Analyzing NAEP/TIMSS Data with Direct Estimation using the R packages EdSurvey and Dire

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NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

Workshop Goal

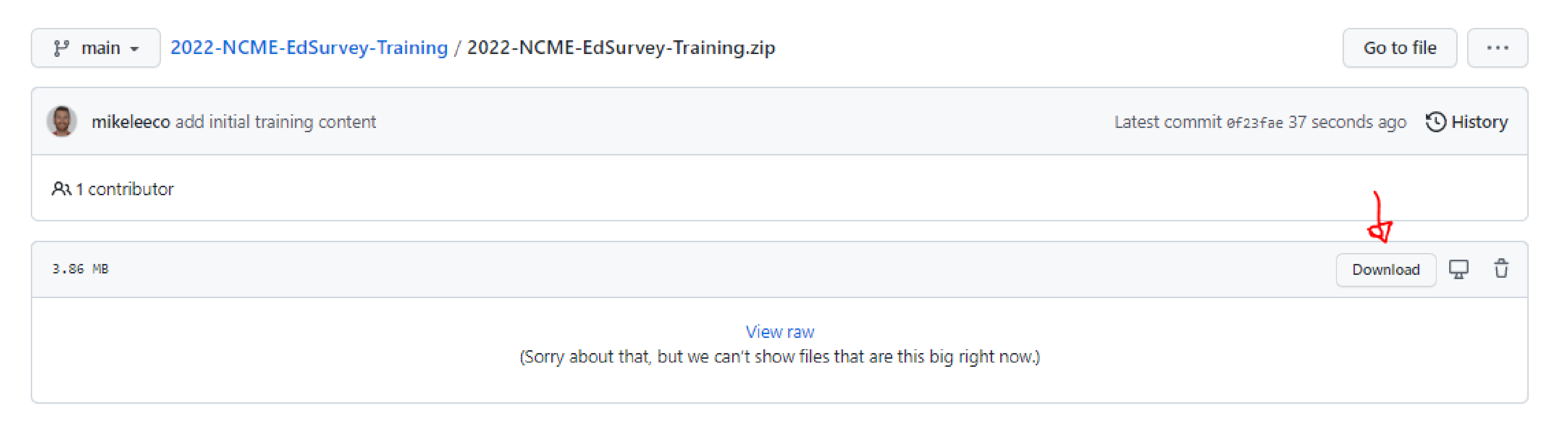
Provide participants with an overview of the methods used to analyze national and international large-scale assessment data using the R package `EdSurvey` and `Dire`.

Outline of EdSurvey Workshop

1. Introduction to R, EdSurvey, and Dire
2. Data Processing and Data Manipulation
3. Hands-on practice
4. Descriptive statistics
5. Hands-on practice
6. Direct estimation with EdSurvey and Dire
7. Hands-on practice

Course Materials

Available here: 2022 NCME Training Content



main ▾ 2022-NCME-EdSurvey-Training / 2022-NCME-EdSurvey-Training.zip

Go to file ···

mikeleeco add initial training content

Latest commit 0f23fae 37 seconds ago History

1 contributor

3.86 MB

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(Sorry about that, but we can't show files that are this big right now.)

Introduction to R, EdSurvey, and Dire

NAEP
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Why R?

1. **Free:** users can legally use and edit R package code
2. **Extensible:** large variety of contributed packages that expand its functionality
3. **Reproducible:** automated data analysis
4. **Designed by and for researchers:** robust ecosystem to translate data into analyses, visualizations, and summary reports with one software

Why EdSurvey?

1. **One-stop shop** for data downloading, processing, manipulation and analysis of survey data.
2. **Automated**: Weights and complex sampling design calculations are automated following standard OECD methodology.
3. **Simple**: e.g., a regression with 80 replicate weights requires only a few lines of code.
4. **Flexible**: You can use functions that rely on EdSurvey methods or get the data and use traditional R.
5. **Minimizes memory footprint** by only reading in required data.

Why Dire?

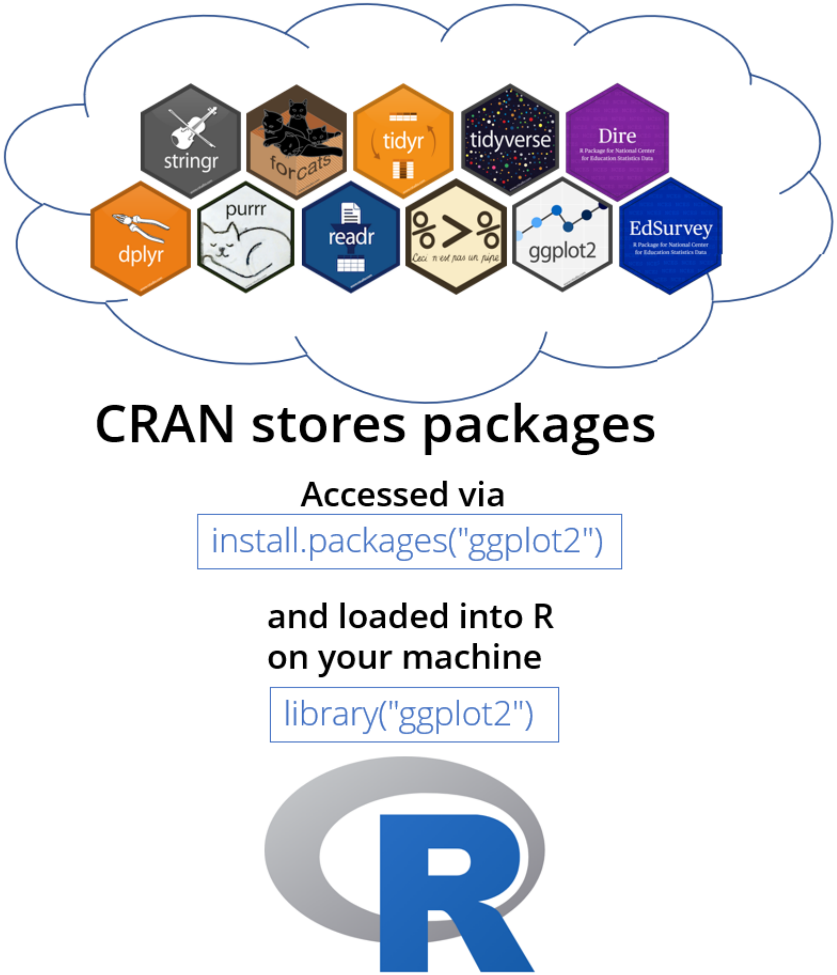
1. **Wow**: Assessments with the matrix booklet design require special considerations in data analysis, e.g., IRT and multiple imputation for item responses. `Dire` provides direct estimation functions that handles analyses of these assessment data properly.
2. **Efficient**: Students' latent proficiency distribution, as well as reporting group difference parameters, are estimated on the fly.
3. **Plausible Values Generation**: No need to rely on testing companies. Plausible values can be generated from the user-defined MML model and used for further analysis.
4. **Expanding Research Scope**: Providing the opportunity for researchers to link administrative data, aggregate data about a community from official statistics, or data from multiple surveys to open up new research questions.

Basic R Infrastructure

stringr
forcats
tidyr
tidyverse
Dire
R Package for National Center for Education Statistics Data
dplyr
purrr
readr
%>%
Ceci n'est pas un pipe
ggplot2
EdSurvey
R Package for National Center for Education Statistics Data

CRAN stores packages

Basic R Infrastructure


stringr
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ggplot2
EdSurvey
R Package for National Center for Education Statistics Data

CRAN stores packages

Accessed via

```
install.packages("ggplot2")
```

and loaded into R
on your machine

```
library("ggplot2")
```

Basic R Infrastructure

stringr
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These package libraries consist of functions

```
ggplot()
geom_point()
...
```

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on your machine

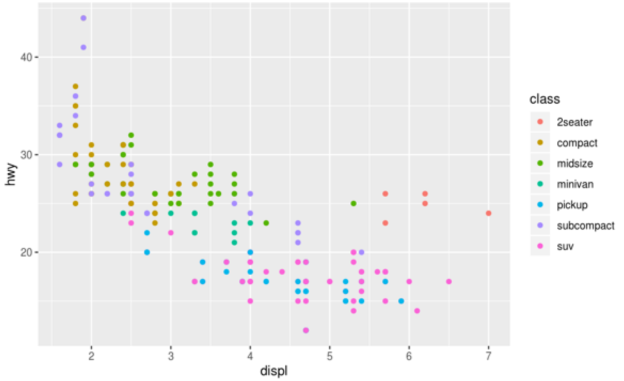
```
library("ggplot2")
```

These package libraries consist of functions

```
ggplot()
geom_point()
...
```

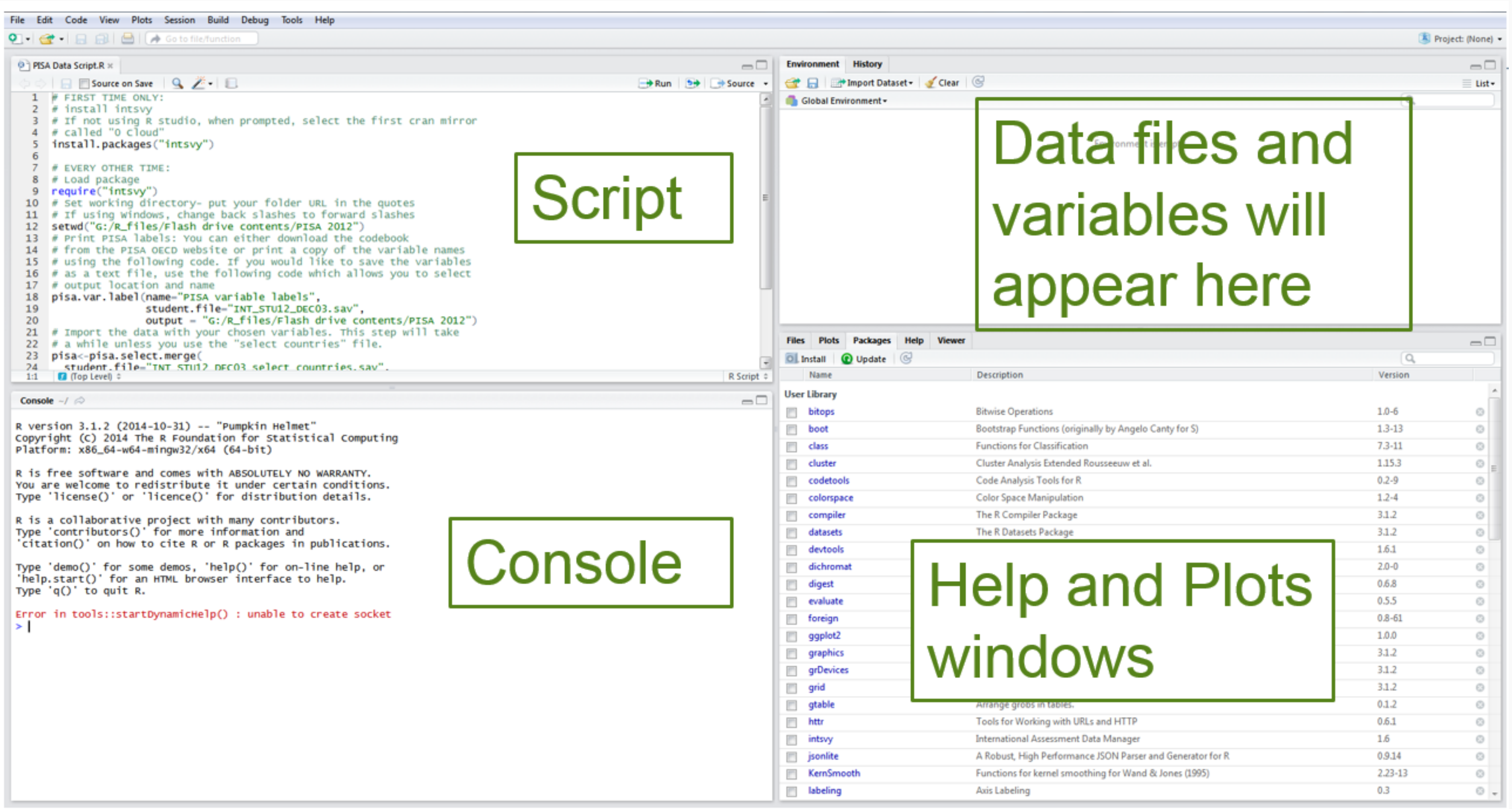
That can be used to analyze data

```
ggplot(mpg, aes(displ, hwy, colour = class)) +
  geom_point()
```



Get to Know the R Environment

Follow Along - R Scripts



```r
# FIRST TIME ONLY:
# install intsvy
# If not using R studio, when prompted, select the first cran mirror
# called "0 Cloud"
install.packages("intsvy")

# EVERY OTHER TIME:
# Load package
require("intsvy")
# Set working directory- put your folder URL in the quotes
# If using Windows, change back slashes to forward slashes
setwd("G:/R_files/Flash drive contents/PISA 2012")
# Print PISA labels: You can either download the codebook
# from the PISA OECD website or print a copy of the variable names
# using the following code. If you would like to save the variables
# as a text file, use the following code which allows you to select
# output location and name
pisa.var.label(name="PISA variable labels",
               student.file="INT_STU12_DEC03.sav",
               output = "G:/R_files/Flash drive contents/PISA 2012")
# Import the data with your chosen variables. This step will take
# a while unless you use the "select countries" file.
pisa<-pisa.select.merge(
  student.file="INT_STU12_DEC03_select_countries.sav",
```

```
R version 3.1.2 (2014-10-31) -- "Pumpkin Helmet"
Copyright (C) 2014 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

Error in tools::startDynamicHelp() : unable to create socket
> |
```

	Name	Description	Version
	User Library		
□	bitops	Bitwise Operations	1.0-6
□	boot	Bootstrap Functions (originally by Angelo Canty for S)	1.3-13
□	class	Functions for Classification	7.3-11
□	cluster	Cluster Analysis Extended Rousseeuw et al.	1.15.3
□	codetools	Code Analysis Tools for R	0.2-9
□	colorspace	Color Space Manipulation	1.2-4
□	compiler	The R Compiler Package	3.1.2
□	datasets	The R Datasets Package	3.1.2
□	devtools		1.6.1
□	dichromat		2.0-0
□	digest		0.6.8
□	evaluate		0.5.5
□	foreign		0.8-61
□	ggplot2		1.0.0
□	graphics		3.1.2
□	grDevices		3.1.2
□	grid		3.1.2
□	gtable	Arrange grobs in tables.	0.1.2
□	httr	Tools for Working with URLs and HTTP	0.6.1
□	intsvy	International Assessment Data Manager	1.6
□	jsonlite	A Robust, High Performance JSON Parser and Generator for R	0.9.14
□	KernSmooth	Functions for kernel smoothing for Wand & Jones (1995)	2.23-13
□	labeling	Axis Labeling	0.3

Script

Data files and variables will appear here

Console

Help and Plots windows

Follow along in edsurvey_part1_Script.R

Notes About Using R

- Highlight , `ctrl` + `enter` executes code to console
- Comment character is a hash

```
# this line is not executed
```

- Variables are assigned with an equals or `<-`

```
x <- 12
x
```

```
## [1] 12
```

- In file names on Windows use a forward slash
  - `C:/`
- R is case sensitive!

```
j <- 12
J
```

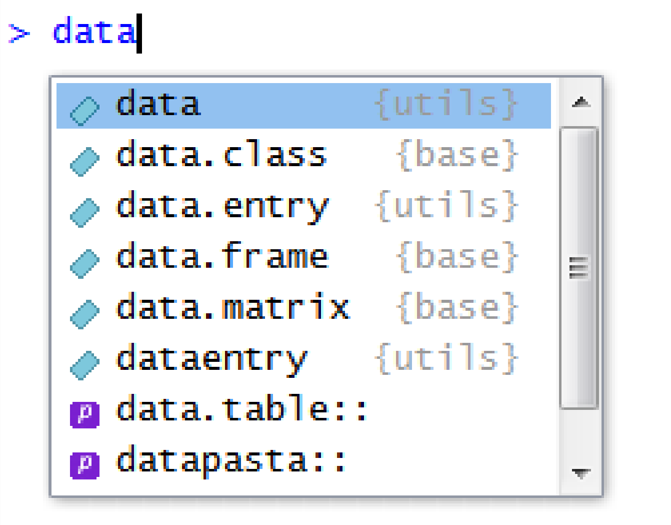
```
## Error in eval(expr, envir, enclos): object 'J' not found
```

Notes About Using R (cont)

- Any command can be input with a question mark preceding it to open the help guide

```
?mean
```

- Use the up arrow on your keyboard to copy your previous lines of code
- Try tab completion, type, "data" then hit the tab key



```
> data
```

Using R Functions

- `c()` function combines values, separated by a comma, into a vector

```
colors <- c("red", "green", "blue")
colors
```

```
## [1] "red"   "green" "blue"
```

```
numbers <- c(1, 2, 3)
numbers
```

```
## [1] 1 2 3
```

- In the `EdSurvey` package we'll use vectors to combine the names of variables in our analyses

Using R Functions

- Arguments can be explicitly or implicitly named

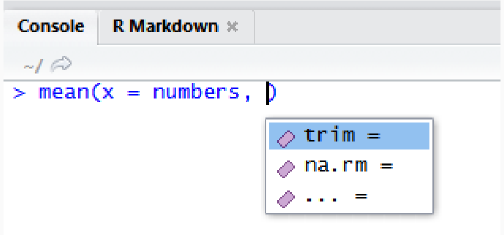
```
mean(x = numbers)
```

```
## [1] 2
```

```
mean(numbers)
```

```
## [1] 2
```

- Arguments are separated by commas



```
> mean(x = numbers, )
```

Installing the EdSurvey Package

- After opening up RStudio, run the following scripts in the console to download and initialize the `EdSurvey` package:

```
#install Dire 2.0.1
# you may need to get rtools
install.packages("Dire")

# then install devtools and EdSurvey from GitHub
install.packages("devtools")
devtools::install_github("American-Institutes-for-Research/edsurvey")

#Install NCESDatalike from location of NCESDatalike_1.0.0.tar.gz file
install.packages("lsasim")
# the tar.gz location may differ depending on your R working directory
install.packages("NCESDatalike_1.0.0.tar.gz", repos = NULL, type = "source"
```

```
# to load the package
library(EdSurvey)
```

Learning EdSurvey

- Reading vignettes provided in training materials

```
vignette("introduction", package="EdSurvey")
```

- R help

```
help(package = "EdSurvey")
```

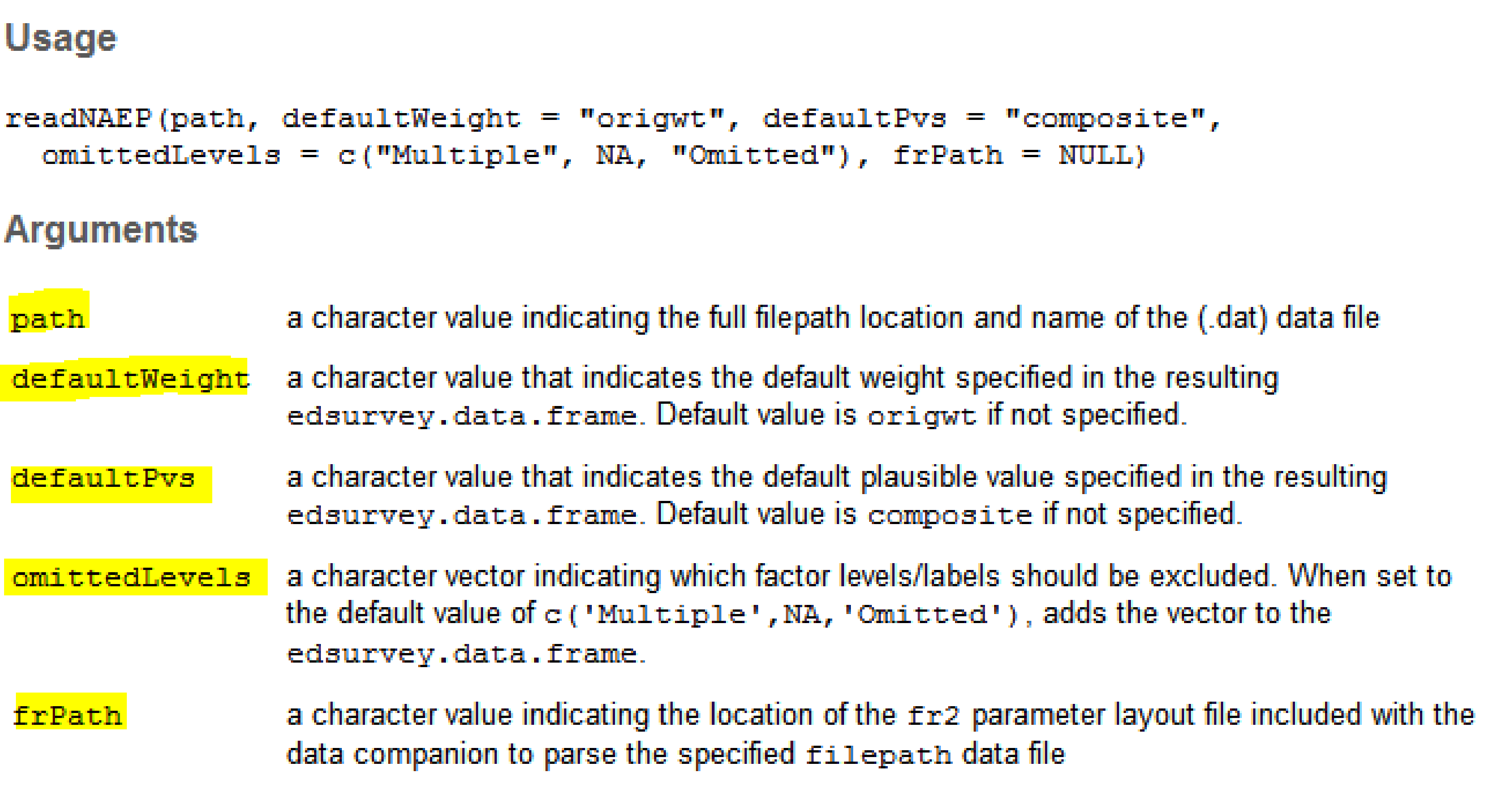
- EdSurvey eBook
- EdSurvey Website
- EdSurvey Github
- NAEP Data Training workshop

Self-Reflection - R Functions

Ask yourself: What are the arguments of the function `readNAEP()`? What are some examples of acceptable values for each argument?

Self-Reflection - R Functions

`readNAEP()` arguments, from R documentation (*type* `?readNAEP` *in the console*)



Usage

```
readNAEP(path, defaultWeight = "origwt", defaultPvs = "composite",
  omittedLevels = c("Multiple", NA, "Omitted"), frPath = NULL)
```

Arguments

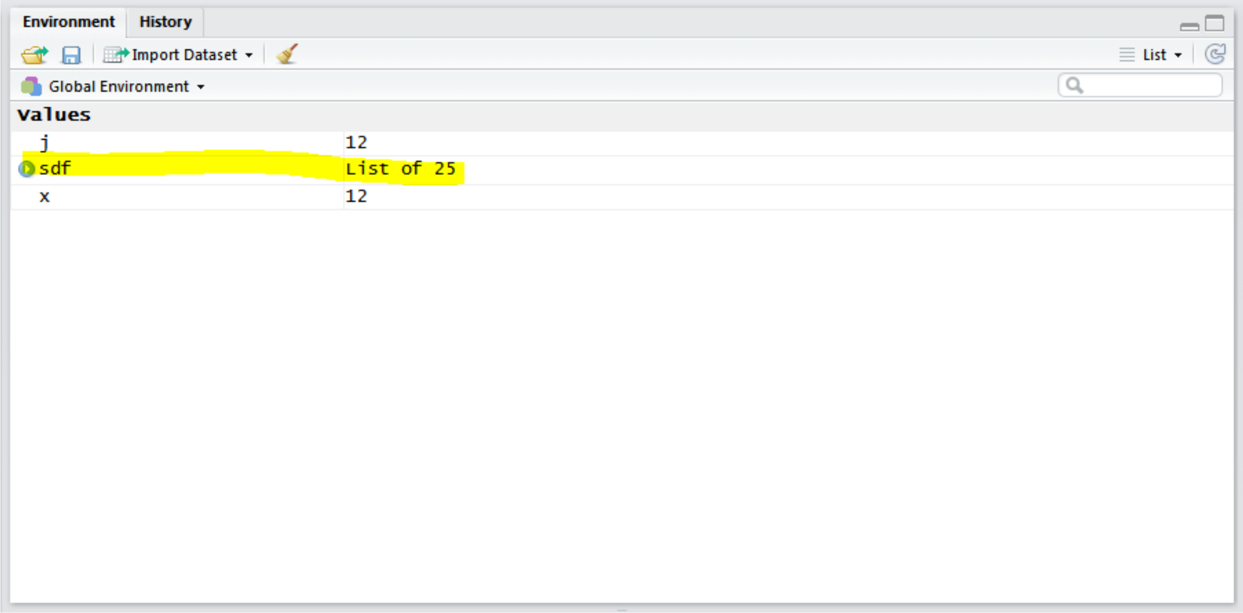
`path`	a character value indicating the full filepath location and name of the (.dat) data file
`defaultWeight`	a character value that indicates the default weight specified in the resulting `edsurvey.data.frame`. Default value is `origwt` if not specified.
`defaultPvs`	a character value that indicates the default plausible value specified in the resulting `edsurvey.data.frame`. Default value is `composite` if not specified.
`omittedLevels`	a character vector indicating which factor levels/labels should be excluded. When set to the default value of `c('Multiple',NA,'Omitted')`, adds the vector to the `edsurvey.data.frame`.
`frPath`	a character value indicating the location of the `fr2` parameter layout file included with the data companion to parse the specified `filepath` data file

Data Processing

Data Processing

- First, read in the publicly available NAEP data from `NAEPprimer`

```
sdf <- readNAEP(system.file("extdata/data", "M36NT2PM.dat", package = "NAEF
```



```
Values
  j      12
  sdf    List of 25
  x      12
```

- How long did that take?

Data Processing

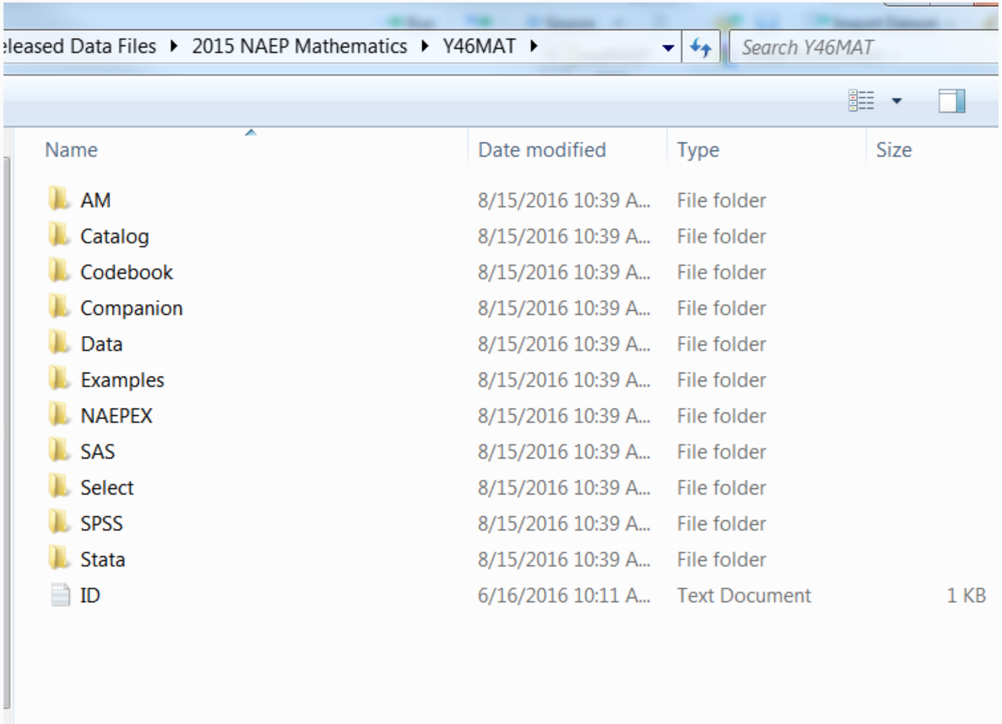
- Can also read in other restricted-use NAEP data by naming the file location

```
math17 <- readNAEP("//path_to_directory/Data/M48NT2AT.dat")
```

- The first character indicates the subject - `M` (Math)
- The second and third characters indicate the NAEP year - `48` (2017 - 1969 = 48)
- The fourth character indicates the component - `N` (National)
- The fifth character indicates the type of data - `T` (Student)
- The sixth character indicates the grade cohort - `2` (8th)
- The seventh and eighth characters indicate the sample - `AT` (Main NAEP)

Data Processing

NOTE: the dat file requires its intact data folder directory in order to be read in correctly; containing both the student and school level files to merge data



Name	Date modified	Type	Size
AM	8/15/2016 10:39 A...	File folder	
Catalog	8/15/2016 10:39 A...	File folder	
Codebook	8/15/2016 10:39 A...	File folder	
Companion	8/15/2016 10:39 A...	File folder	
Data	8/15/2016 10:39 A...	File folder	
Examples	8/15/2016 10:39 A...	File folder	
NAEPEX	8/15/2016 10:39 A...	File folder	
SAS	8/15/2016 10:39 A...	File folder	
Select	8/15/2016 10:39 A...	File folder	
SPSS	8/15/2016 10:39 A...	File folder	
Stata	8/15/2016 10:39 A...	File folder	
ID	6/16/2016 10:11 A...	Text Document	1 KB

Meet Your Data

Quick Terminology Notes

The `edsurvey.data.frame` class stores information about survey data via a data connection, which allows for:

- Correct calculation of relevant statistics.
- Limited working memory usage.

`_____SDF`

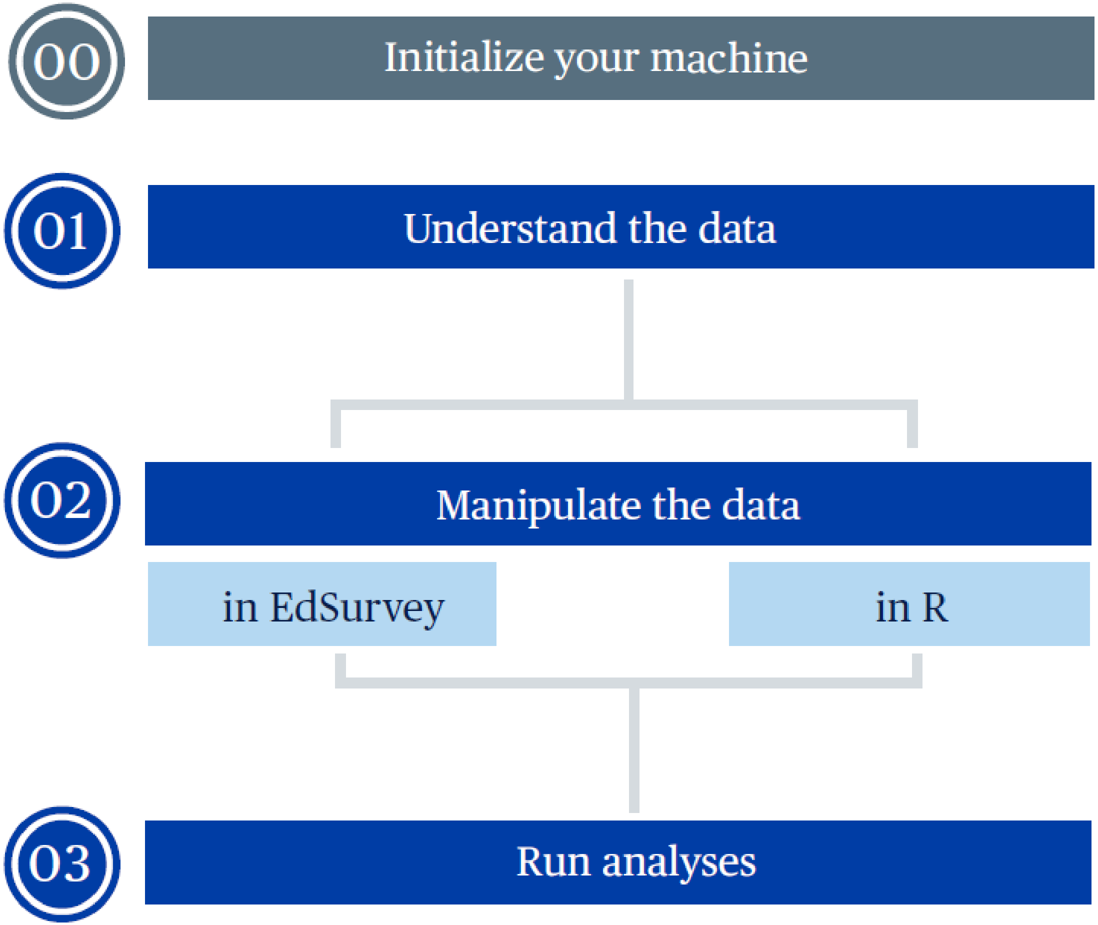
The Edsurvey package uses the acronym `SDF` in the names of several functions to signify their relationship to **S**urvey **D**ata **F**rames.

Quick Terminology Notes

The `edsurvey.data.frame.list` class stores a list of `edsurvey.data.frame` objects.

- The list can be passed to the analysis functions, and a result list will be returned.
- A list can store both `cov` (covariants) and `labels` arguments. For example, the 'year' and 'country' might vary across the `edsurvey.data.frame`s in the list.
- `edsurvey.data.frame.lists` can also be constructed manually. See the `?edsurvey.data.frame.list` documentation.

One-stop Shop for NCES Survey Analysis



00 Initialize your machine

01 Understand the data

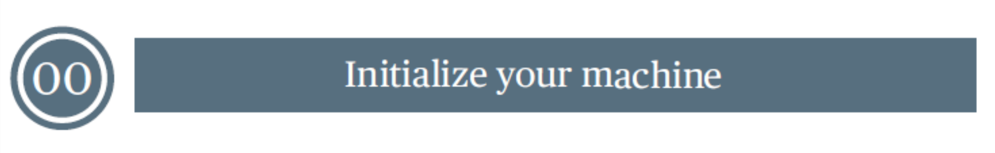
02 Manipulate the data

in EdSurvey

in R

03 Run analyses

One-stop Shop for NCES Survey Analysis



00 Initialize your machine

- Install R and EdSurvey
- Download and read-in data

Example functions:

- `readTIMSS`
- `downloadTIMSS`

One-stop Shop for NCES Survey Analysis

01

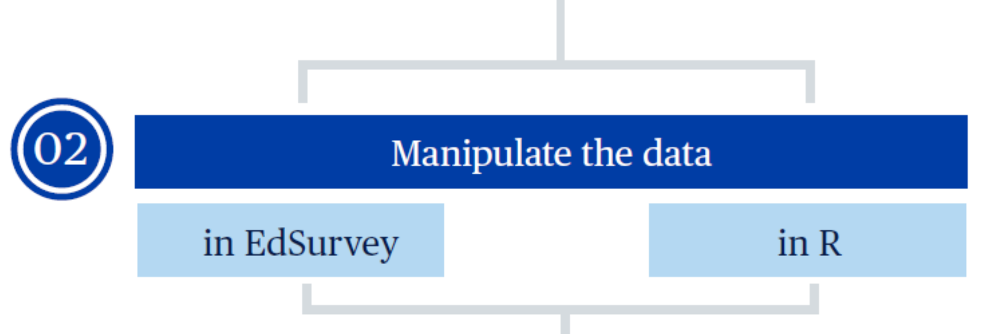
Understand the data

- *Explore*: explore the codebook, see the variables with plausible values, see weights
- *Search*: search variables
- *Expand*: see variable levels, tabulate response percentages, see assessment scores by response category, summarize continuous variables

Example functions:

- `showCodebook`, `showPlausibleValues`, `showWeights`
- `searchSDF`, `levelsSDF`
- `summary2`, `edsurveyTable`

One-stop Shop for NCES Survey Analysis



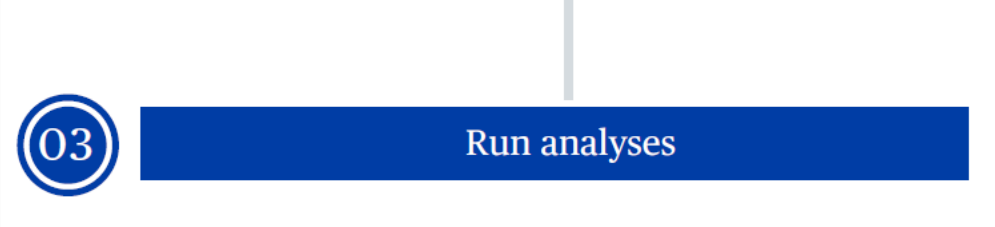
In *EdSurvey*: Clean and manipulate data with built-in subset and recode features.

In *R*: Extract and manipulate data as a data frame (for experienced users)

Example functions:

- `subset`
- `rename.sdf`, `recode.sdf`
- `getData`, `rebindAttributes`

One-stop Shop for NCES Survey Analysis

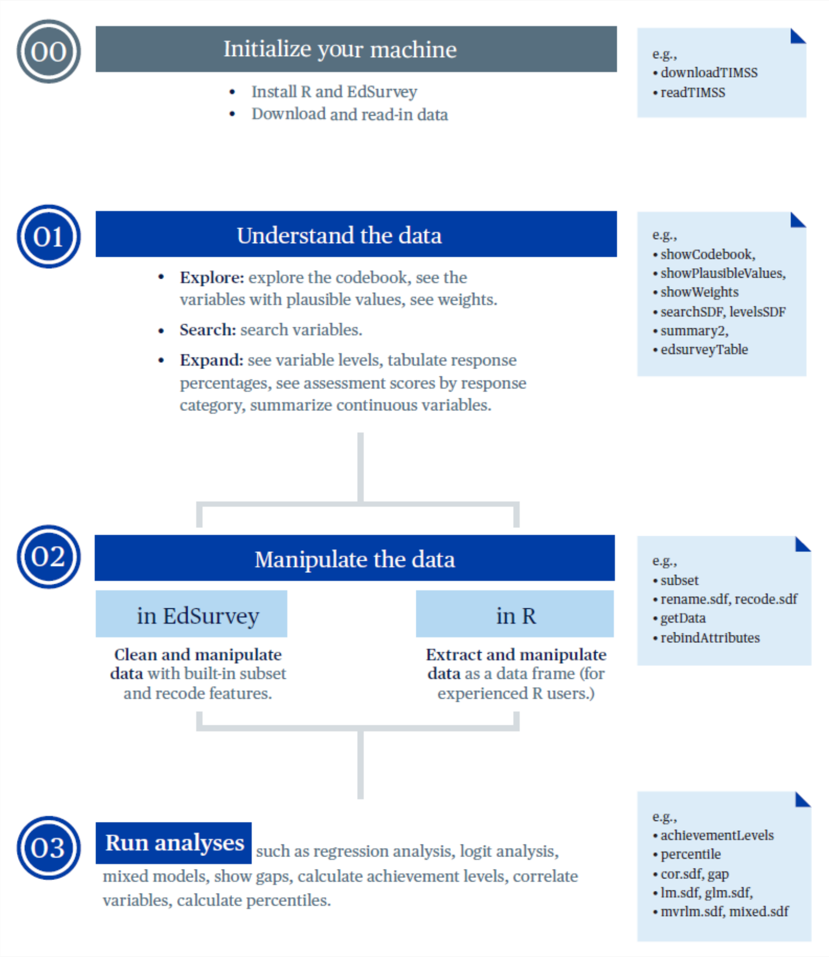


- *Run analyses*: such as regression analysis, logit analysis, mixed models, show gaps, calculate achievement levels, correlate variables, calculate percentiles.

Example functions:

- `achievementLevels`, `percentile`
- `cor.sdf`
- `gap`
- `lm.sdf`, `glm.sdf`
- `mvrlm.sdf`, `mixed.sdf`

One-stop Shop for NCES Survey Analysis



00 Initialize your machine

- Install R and EdSurvey
- Download and read-in data

e.g.,
- downloadTIMSS
- readTIMSS

01 Understand the data

- **Explore:** explore the codebook, see the variables with plausible values, see weights.
- **Search:** search variables.
- **Expand:** see variable levels, tabulate response percentages, see assessment scores by response category, summarize continuous variables.

e.g.,
- showCodebook,
- showPlausibleValues,
- showWeights
- searchSDF, levelsSDF
- summary2,
- edsurveyTable

02 Manipulate the data

in EdSurvey

Clean and manipulate data with built-in subset and recode features.

in R

Extract and manipulate data as a data frame (for experienced R users.)

e.g.,
- subset
- rename.sdf, recode.sdf
- getData
- rebindAttributes

03 **Run analyses** such as regression analysis, logit analysis, mixed models, show gaps, calculate achievement levels, correlate variables, calculate percentiles.

e.g.,
- achievementLevels
- percentile
- cor.sdf, gap
- lm.sdf, glm.sdf,
- mvrlm.sdf, mixed.sdf

- Related Documentation - EdSurvey.pdf, Chap 3, EdSurvey Book

Meet Your Data - print

`print()`

- Print returns detailed data file information:

```r
print(sdf)
```

```
## edsurvey.data.frame for 2005 NAEP (Mathematics) in USA
## Dimensions: 17606 rows and 303 columns.
##
## There is 1 full sample weight in this edsurvey.data.frame:
##   'origwt' with 62 JK replicate weights (the default).
##
##
## There are 6 subject scale(s) or subscale(s) in this edsurvey.data.frame:
## 'num_oper' subject scale or subscale with 5 plausible values.
##
## 'measurement' subject scale or subscale with 5 plausible values.
##
## 'geometry' subject scale or subscale with 5 plausible values.
##
## 'data_anal_prob' subject scale or subscale with 5 plausible values.
##
```

Meet Your Data - dim

`dim()`

- Returns the dimensions of the student data set:

```
dim(sdf)
```

```
## [1] 17606   303
```

Meet Your Data - colnames

`colnames()`

- Prints the names of all variables in the student and school data sets:

```
colnames(sdf)
```

```
##   [1] "ROWID"   "year"    "cohort"  "scrpsu"  "dsex"    "iep"     "lep"     "ell3"    "sdracem" "pared"   "b003501" "b003601"
##  [13] "b013801" "b017001" "b017101" "b018101" "b018201" "b017451" "m815401" "m815501" "m815601" "m815801" "m815701" "rptsamp"
##  [25] "repgrp1" "repgrp2" "jkunit"  "origwt"  "srwt01"  "srwt02"  "srwt03"  "srwt04"  "srwt05"  "srwt06"  "srwt07"  "srwt08"
##  [37] "srwt09"  "srwt10"  "srwt11"  "srwt12"  "srwt13"  "srwt14"  "srwt15"  "srwt16"  "srwt17"  "srwt18"  "srwt19"  "srwt20"
##  [49] "srwt21"  "srwt22"  "srwt23"  "srwt24"  "srwt25"  "srwt26"  "srwt27"  "srwt28"  "srwt29"  "srwt30"  "srwt31"  "srwt32"
##  [61] "srwt33"  "srwt34"  "srwt35"  "srwt36"  "srwt37"  "srwt38"  "srwt39"  "srwt40"  "srwt41"  "srwt42"  "srwt43"  "srwt44"
##  [73] "srwt45"  "srwt46"  "srwt47"  "srwt48"  "srwt49"  "srwt50"  "srwt51"  "srwt52"  "srwt53"  "srwt54"  "srwt55"  "srwt56"
##  [85] "srwt57"  "srwt58"  "srwt59"  "srwt60"  "srwt61"  "srwt62"  "smsrswt" "mrps11"  "mrps12"  "mrps13"  "mrps14"  "mrps15"
##  [97] "mrps21"  "mrps22"  "mrps23"  "mrps24"  "mrps25"  "mrps31"  "mrps32"  "mrps33"  "mrps34"  "mrps35"  "mrps41"  "mrps42"
## [109] "mrps43"  "mrps44"  "mrps45"  "mrps51"  "mrps52"  "mrps53"  "mrps54"  "mrps55"  "mrpcm1"  "mrpcm2"  "mrpcm3"  "mrpcm4"
## [121] "mrpcm5"  "m075201" "m075401" "m075601" "m019901" "m066201" "m047301" "m046201" "m066401" "m020101" "m067401" "m086101"
## [133] "m047701" "m067301" "m048001" "m093701" "m086001" "m051901" "m076001" "m046001" "m046101" "m067701" "m046701" "m046901"
## [145] "m047201" "m046601" "m046801" "m067801" "m066601" "m067201" "m068003" "m068005" "m068008" "m068007" "m068006" "m093601"
## [157] "m053001" "m047801" "m086301" "m085701" "m085901" "m085601" "m085501" "m085801" "m019701" "m020001" "m046301" "m047001"
## [169] "m046501" "m066501" "m047101" "m066301" "m067901" "m019601" "m051501" "m047901" "m053101" "m143601" "m143701" "m143801"
## [181] "m143901" "m144001" "m144101" "m144201" "m144301" "m144401" "m144501" "m144601" "m144701" "m144801" "m144901" "m145001"
```

Meet Your Data - searchSDF

`searchSDF()` - Search the survey data frame by character strings

```
searchSDF("education", sdf)
```

```
##   variableName                                          Labels
## 1        pared Parental education level (from 2 questions)
## 2      b003501                          Mother's education level
## 3      b003601                          Father's education level
## 4      c044007                       Percent in special education
```

- Add argument `levels = TRUE` to return variable levels.

```
searchSDF("b003501", sdf, levels = TRUE)
```

```
## Variable: b003501
## Label: Mother's education level
## Levels (Lowest level first):
##      1. Did not finish H.S.
##      2. Graduated H.S.
##      3. Some ed after H.S.
##      5. I don't know
```

- What occurs with an empty string?

```
searchSDF("", sdf)
```

Meet Your Data - levelsSDF

`levelsSDF()`

- Show the levels of a variable

```
levelsSDF("b018201", sdf)
```

```
## Levels for Variable 'b018201' (Lowest level first):
##     1. Never (n = 9524)
##     2. Once in a while (n = 3328)
##     3. Half the time (n = 1178)
##     4. All or most of time (n = 2133)
##     8. Omitted* (n = 741)
##     0. Multiple* (n = 11)
##     NOTE: * indicates an omitted level.
```

Meet Your Data - showCodebook

`showCodebook()`

- Show the levels of a variable

```
showCodebook(sdf)
```

```
##     variableName                                              Labels
## 1           year                                     Assessment year
## 2         cohort                                        All students
## 3         scrpsu                          Scrambled PSU and school code
## 4           dsex                                              Gender
## 5            iep    Student classified as having a disability (504)
## 6            lep           Student classified as ELL (2 categories)
## 7           ell3     Student classified Eng lang learner (3 categ)
## 8        sdracem              Race/ethnicity (from school records)
## 9          pared        Parental education level (from 2 questions)
## 10       b003501                           Mother's education level
## 11       b003601                           Father's education level
## 12       b013801                                       Books in home
## 13       b017001                                   Newspaper in home
## 14       b017101                                    Computer at home
```

- `View()` shows a preview of a selected data set

```
View(showCodebook(sdf))
```

Meet Your Data - showPlausibleValues

`showPlausibleValues()` - Prints all plausible values

```
showPlausibleValues(sdf)
```

```
## There are 6 subject scale(s) or subscale(s) in this edsurvey.data.frame:
## 'num_oper' subject scale or subscale with 5 plausible values.
##
## 'measurement' subject scale or subscale with 5 plausible values.
##
## 'geometry' subject scale or subscale with 5 plausible values.
##
## 'data_anal_prob' subject scale or subscale with 5 plausible values.
##
## 'algebra' subject scale or subscale with 5 plausible values.
##
```

- add `verbose = TRUE`

```
showPlausibleValues(sdf, verbose = TRUE)
```

```
## There are 6 subject scale(s) or subscale(s) in this edsurvey.data.frame:
## 'num_oper' subject scale or subscale with 5 plausible values.
##   The plausible value variables are: 'mrps11', 'mrps12', 'mrps13', 'mrps14', and 'mrps15'
##
## 'measurement' subject scale or subscale with 5 plausible values.
##   The plausible value variables are: 'mrps21', 'mrps22', 'mrps23', 'mrps24', and 'mrps25'
##
```

Meet Your Data - showWeights

`showWeights()` - Prints all weights:

```
showWeights(sdf)
```

```
## There is 1 full sample weight in this edsurvey.data.frame:
##   'origwt' with 62 JK replicate weights (the default).
```

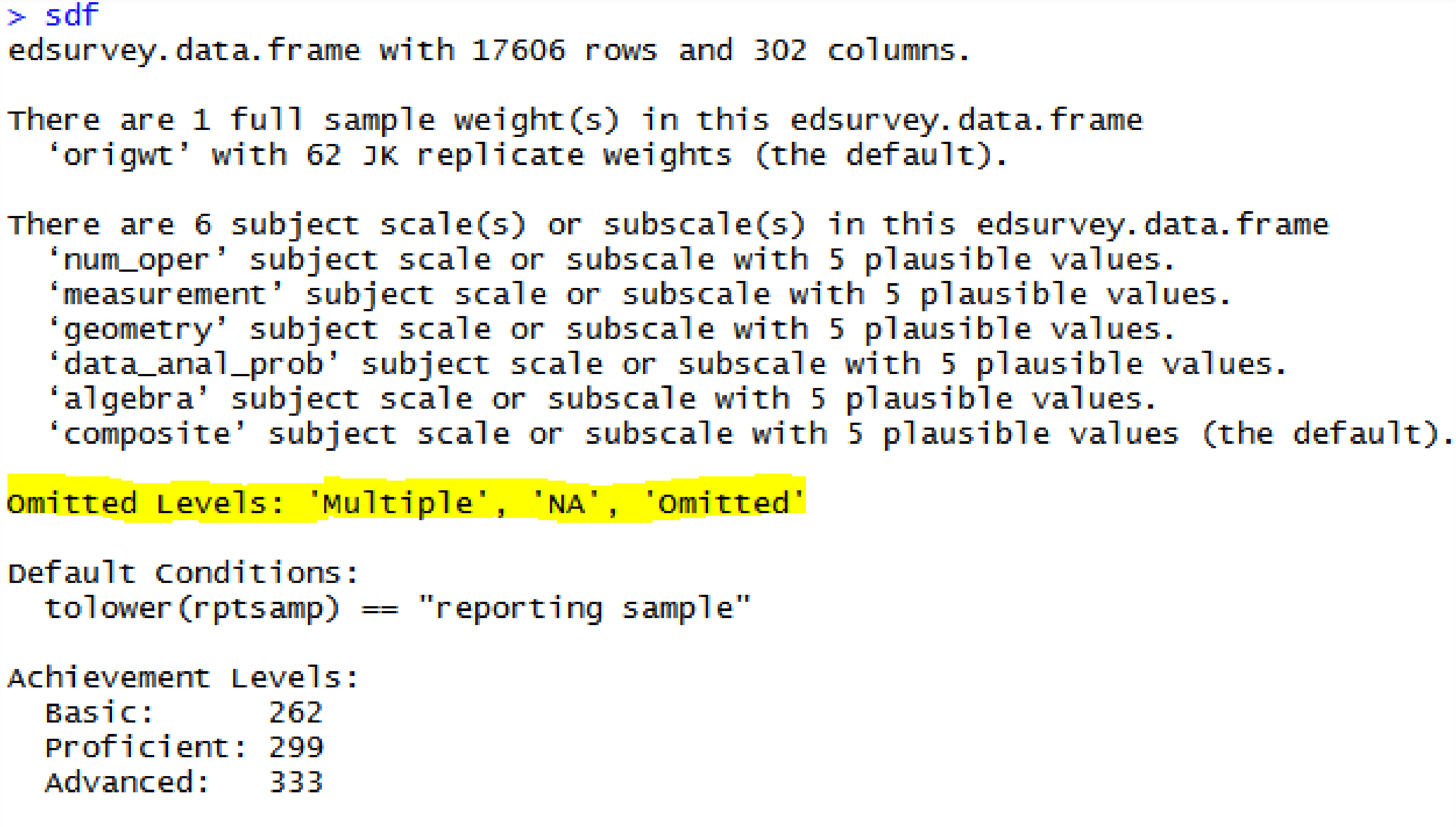
- add `verbose = TRUE` to print the complete list of jackknife replicate weights associated with each full sample weight.

```
showWeights(sdf, verbose = TRUE)
```

```
## There is 1 full sample weight in this edsurvey.data.frame:
##   'origwt' with 62 JK replicate weights (the default).
##     Jackknife replicate weight variables associated with the full sample weight 'origwt':
##     'srwt01', 'srwt02', 'srwt03', 'srwt04', 'srwt05', 'srwt06', 'srwt07', 'srwt08', 'srwt09', 'srwt10', 'srwt11',
##     'srwt12', 'srwt13', 'srwt14', 'srwt15', 'srwt16', 'srwt17', 'srwt18', 'srwt19', 'srwt20', 'srwt21', 'srwt22',
##     'srwt23', 'srwt24', 'srwt25', 'srwt26', 'srwt27', 'srwt28', 'srwt29', 'srwt30', 'srwt31', 'srwt32', 'srwt33',
##     'srwt34', 'srwt35', 'srwt36', 'srwt37', 'srwt38', 'srwt39', 'srwt40', 'srwt41', 'srwt42', 'srwt43', 'srwt44',
##     'srwt45', 'srwt46', 'srwt47', 'srwt48', 'srwt49', 'srwt50', 'srwt51', 'srwt52', 'srwt53', 'srwt54', 'srwt55',
##     'srwt56', 'srwt57', 'srwt58', 'srwt59', 'srwt60', 'srwt61', and 'srwt62'
```

Meet Your Data - Omitted Levels

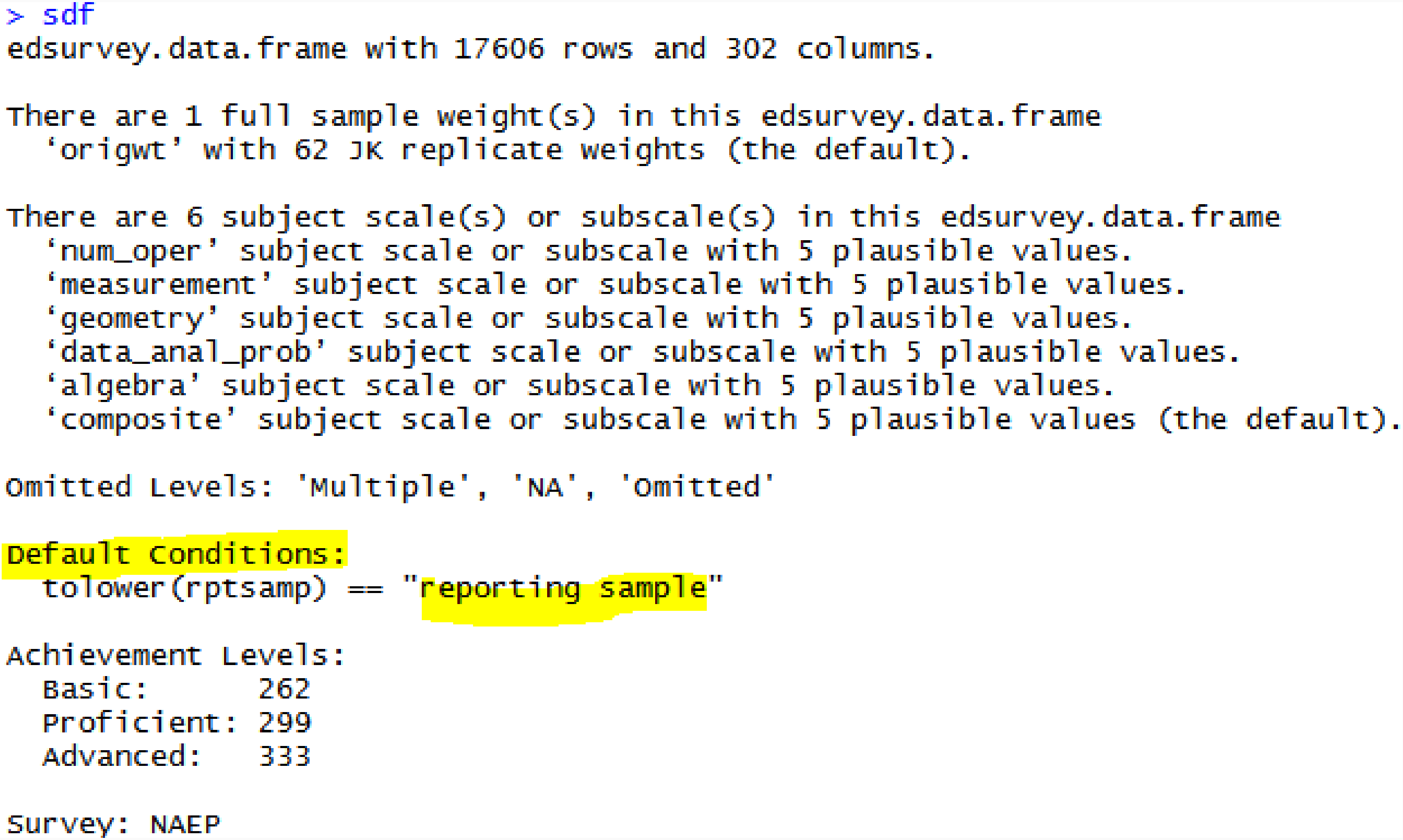
- Levels of the variables that will be omitted by default from the `edsurvey.data.frame`



```
> sdf
edsurvey.data.frame with 17606 rows and 302 columns.

There are 1 full sample weight(s) in this edsurvey.data.frame
  'origwt' with 62 JK replicate weights (the default).

There are 6 subject scale(s) or subscale(s) in this edsurvey.data.frame
  'num_oper' subject scale or subscale with 5 plausible values.
  'measurement' subject scale or subscale with 5 plausible values.
  'geometry' subject scale or subscale with 5 plausible values.
  'data_anal_prob' subject scale or subscale with 5 plausible values.
  'algebra' subject scale or subscale with 5 plausible values.
  'composite' subject scale or subscale with 5 plausible values (the default).

Omitted Levels: 'Multiple', 'NA', 'Omitted'

Default Conditions:
  tolower(rptsamp) == "reporting sample"

Achievement Levels:
  Basic:      262
  Proficient: 299
  Advanced:   333
```

Meet Your Data - Default Conditions

- Special considerations for a particular `edsurvey.data.frame`



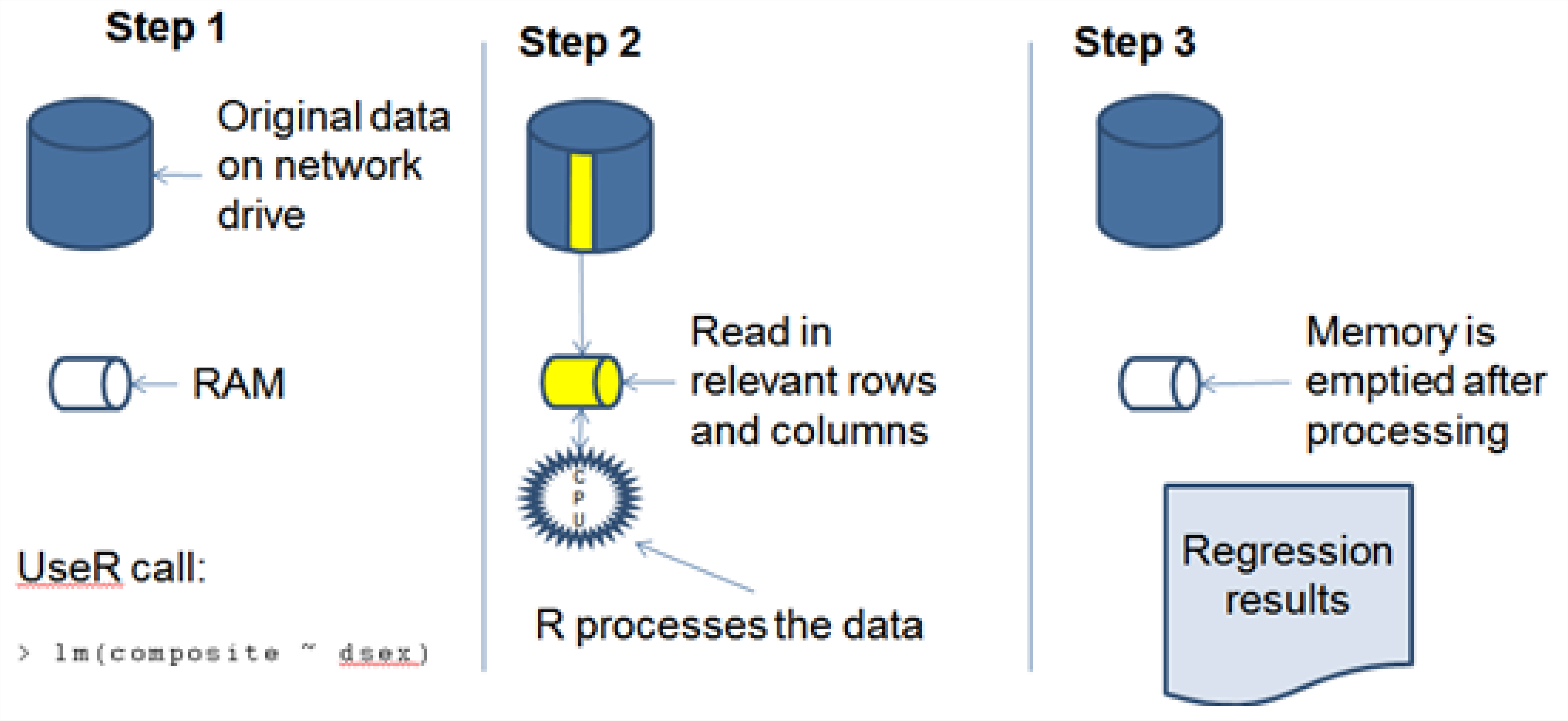
```
> sdf
edsurvey.data.frame with 17606 rows and 302 columns.

There are 1 full sample weight(s) in this edsurvey.data.frame
  'origwt' with 62 JK replicate weights (the default).

There are 6 subject scale(s) or subscale(s) in this edsurvey.data.frame
  'num_oper' subject scale or subscale with 5 plausible values.
  'measurement' subject scale or subscale with 5 plausible values.
  'geometry' subject scale or subscale with 5 plausible values.
  'data_anal_prob' subject scale or subscale with 5 plausible values.
  'algebra' subject scale or subscale with 5 plausible values.
  'composite' subject scale or subscale with 5 plausible values (the default).

Omitted Levels: 'Multiple', 'NA', 'Omitted'

Default Conditions:
  tolower(rptsamp) == "reporting sample"

Achievement Levels:
  Basic:      262
  Proficient: 299
  Advanced:   333

Survey: NAEP
```

Data Manipulation

NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

EdSurvey Calls Network Connection

Small Memory Footprint


Step 1
Original data on network drive
RAM
UseR call:
Step 2
Read in relevant rows and columns
C P U
R processes the data
Step 3
Memory is emptied after processing
Regression results

```
> lm(composite ~ dsex)
```

Data Manipulation - getData

`getData()`: reads in selected variables and sampling weights from the EdSurvey database and returns a `light.EdSurvey.data.frame` (a data frame like object) into the Global environment.

Functionality

- Retrieve variables by call.
- Manipulate the resulting `light.EdSurvey.data.frame`:
  - Subset.
  - Recode.
  - Drop levels.
- Use `EdSurvey` package functions on `light.EdSurvey.data.frames`.
- Related Documentation - getData.pdf, Chap 9, EdSurvey Book

Data Manipulation - getData

`getData()`

```
gddat <- getData(sdf, varnames = c('dsex', 'sdracem', 'b018201', 'b017451',
                                   'composite', 'geometry', 'origwt'),
              addAttributes = TRUE, omittedLevels = FALSE)
```

NAEP mathematics composite scale scores of 8th grade students

- A vector of variable names, including `dsex` (Gender), `sdracem` (Race/ethnicity), `b018201` (Language other than English spoken in home) and `b017451` (Frequency of talk about studies at home)
- Overall math performance across subscales (`composite`) and five others associated with `geometry`
- The sampling weight for this dataframe: `origwt`

Data Manipulation - getData

Output:

```
# Note: head returns the first 6 rows of a data frame
head(gddat)
```

```
##     dsex sdracem         b018201              b017451 mrpcm1 mrpcm2 mrpcm3 mrpcm4 mrpcm5 mrps31 mrps32 mrps33 mrps34 mrps35
## 1   Male   White           Never            Every day 318.01 303.68 296.61 328.97 315.70 294.79 286.84 264.39 311.77 304.62
## 2 Female   White           Never    About once a week 288.43 283.93 280.45 290.03 286.23 277.26 266.43 261.98 286.23 264.76
## 3 Female   White           Never            Every day 342.72 338.03 329.48 352.46 342.26 354.18 320.11 331.88 354.47 365.00
## 4   Male   White           Never            Every day 348.76 321.79 327.87 333.35 327.32 326.91 302.79 321.28 333.43 318.45
## 6 Female   White Once in a while Once every few weeks 278.44 245.08 263.00 277.50 285.04 263.22 232.62 260.05 280.10 278.96
## 7   Male   White Once in a while  2 or 3 times a week 327.95 338.59 328.07 334.07 320.02 309.38 317.19 328.37 331.75 309.70
##   srwt01 srwt02 srwt03 srwt04 srwt05 srwt06 srwt07 srwt08 srwt09 srwt10 srwt11 srwt12 srwt13 srwt14 srwt15 srwt16 srwt17 srwt18
## 1 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004
## 2 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004
## 3 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004
## 4 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004
## 6 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004
## 7 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004
##   srwt19 srwt20 srwt21 srwt22 srwt23 srwt24 srwt25 srwt26 srwt27 srwt28 srwt29 srwt30 srwt31 srwt32 srwt33 srwt34 srwt35 srwt36
## 1 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 2.2008 1.1004 1.1004 1.1004 1.1004
## 2 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 2.2008 1.1004 1.1004 1.1004 1.1004
## 3 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 2.2008 1.1004 1.1004 1.1004 1.1004
## 4 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 1.1004 2.2008 1.1004 1.1004 1.1004 1.1004
```

Data Manipulation - getData

`getData()`

```r
gddat <- getData(sdf, varnames = c('dsex', 'sdracem', 'b018201', 'b017451',
                                   'composite', 'geometry', 'origwt'),
              addAttributes = TRUE, omittedLevels = FALSE)
```

- A few important things to note:
  - "`addAttributes = TRUE`" allows the data.frame to be passed to `EdSurvey` package functions
  - all of the jackknife replicates are automatically returned (`srwt01` to `srwt62`)
  - "`omittedLevels = FALSE`" returns variables with special values (such as multiple entries or NA's) and manipulated by the user

Data Manipulation - subset

`subset()`: Returns only the data matching elements from a variable

- Subset the connection to the data for all analyses:

```
subsetSDF <- subset(sdf, dsex %in% c("Male"))
```

- As expected the `subsetSDF` contains about half of the rows as the original:

```
dim(sdf)
```

```
## [1] 17606   303
```

```
dim(subsetSDF)
```

```
## [1] 8905  303
```

Data Manipulation - recode.sdf

`recode.sdf()` is used to recode the levels of a variable

- collapse or rename values

```
sdf2 <- recode.sdf(sdf, recode =
                     list(b017451 = list(from = c("Never or hardly ever", '
                                         to = c("Infrequently")),
                          b017451 = list(from = c("Every day"),
                                        to = c("Frequently")))
                   )
searchSDF("b017451", sdf2, levels = TRUE)
```

```
## Variable: b017451
## Label: Talk about studies at home
## Levels (Lowest level first):
##      3. About once a week
##      4. 2 or 3 times a week
##      8. Omitted
##      0. Multiple
##      9. Infrequently
##      10. Frequently
```

Data Manipulation - rename.sdf

`rename.sdf()` is used to rename variables

```
sdf2 <- rename.sdf(sdf2, oldnames = "b017451",
                         newnames = "studytalkfrequency")
searchSDF("studytalkfrequency", sdf2, levels = TRUE)
```

```
## Variable: studytalkfrequency
## Label: Talk about studies at home
## Levels (Lowest level first):
##      3. About once a week
##      4. 2 or 3 times a week
##      8. Omitted
##      0. Multiple
##      9. Infrequently
##      10. Frequently
```