Using the API through R to automate Redcap exports
Some updates

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Redcap and web-based data exports
What is API
Some changes to redcap's API
A new tool to interface with redcap's API in R
How to use it

Outline

1 Redcap and web-based data exports

2 What is API

3 Some changes to redcap's API

4 A new tool to interface with redcap's API in R

5 How to use it

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Redcap

- Redcap is designed for researchers to be able to easily create their own database (mysql).
- Has a web interface to design the database and to either enter the data or import a data file.
- https://redcap.vanderbilt.edu/

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Redcap example

- Example: Telephone counseling study for parents of childhood cancer survivors

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Exporting data in Redcap via web interface

- data export tool
- choice of formats, including pdf!
- for R
  - csv file
  - .R script with metadata: labels, factor levels, units

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Drawbacks of exporting with web

- not automated
- uses web browser
- point and click
- "advanced data export" less automated
- may have to edit .R file with correct file name/path
- may need to edit the .R script

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Things I wanted to change about the script file

- includes `rm(list = ls())`
- makes a new set of variables for variables created with dropdown list or radio buttons: numeric and factor
- new set of variables have ".factor" suffix on variable name
- If you remove ".factor," it overwrites the variables after the labels are defined

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What is API

Application programming interface

- lets programs communicate

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Redcap's API

- lets applications connect to redcap remotely
- can interface with different types of code

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Advantages of using API from within R for exports

- can be coded in a script $\Rightarrow$ automated and reproducible
- faster
- can easily incorporate data pull in your R analysis code; analysis is always on current data

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How the API works

- your application connects to the server (using something like Curl)
- submits request (eg, postForm() function in RCurl package)

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Functionality of redcap's API

- export data from redcap
- export metadata (data dictionary)
- import data to redcap
- import/export files
- Export other project data: lists of users, names of data collection forms/instruments
- data entry triggers

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New options in redcap's API

Redcap's API has some new options available

- some documentation at
  https://redcap.vanderbilt.edu/api/help/
- also within a project page: Other Functionality tab
- has example files with code for different languages

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New options in redcap's API

Redcap's API has some new options available
Documentation at
https://redcap.vanderbilt.edu/api/help/

- labels (TRUE/FALSE): Encodes categorical variables with their factor levels (level labels) rather than a numeric coding
- checkboxLabels (TRUE/FALSE)
- forms: Lets you select specific forms, which are groups of variables that display on the same page in the web data entry interface
- fields: Lets you select specific variables
- rawOrLabel:

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Will's functions

R functions posted on github by Will Gray

- Find at https://raw.githubusercontent.com/graywh/
  redcap/master/redcapExport.R
- This is different from the one I had on my wiki page
- Redcap has added new data export options and changed some
  defaults.
- Alternative is to work directly with the API using postForm
  function in RCurl.

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Will's functions

R functions to interface with the redcap API

- Function to export the data and automatically apply metadata (labels and factor levels) to the data
- Function to export the metadata
- take advantage of the new options redcap has recently provided
- **argument defaults are consistent with old settings, so your older analysis code won't break**

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Options in redcapExport() R function

Options in redcapExport() R function

- labels (TRUE/FALSE): Encodes categorical variables as factors in R with levels labels rather than a numeric coding
- checkboxLabels (TRUE/FALSE)
- forms
- fields

Automatically applies variable labels using Hmisc label() function if Hmisc is installed

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Getting set up

- request redcap access for a particular project
- specifically ask for API access
- go to the project page and request the API key specific for you to access that project
- once you get email notification, go get the key

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Getting set up

- install RCurl R package

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Using the redcapExport() function . . . Source the url location of
the function code This is what my code to read the data looks like:

```
library(RCurl)
eval(expr = parse(text =
   getURL("https://raw.githubusercontent.com/graywh/redcap/
key <- '349F9F370555' # (Fake key)
chartAbstraction <- redcapExport(APIKEY = key,
   labels = TRUE, # categorical var level labels
   forms = NULL)
rm(key)
```

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Incorporating the data pulls into your workflow

Here's a way to incorporate the data pulls into your workflow

1. data manupulation file
   - .R text file with R code
   - pull the data from redcap
   - do other data manipulation

2. analysis/report-generating file
   - .Rnw file
   - start by sourcing the data manipulation file
   - put your analysis code here
   - write text that explains your methods and results

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Incorporating the data pulls into your workflow

Can also save the data but note date of last export

1. separate export code/file
   - export data from Redcap
   - **save data as .Rdata file**
   - **can record the date of the export!**

```
save(tc, questionnaireVarNames, metaData, file = "redcapData
lastDataPull <- strftime( file.info("redcapData.Rdata")$mti
format = "%B %d, %Y", usetz = FALSE)
```

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Incorporating the data pulls into your workflow

Saving the data and noting date of last export

1. data manupulation file
   - .R text file with R code
   - **load .Rdata file**
   - do other data manipulation

2. analysis/report-generating file
   - .Rnw file
   - start by sourcing the data manipulation file
   - put your analysis code here
   - write text that explains your methods and results
   - Include **"These results reflect the redcap database as of \Sexpr{lastDataPull}."**

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Recapitulation of set-up

Set-up review:

- install RCurl package
- install Hmisc package if you want variable labels applied
- get an API key for the project
- run the text from
  "https://raw.githubusercontent.com/graywh/
  redcap/master/redcapExport.R" in R

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Summary

- You can use the API to get data from redcap.

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Summary

- You can use the API to get data from redcap.

- Reflexive pronouns can never correctly be used as subjects.

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Thanks

Thanks to Will Gray