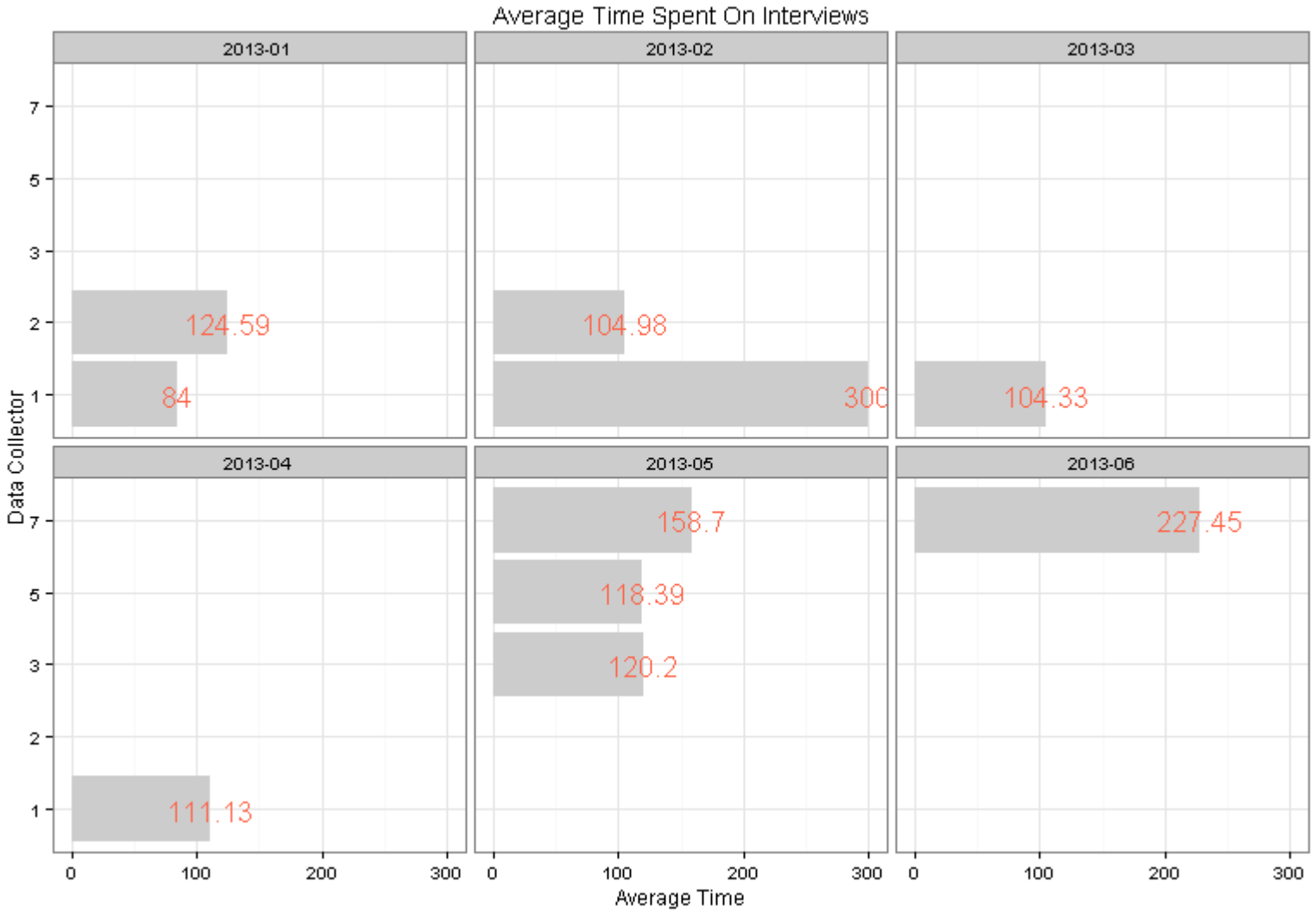
MIECHV Project Productivity Indicators

- Community Survey Recruitment
  - Total recruitment calls made
  - Time spent on recruitment calls
  - Average time per recruiting call
  - Number of recruits who agreed to participate
  - Percent of recruits who agreed to participate
- Community Surveying
  - Total interviews completed
  - Time spent conducting interviews
  - Average time per interview

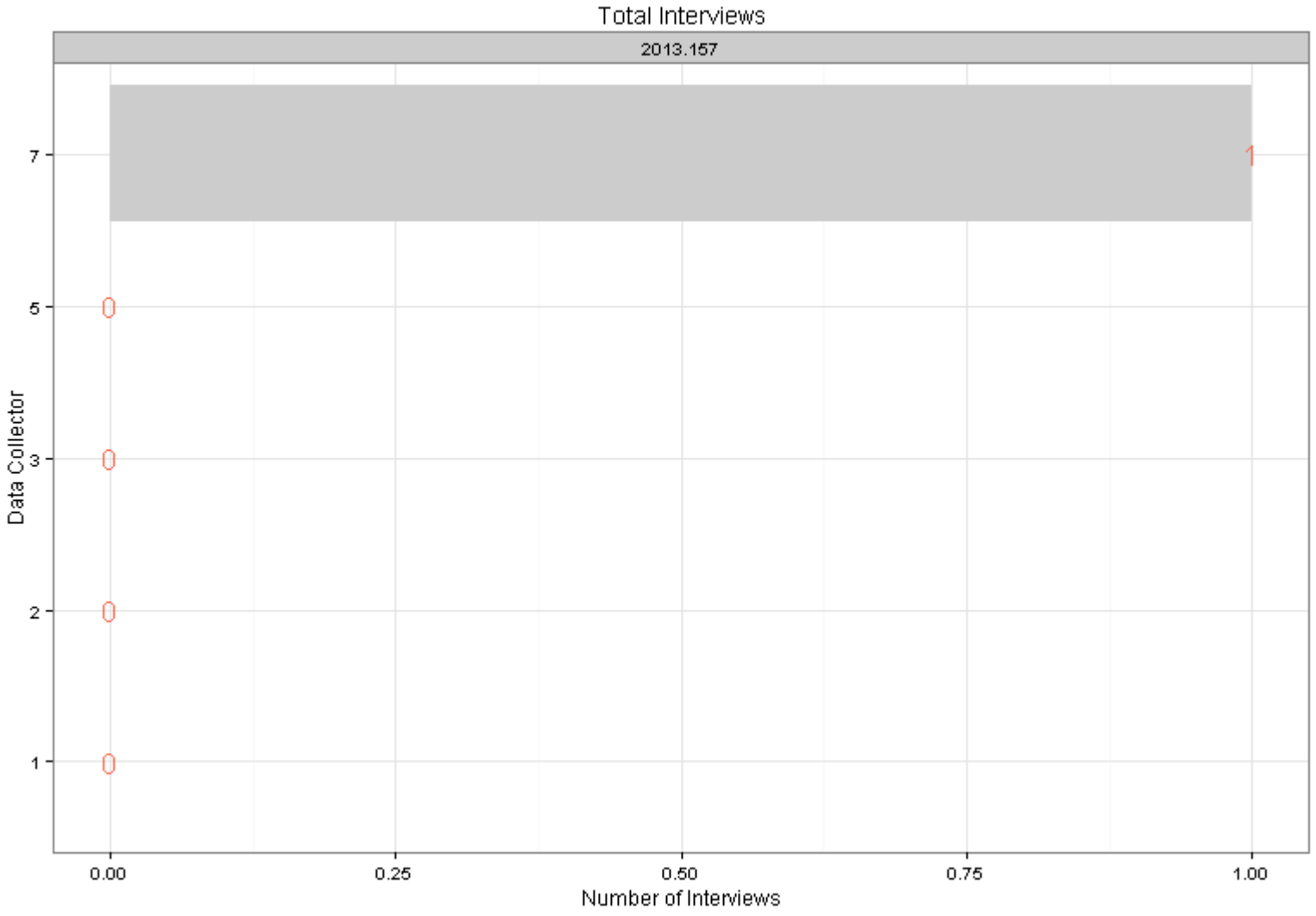
Example Report (Project Aggregate)



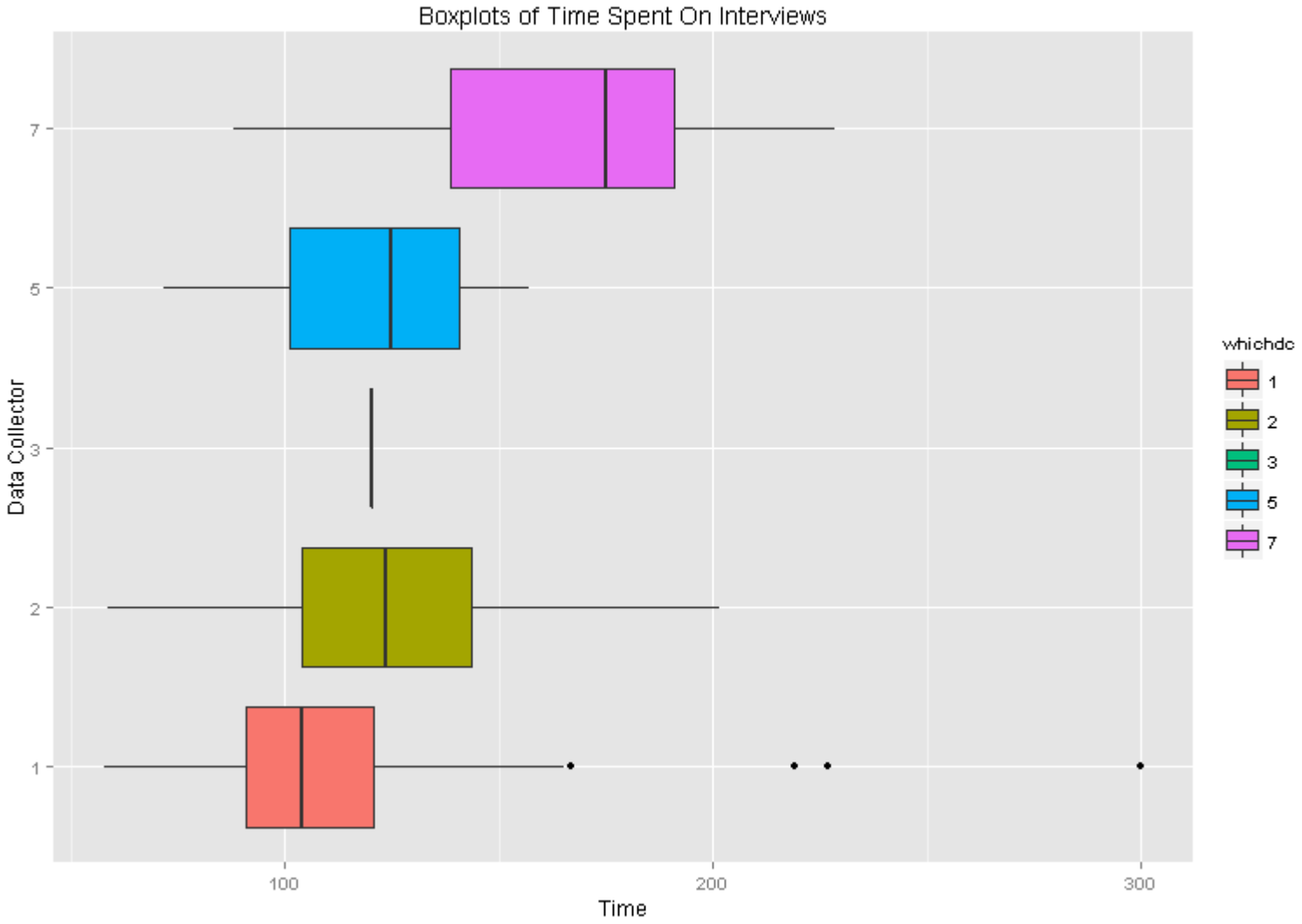
Example Report (6 Month History)



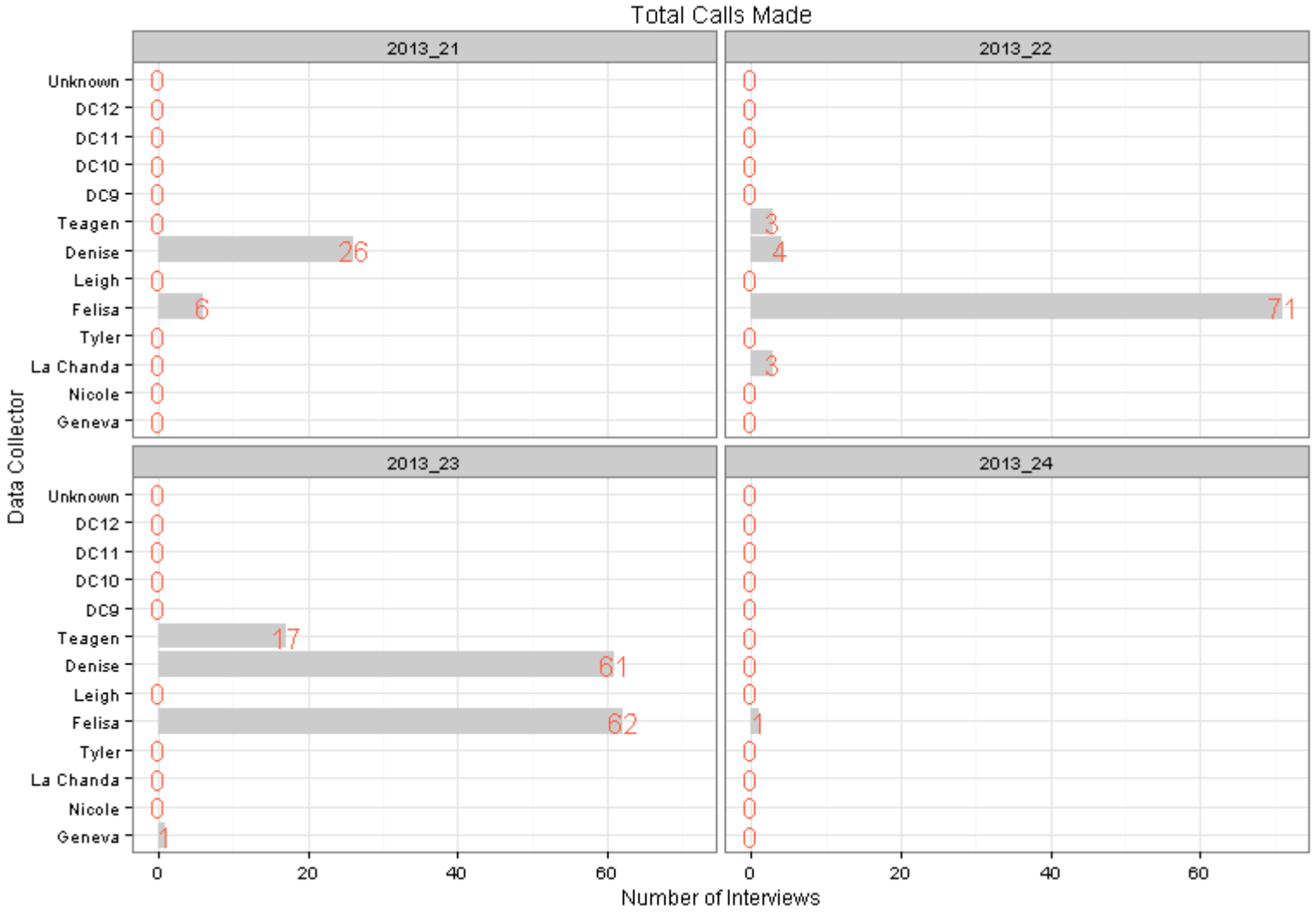
Example Report (7 Day History)



Example Report (Project Aggregate)



Example Report (4 Week History)



REDCap Advantages

- Flexibility:
  - Productivity indicators established by project team
  - Reporting methods determined by project needs
  - All aspects are customizable
  - Current and historical reports

- Automated:
  - Not necessary to compile data
  - Real-time data availability

Reports for Outcomes:
within REDCap

Accommodates basic descriptives & graphs, but not much more.

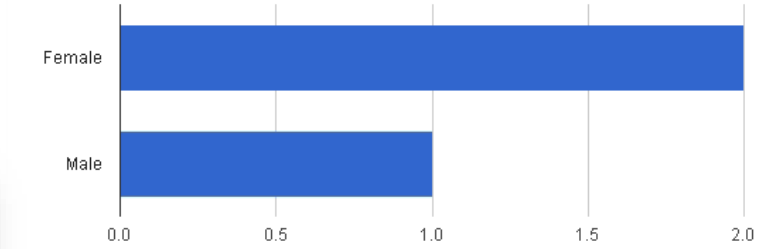
Number of results returned: 3
Total number of records queried: 12 ('records' =

PresentationDemo	
Ethnicity (ethnicity)	Gender (sex)
Non-Hispanic (1)	Female (0)
Hispanic (2)	Female (0)
Non-Hispanic (1)	Male (1)

Gender: Refresh Plot | View as Bar Chart

Total (N)	Missing	Unique
3	9 (75%)	2

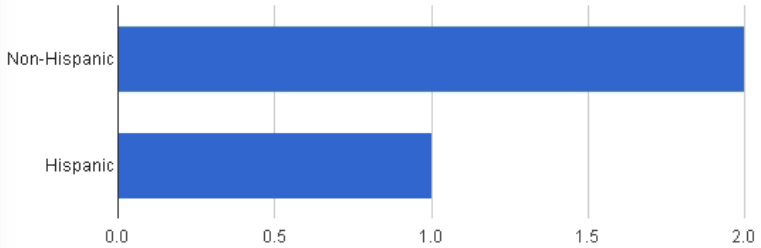
Counts/frequency: Female (2, 66.7%), Male (1, 33.3%)



Ethnicity : Refresh Plot | View as Bar Chart

Total (N)	Missing	Unique
3	9 (75%)	2

Counts/frequency: Non-Hispanic (2, 66.7%), Hispanic (1, 33.3%)



Reports for Outcomes:
External to REDCap

- Use automation to present results in a coherent document.

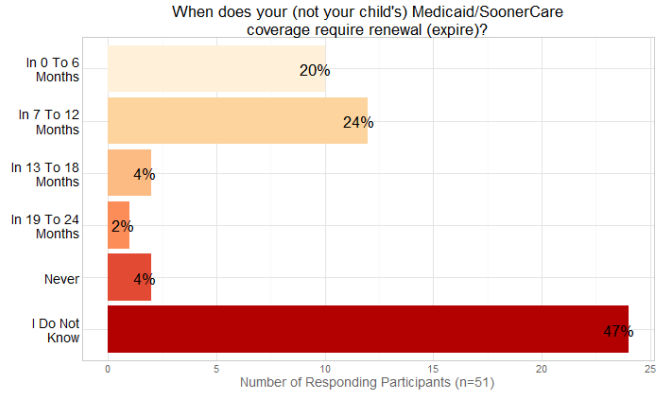
- Eliminate the need to repeatedly copy & paste:
  - Multiple descriptives, graphs, and model results.
  - Updated results after more data trickles in.

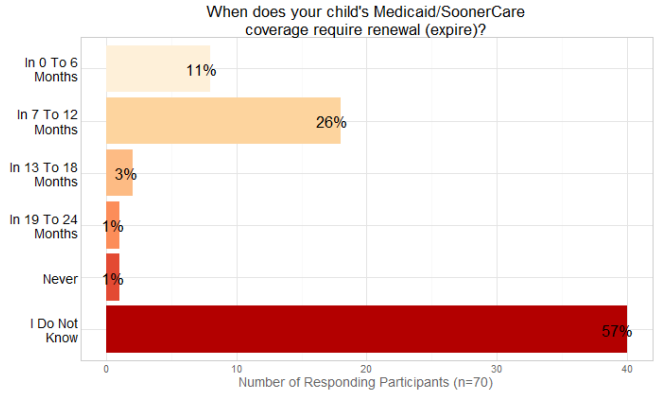
- Internal vs. External Audiences

Reports for Outcomes:
Examples

- Descriptives & graphs for internal audiences.
- Tables for external audiences.
- Text and Graphs for external audiences.
- Optionally hosted online.
  https://github.com/OuhscCcanMiechvEvaluation/MReporting/blob/master/OhcaReports/OhcaReport1/OhcaReport1.md

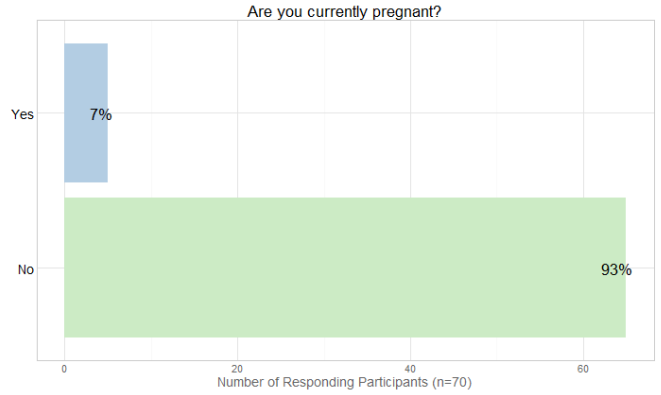
Quick for Internal Audiences

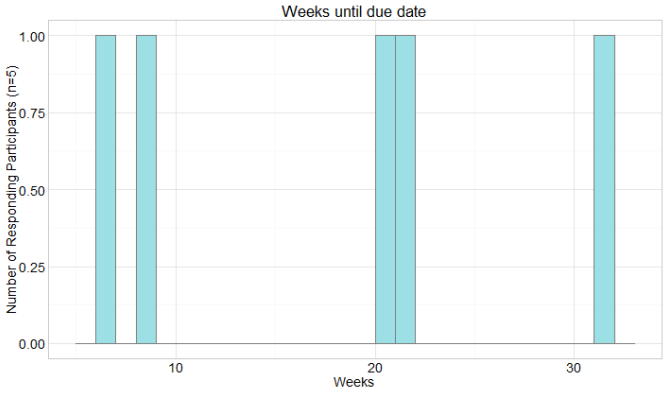


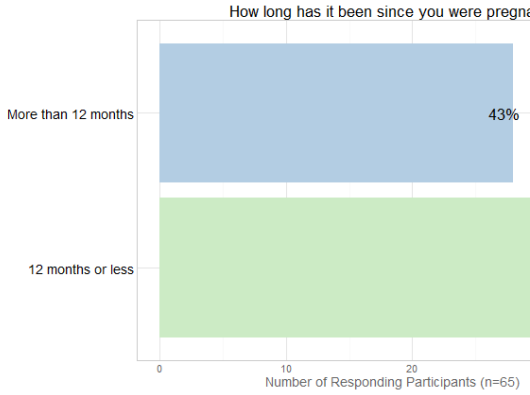


Section B: Pregnancy

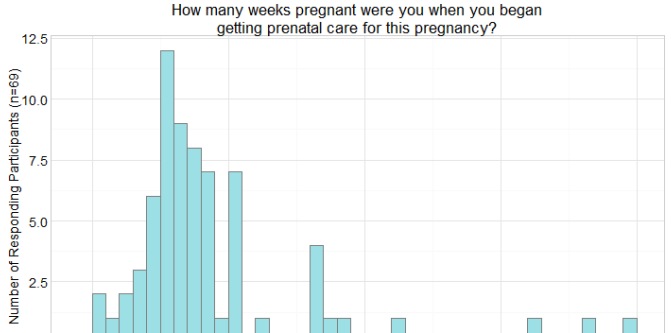
Current and Previous Pregnancy

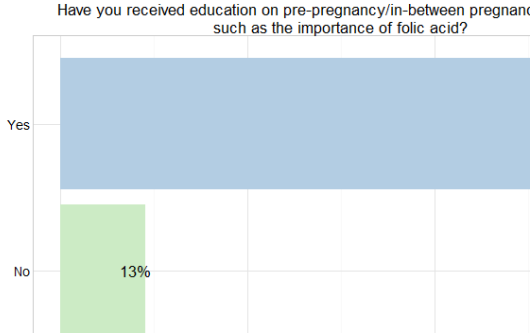






Prenatal Care and Education





Text and Graphs for External Audiences

Draft of C1 Activity Level Report

OUHSC External MIECHV Evaluation Team
David Bard, Will Beasley, & Thomas Wilson

March 21, 2013

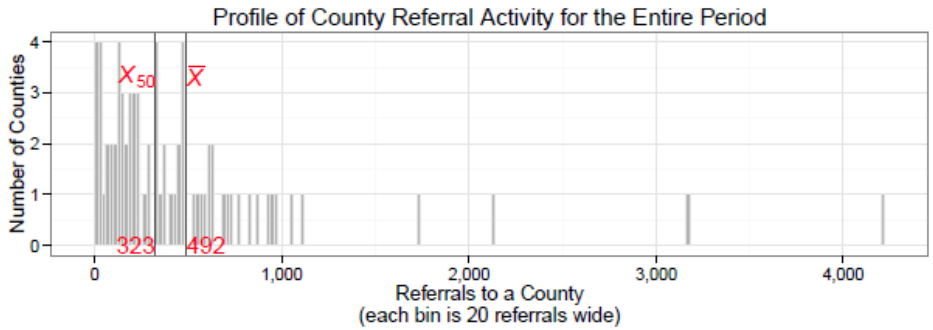
Note: This is a draft, and does not represent the official results. One next step is to address potential redundant records, which we believe represent fewer than 10% of the existing records. A second step is to account for the referrals that come from a county without an established health department or C1 program. Currently the analysis considers all referrals equivalently, which biases down the activity level so it appears that the performance is worse than it actually is.

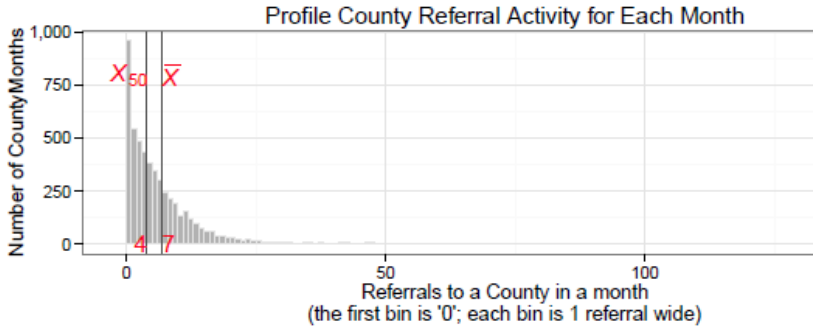
This report contains information from 74 counties, 86 clinics, 33,170 parents, 36,379 referrals, 5,936 enrollments, 641 recorded graduations, and 2,826 recorded nongraduations. It summarizes C1 referrals between January 02, 2007 and November 29, 2012. The 3 referrals received by the central OSDH office (*i.e.*, ID #99) have been excluded.

1 Referrals

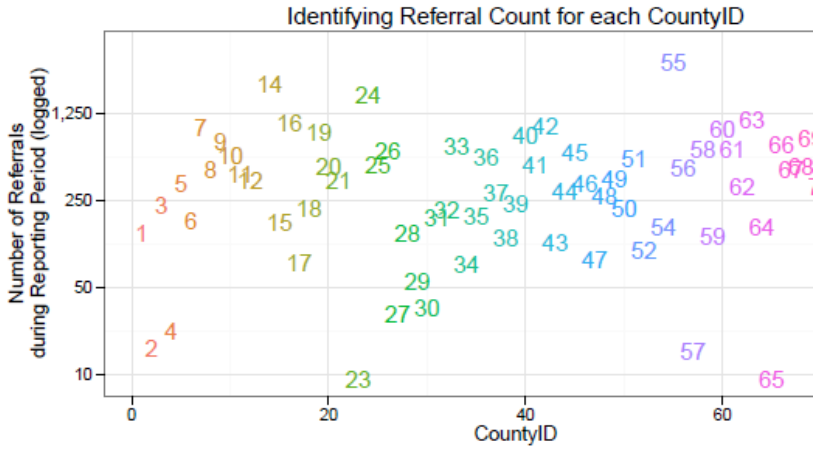
The first histogram looks at the number of referrals received by the different *counties* during the reporting period. The second histogram looks at the number of referrals received by the different *county months* during the reporting period. Notice the median and mean are annotated each with a darker vertical gray line; the median is on the left, the mean is on the right.

There are many months where a county received few referrals. Several sources of these zeros have been identified, and we are deciding how to most accurately represent them in various contexts. For instance, when analyzing the cost-effectiveness of C1, an understaffed county should be treated differently than an adequately staffed county. We soon will incorporate a county's operational dates and its specific funding and staffing levels.





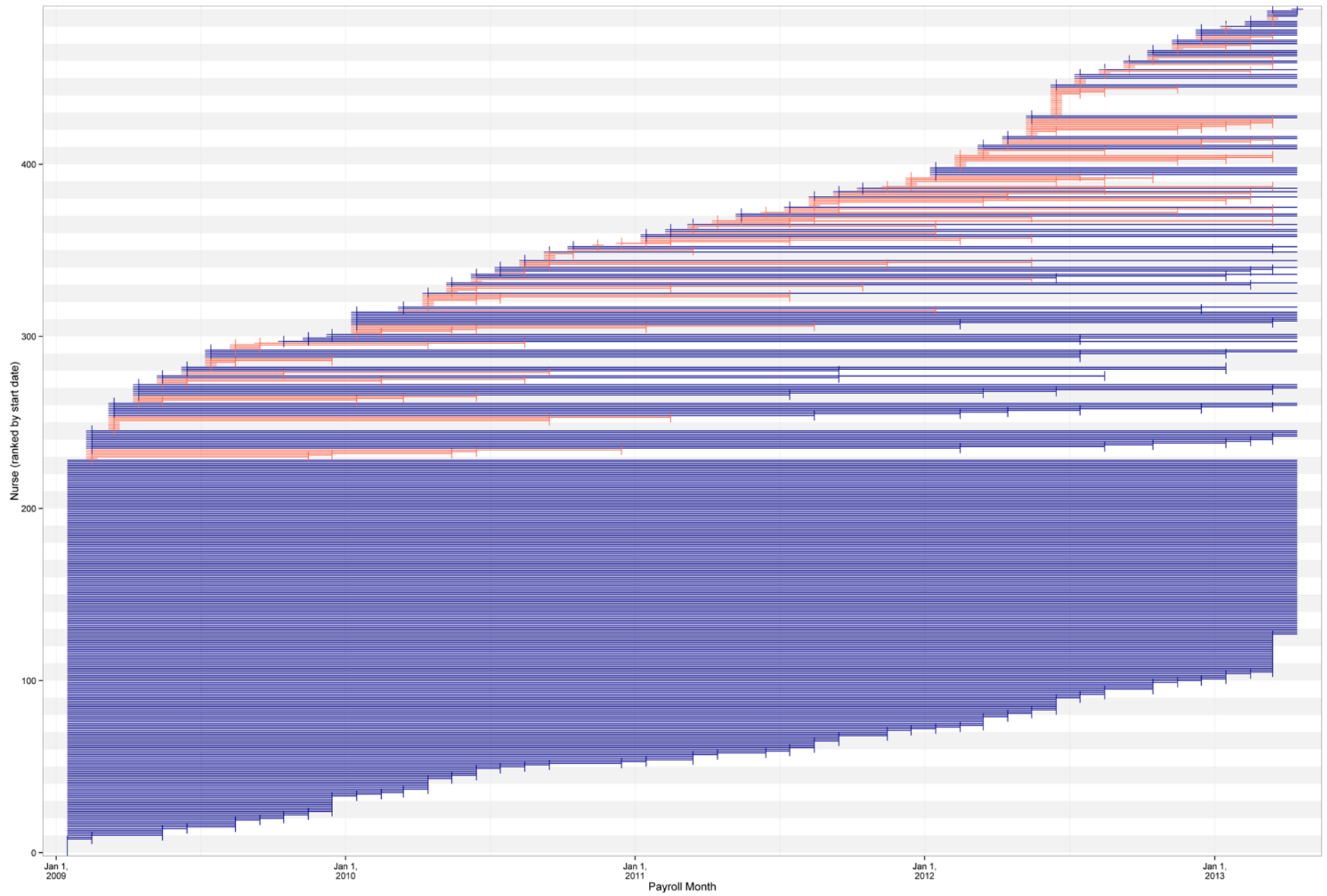
This scatterplot is atypical, because the horizontal is not a real quantitative dimension, it is the value of The information is redundantly displayed by the numbers in the scatterplot. Notice the vertical is logged smaller counties will not be bunched together. This plot can serve as a legend for the subsequent line graphs in the scatterplot corresponds to its color in the subsequent line graphs. The county names corresponding are decoded in the long table at the end of this document.



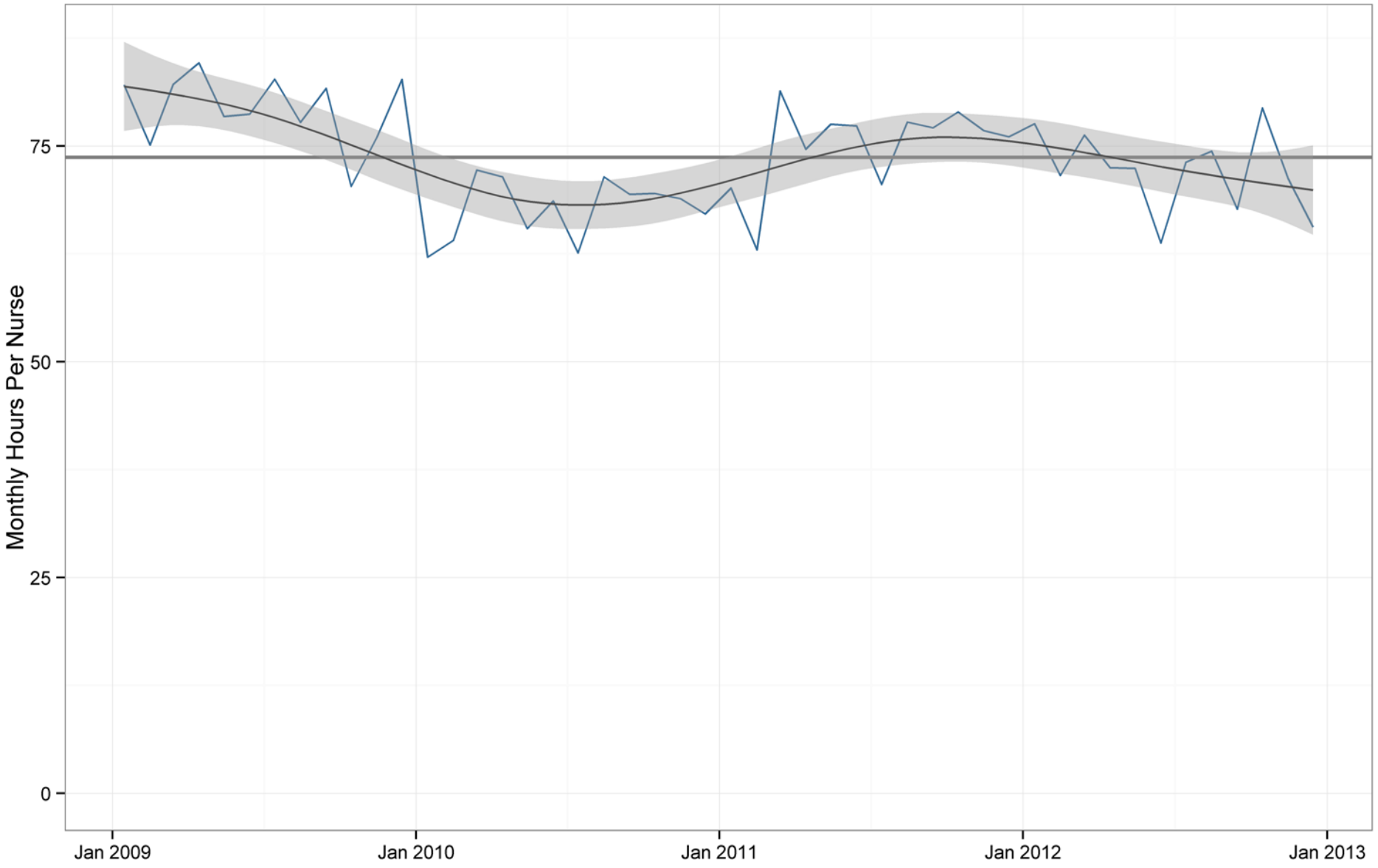
The next two graphs show the number of referrals received over time, by county. Each county has a unique l denotes a month's 25%, 50% and 75% counts of referrals to a county. For instance, when the middle of a bo then 50% of the counties received 7 referrals or fewer.

The gray lines appear again as the median (on bottom) and mean (on top). A curvy longitudinal lin state's trend during the reporting period. The two graphs are identical, except the second one zooms in o

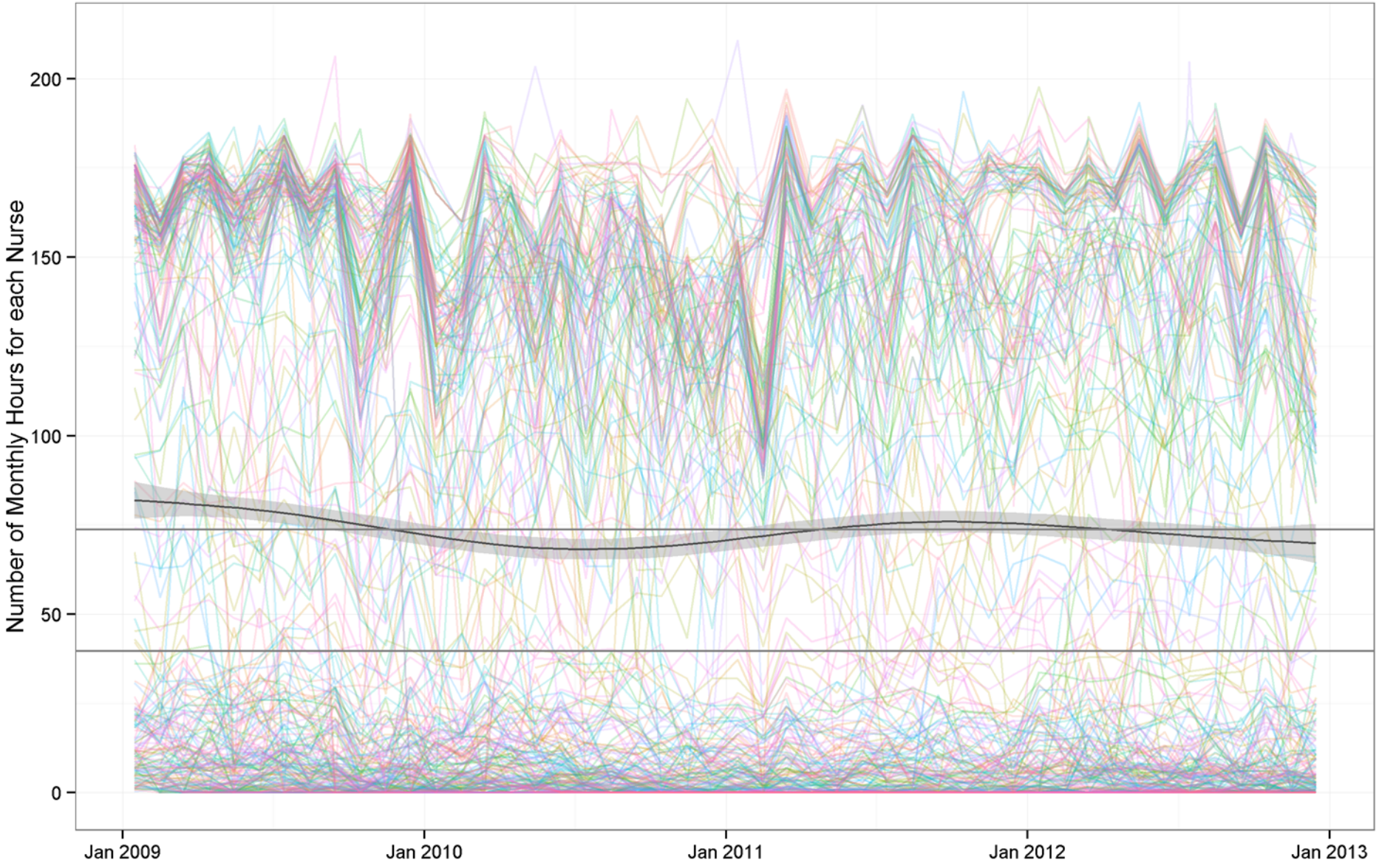
Text and Graphs for External Audiences



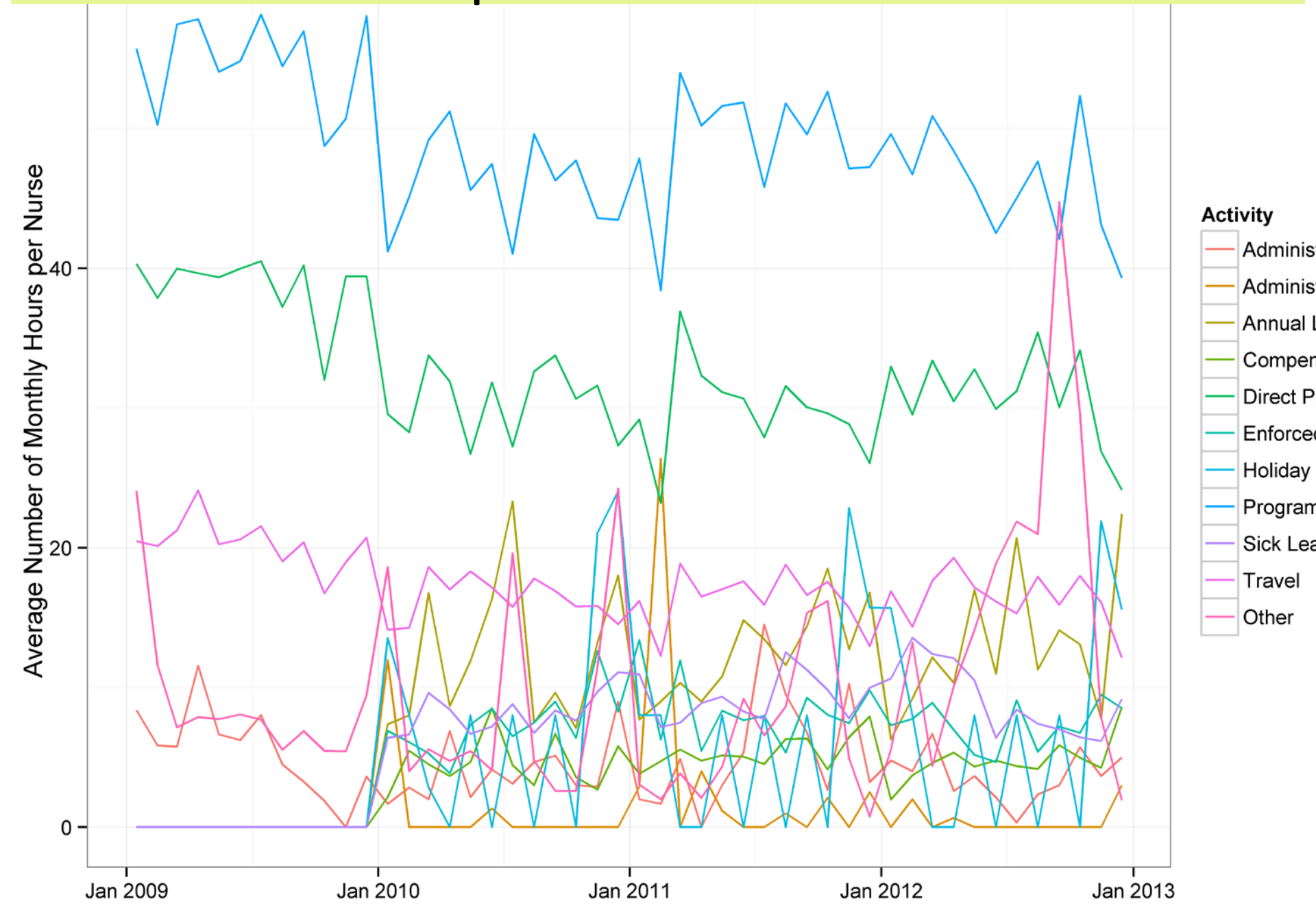
Text and Graphs for External Audiences



Text and Graphs for External Audiences



Text and Graphs for External Audiences



Tables for External Audiences

Comparison of Versions of Kinship Links

Joe Rodger's BG Team

December 9, 2012

Outcome: HeightZGenderAge;
RelationshipPath: Gen1Housemates [ID:1]; **Newer Links Version**: 53; **Older Links Version**: 52;

```
Newer Links: R Excludes Gen1 R=0, .375, .75
Older Links: After chaning 'R' to 'RFull'; Excludes Gen1 R=0
R Groups specifically excluded: {  }
Drop pair if housemates are not confirmed in the same generation: FALSE
```

1 Ace - Comparison of R Variants

(See the final table for an explanation of the different R variants.)

R Variant	a^2_{new}	c^2_{new}	e^2_{new}	N_{new}	a^2_{old}	c^2_{old}	e^2_{old}	N_{old}
R	.90	.00	.10	3729	.90	.00	.10	3784
RFull	.50	.19	.31	4227	.50	.19	.31	4227
RExplicit	.78	.06	.16	3702	.78	.06	.16	3702
RImplicit2004	.75	.09	.16	2262	.75	.09	.16	2262

Table 1: Comparison of R Variants (by rows) and of Links Versions (left vs right side).

2 Subgroups – R

R	Included in SEM	N_{Pairs}	s^2_1	s^2_2	$s_{1,2}$	r	Determinant	PosDefinite
0.125	TRUE	88	0.91	0.95	0.15	0.16	0.8	TRUE
0.250	TRUE	238	1.01	1.14	0.26	0.24	1.1	TRUE
0.500	TRUE	3392	0.97	1.02	0.44	0.44	0.8	TRUE
1.000	TRUE	11	0.29	0.61	0.37	0.89	0.0	TRUE

Table 2: R – Newer Version of Links

R	Included in SEM	N_{Pairs}	s^2_1	s^2_2	$s_{1,2}$	r	Determinant	PosDefinite
0.125	TRUE	88	0.91	0.95	0.15	0.16	0.8	TRUE
0.250	TRUE	238	1.01	1.14	0.26	0.24	1.1	TRUE
0.375	TRUE	45	1.00	1.18	0.48	0.44	1.0	TRUE
0.500	TRUE	3392	0.97	1.02	0.44	0.44	0.8	TRUE
0.750	TRUE	10	0.78	0.76	0.55	0.71	0.3	TRUE
1.000	TRUE	11	0.29	0.61	0.37	0.89	0.0	TRUE

Table 3: R – Older Version of Links

3 Subgroups – RFull

RFull	Included in SEM	N_{Pairs}	s^2_1	s^2_2	$s_{1,2}$	r	Determinant	PosDefinite
0.000	TRUE	443	0.93	0.82	0.23	0.26	0.7	TRUE
0.125	TRUE	88	0.91	0.95	0.15	0.16	0.8	TRUE
0.250	TRUE	238	1.01	1.14	0.26	0.24	1.1	TRUE
0.375	TRUE	45	1.00	1.18	0.48	0.44	1.0	TRUE
0.500	TRUE	3392	0.97	1.02	0.44	0.44	0.8	TRUE
0.750	TRUE	10	0.78	0.76	0.55	0.71	0.3	TRUE
1.000	TRUE	11	0.29	0.61	0.37	0.89	0.0	TRUE

Table 4: RFull – Newer Version of Links

RFull	Included in SEM	N_{Pairs}	s^2_1	s^2_2	$s_{1,2}$	r	Determinant	PosDefinite
0.000	TRUE	443	0.93	0.82	0.23	0.26	0.7	TRUE
0.125	TRUE	88	0.91	0.95	0.15	0.16	0.8	TRUE
0.250	TRUE	238	1.01	1.14	0.26	0.24	1.1	TRUE
0.375	TRUE	45	1.00	1.18	0.48	0.44	1.0	TRUE
0.500	TRUE	3392	0.97	1.02	0.44	0.44	0.8	TRUE
0.750	TRUE	10	0.78	0.76	0.55	0.71	0.3	TRUE
1.000	TRUE	11	0.29	0.61	0.37	0.89	0.0	TRUE

Table 5: RFull – Older Version of Links

4 Subgroups – RExplicit

RExplicit	Included in SEM	N_{Pairs}	s^2_1	s^2_2	$s_{1,2}$	r	Determinant	PosDefinite
0.250	TRUE	245	1.03	1.18	0.29	0.26	1.1	TRUE
0.375	TRUE	45	1.00	1.18	0.48	0.44	1.0	TRUE
0.500	TRUE	3412	0.96	1.01	0.44	0.44	0.8	TRUE

Table 6: RExplicit – Newer Version of Links

RExplicit	Included in SEM	N_{Pairs}	s^2_1	s^2_2	$s_{1,2}$	r	Determinant	PosDefinite
0.250	TRUE	245	1.03	1.18	0.29	0.26	1.1	TRUE
0.375	TRUE	45	1.00	1.18	0.48	0.44	1.0	TRUE
0.500	TRUE	3412	0.96	1.01	0.44	0.44	0.8	TRUE

Table 7: RExplicit – Older Version of Links

Quick for Internal Audiences

One-way General Linear Model

Predictor Variable:

Gender

Show your score

Show Summary

What is your gender?

Male

What is your age?

0 40 100

What is your marital status?

Unmarried

How many children do you have?

0

What is your yearly income?

30,000 1,000,000

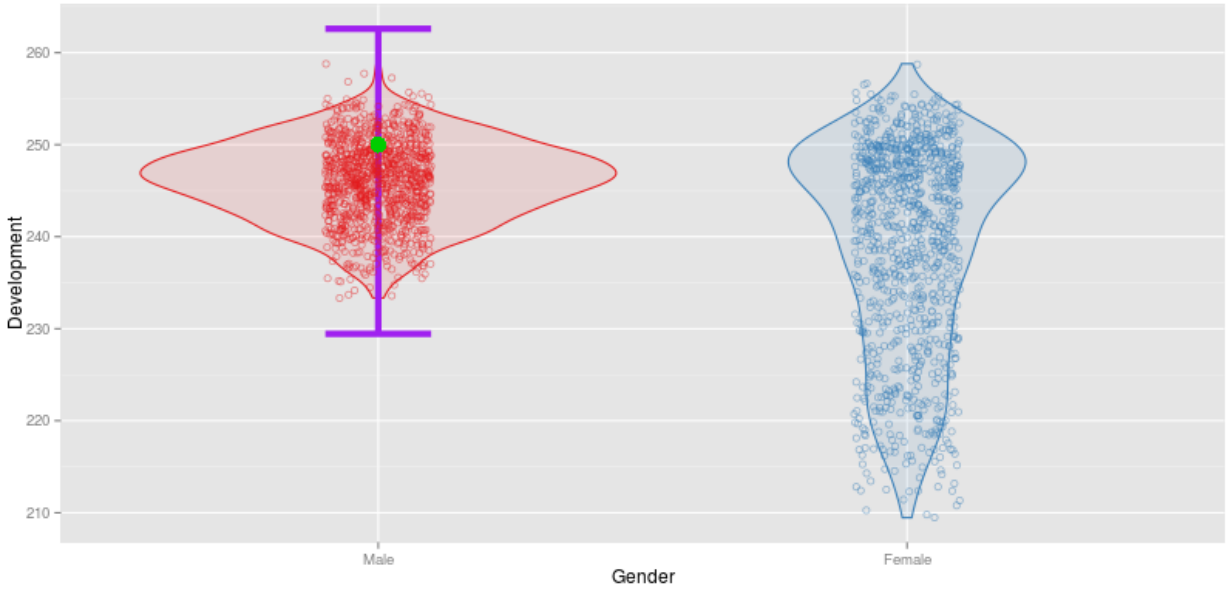
What is your Development Score ?

200 250 300

Predictor Variable: Gender

Dataset: /home/wibeasley/ShinyApps/Oneway/Data/FakeData.csv

Sample Scores



Most patients with your value of Gender fall between 229 and 263 points on the Development scale.

Subset of data:

Number of rows to display:

6

	SubjectID	Development	Gender	Age	MaritalStatus	ChildCount	Income	AgeGroup
1	1	247.24	Female	44.47	Unmarried	1	11508.09	[40,50)

Quick for Internal Audiences

One-way General Linear Model

Predictor Variable:

Age

Show your score

Show Summary

What is your gender?

Male

What is your age?

0 30 100

What is your marital status?

Unmarried

How many children do you have?

3

What is your yearly income?

0 279,000 1,000,000

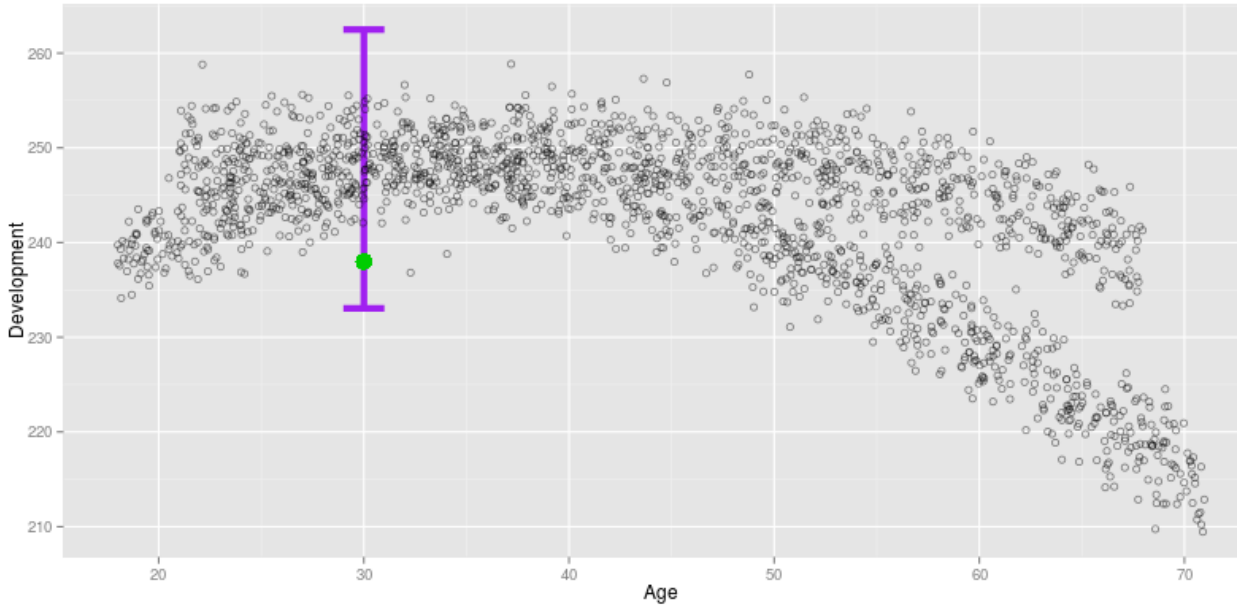
What is your Development Score ?

200 238 300

Predictor Variable: Age

Dataset: /home/wibeasley/ShinyApps/Oneway/Data/FakeData.csv

Sample Scores



Most patients with your value of Age fall between 233 and 262 points on the Development scale.

Subset of data:

Number of rows to display:

6

	SubjectID	Development	Gender	Age	MaritalStatus	ChildCount	Income	AgeGroup
1	1	247.24	Female	44.47	Unmarried	1	11508.09	[40,50)

Goals

- Reproducible research.
  - Facilitates scientific replication.
  - Disseminates techniques to other subfields.
  - Promotes cumulative research.
- Literate programming.
  - Evaluated programs need fresh & frequent feedback.
- Collaborative Development.

Collaboration among

1. The 4 statisticians on the project.
   sharing software development.
2. The 20 people on the project.
   exchanging participant-level data.
3. The 3 partnering organizations. (OSDH, WIC, OHCA)
   -receiving their subject-level & agency-level data.
   -distributing our results –fresh & frequently.
4. Academics in different areas. (particularly at OUHSC)
   exchanging tools and workflows.
5. Researchers in other states pursuing similar goals.
   publishing ideas and replicating previous work.

REDCap™
Research Electronic Data Capture

Oklahoma Shared Clinical and Translational Resources program

Grant targets medically underserved Oklahomans

Modified: September 23, 2013 at 2:26 pm • Published: September 23, 2013

OKLAHOMA CITY (AP) — The University of Oklahoma Health Sciences Center has received a $20.3 million federal grant to target medically underserved Oklahomans, especially in rural areas of the state.

Comments or Questions???

THANK YOU!