



## Intro to R and RStudio



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Materials: [https://github.com/jaclynjanis/nhanes\\_mph677](https://github.com/jaclynjanis/nhanes_mph677)

Slide credits: Thanks to Nick Rohrbaugh and Jeremy Allen for letting me borrow a lot of material!

# Agenda

Disclaimer: you won't leave here today  
an expert R programmer. But you'll have  
an idea of where to start.

- A little about me
- What is R? What is RStudio?
- What you can do with R
- A tour of RStudio
- Replicate Kate's NHANES linear regression in R
- Your next steps

Hey.



# What is R?

# R

- An open-source statistical programming language that's growing rapidly!
  - **open-source:** free to use, change, distribute
  - **statistical:** born out of S, built by statisticians at Bell Labs in 1970s
  - **programming language:** requires writing code
- Maintained by R Development Core Team, supported by R Foundation, R Consortium, and tens of thousands of contributors
- To download R, go to <https://cloud.r-project.org> and then click on the link for either Mac, Windows, or Linux depending on your computer

# What is RStudio?

# RStudio

- An open-source **integrated development environment (IDE)** for writing R (and other) code
- A private company and public benefit corporation devoted to building tools for data science
- Many flavors: RStudio Desktop (Pro), RStudio Workbench, RStudio Connect, RStudio Cloud, and RStudio Package Manager
- To install RStudio, go to <http://www.rstudio.com/download>



## Public Benefit Corporation

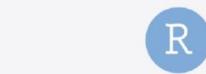
Open source mission codified into our charter

Corporate decisions must balance the best interests of community, customers, employees, and shareholders

J.J. Allaire CEO, RStudio [rstudio.com/pbc-keynote](https://rstudio.com/pbc-keynote)

Details of Certified B Corporation assessment at <https://bcorporation.net/directory/rstudio>

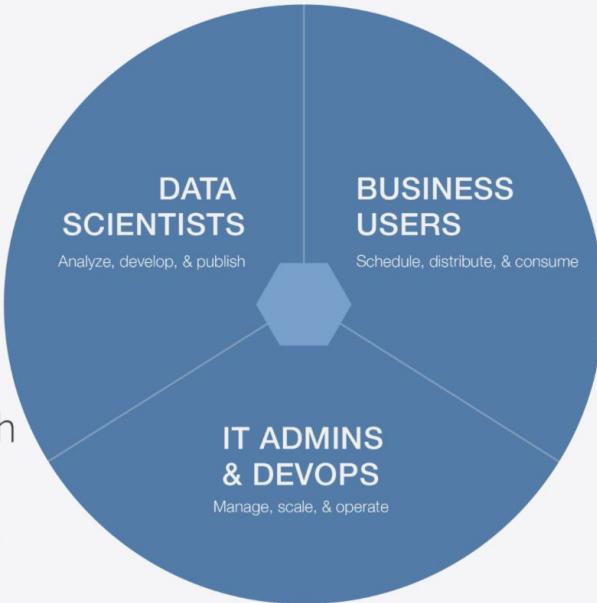




## RStudio Workbench

### ANALYZE DATA

Data Scientists use RStudio Workbench to analyze data and create data products using R and Python



## RStudio Package Manager

### MANAGE PACKAGES

IT Administrators use RStudio Package Manager to control and manage R and Python packages that Data Scientists need to create and share data products.



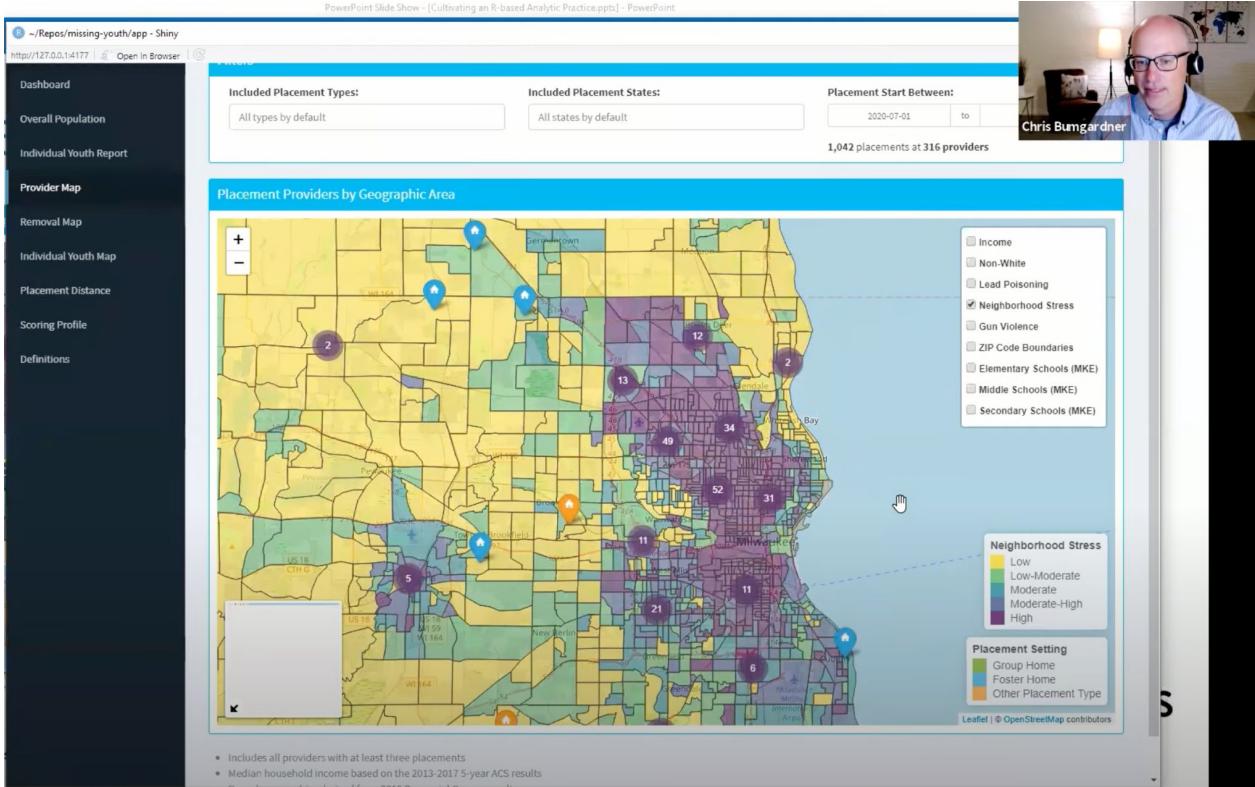
## RStudio Connect

### PUBLISH RESULTS

Business Users and Collaborators use R and Python data products on RStudio Connect that are published by Data Scientists

# What can you do with R?

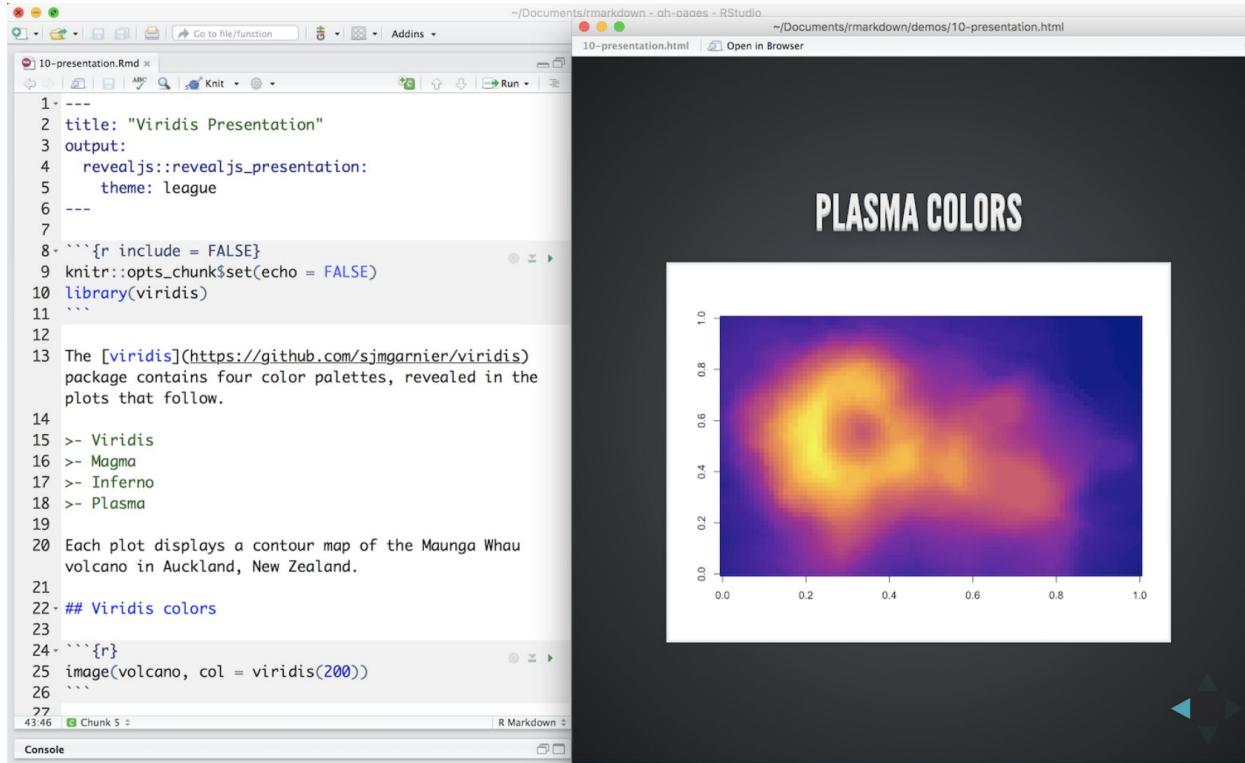
# Create impactful dashboards



At Children's Wisconsin, Chris Bumgardner and his team developed a shiny dashboard to track missing youth.

[See the talk from our community meetup](#)

# Generate slides

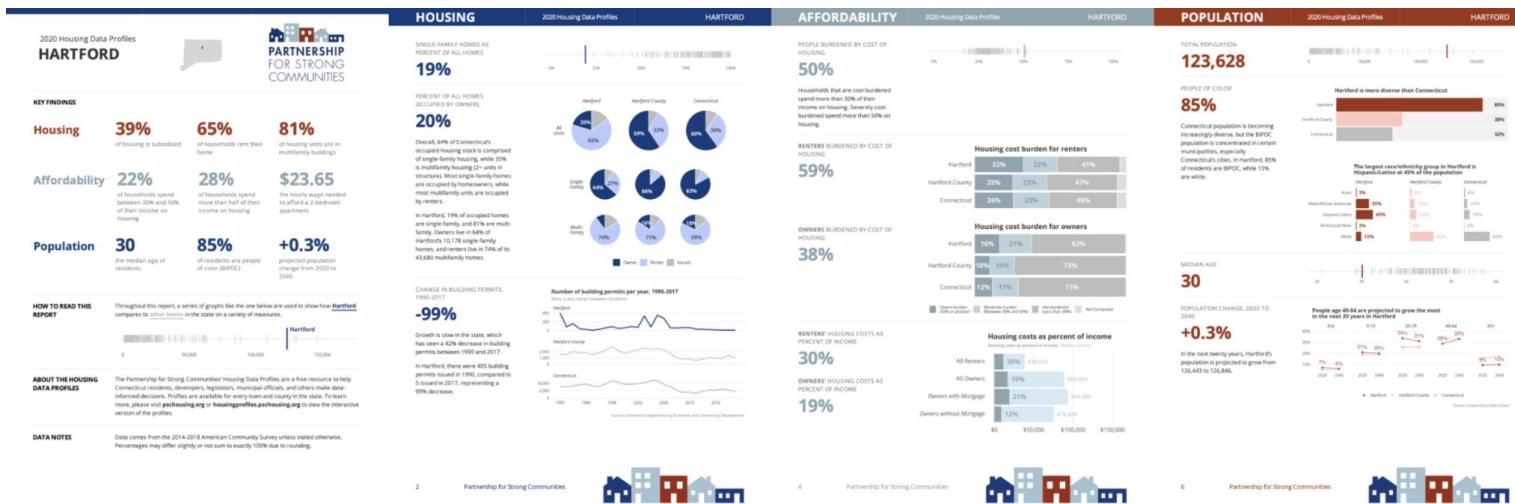


The image shows a screenshot of the RStudio interface. On the left, the R Markdown file "10-presentation.Rmd" is open, displaying R code. The code includes a YAML front matter section defining a title ("Viridis Presentation"), output type ("revealjs::revealjs\_presentation"), theme ("league"), and other options like knitr chunk settings and the viridis package. It also describes the viridis package and its color palettes (Viridis, Magma, Inferno, Plasma). A note mentions a contour map of Maunga Whau volcano. The code concludes with a plot command using the viridis palette. On the right, the generated presentation slide is displayed. The slide has a dark background with the title "PLASMA COLORS" in large white capital letters. Below the title is a heatmap plot with a plasma color gradient, showing a central bright yellow/orange area surrounded by red/purple, set against a dark blue/purple background. The plot axes range from 0.0 to 1.0.

```
1 ---  
2 title: "Viridis Presentation"  
3 output:  
4   revealjs::revealjs_presentation:  
5     theme: league  
6 ---  
7  
8 ````{r include = FALSE}  
9 knitr::opts_chunk$set(echo = FALSE)  
10 library(viridis)  
11 ````  
12  
13 The [viridis](https://github.com/sjmgarnier/viridis)  
package contains four color palettes, revealed in the  
plots that follow.  
14  
15 >- Viridis  
16 >- Magma  
17 >- Inferno  
18 >- Plasma  
19  
20 Each plot displays a contour map of the Maunga Whau  
volcano in Auckland, New Zealand.  
21  
22 ## Viridis colors  
23  
24 ````{r}  
25 image(volcano, col = viridis(200))  
26 ````  
27
```

But not these, sorry... 😊

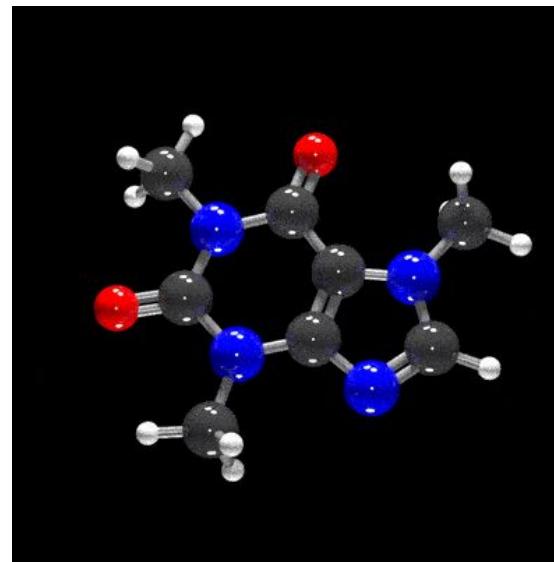
Create reports. Lots of them.



## Explore on R for the Rest of US

## The reports

# Rendering in 3D

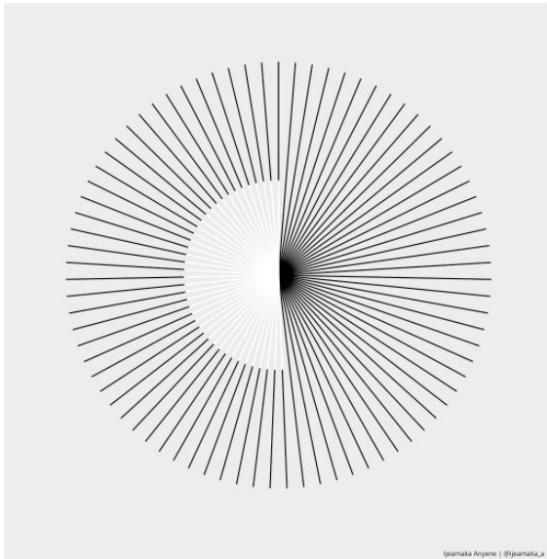


`raymolecule` is an R package to parse and render molecules in 3D. Rendering is powered by two packages: `rayrender` package, a pathtracer for R, and `rayvertex`, a rasterizer for R

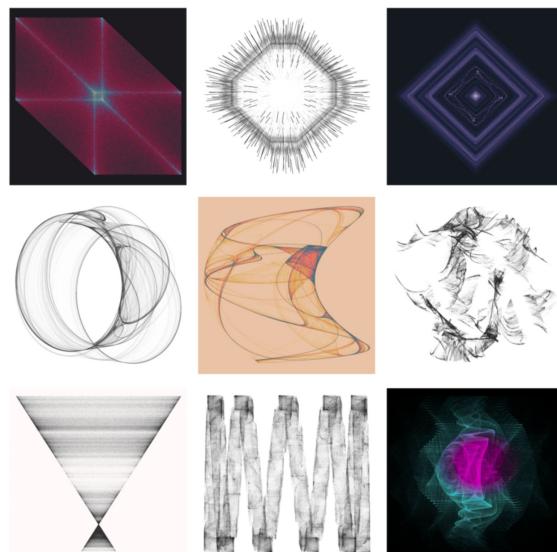
[More 3D rendering by  
Tyler Mogan-Wall](#)

# Art (aRt)

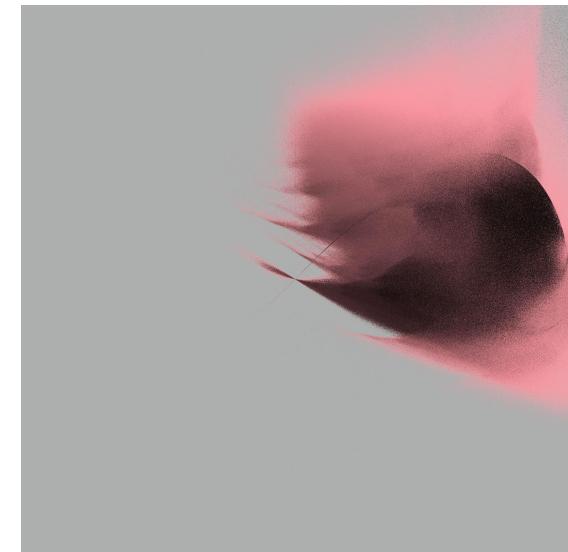
Ijeamaka Anyene



Will Chase



Danielle Navarro



# Books

[bookdown.org](https://bookdown.org)

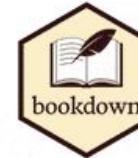
## BOOKDOWN

### Write HTML, PDF, eBook, and Kindle books with R Markdown

The bookdown package is an [open-source R package](#) that facilitates writing books and long-form articles/reports with R Markdown. Features include:

- Generate printer-ready books and eBooks from R Markdown documents.
- A markup language easier to learn than LaTeX, and to write elements such as section headers, lists, quotes, figures, tables, and citations.
- Multiple choices of output formats: PDF, LaTeX, HTML, EPUB, and Word.
- Possibility of including dynamic graphics and interactive applications (HTML widgets and Shiny apps).
- Support a wide range of languages: R, C/C++, Python, Fortran, Julia, Shell scripts, and SQL, etc.
- LaTeX equations, theorems, and proofs work for all output formats.
- Can be published to GitHub, bookdown.org, and any web servers.
- Integrated with the RStudio IDE.
- One-click publishing to <https://bookdown.org>.

Below is a list of featured books. For a full list, please see the [archive](#) page. For the full documentation of the `bookdown` package, please see the free [online book](#) `bookdown: Authoring Books and Technical Documents with R Markdown`.



### Geocomputation with R

by Robin Lovelace, Jakub Nowosad, Jannes Muenchow

2021-09-22

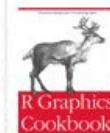


Welcome! Geocomputation with R is for people who want to analyze, visualize and model geographic data with open source software. It is based on R, a statistical programming language that has powerful data processing, visualization, and geospatial capabilities. The book equips you with the knowledge and skills to tackle a wide range of issues manifested in geographic data, including those with scientific, societal, and environmental implications. This book will interest people from many backgrounds, especially Geographic Information Systems (GIS) users interested in applying their domain-specific knowledge in a powerful open source language for data science, and R users interested in extending their skills to handle spatial data. [Read more →](#)

### R Graphics Cookbook, 2nd edition

by Winston Chang

2021-09-22



This cookbook contains more than 150 recipes to help scientists, engineers, programmers, and data analysts generate high-quality graphs quickly—without having to comb through all the details of R's graphing systems. Each recipe tackles a specific problem with a solution you can apply to your own project and includes a discussion of how and why the recipe works. [...] Welcome to the R Graphics Cookbook, a practical guide that provides more than 150 recipes to help you generate high-quality graphs quickly, without having to comb through all the details of R's graphing systems. Each recipe ... [Read more →](#)

### bookdown: Creating Websites with R Markdown

by Yihui Xie, Amber Thomas, Alison Presmanes Hill

2021-09-17



A guide to creating websites with R Markdown and the R package bookdown. [...] A note from the authors: Some of the information and instructions in this book are now out of date

### Statistical Inference via Data Science

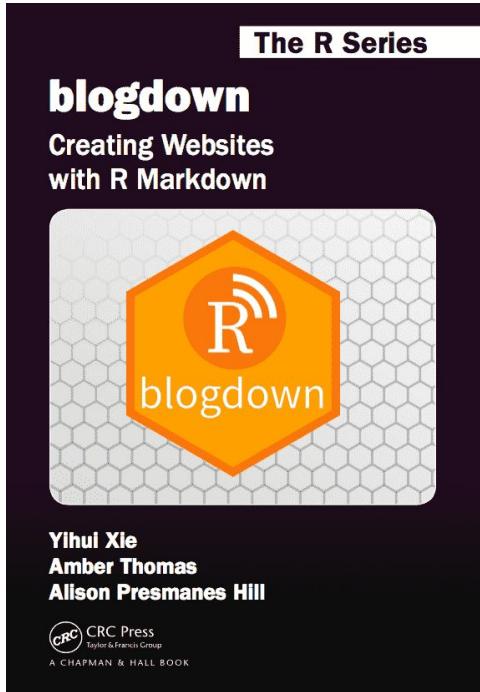
by Chester Ismay and Albert Y. Kim

2021-09-16



An open-source and fully-reproducible electronic textbook for teaching statistical inference using tidyverse data science tools. [...] This is the website for Statistical Inference via Data Science: A ModernDive into R and the

# Websites



[blogdown, also at  
bookdown.org](https://bookdown.org/yihui/blogdown/)

The image is a screenshot of the Distill website. At the top, there is a dark header bar with the 'Distill' logo and navigation links for 'ABOUT', 'PRIZE', and 'SUBMIT'. The main title 'Communicating with Interactive Articles' is displayed prominently in large, bold, black font. Below the title, a subtitle reads: 'Examining the design of interactive articles by synthesizing theory from disciplines such as education, journalism, and visualization.' A large grid of thumbnail images representing various interactive articles is shown, covering topics like data visualization, education, and journalism. At the bottom, there is a caption: 'FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.'

[the distill  
package](#)



And of course...

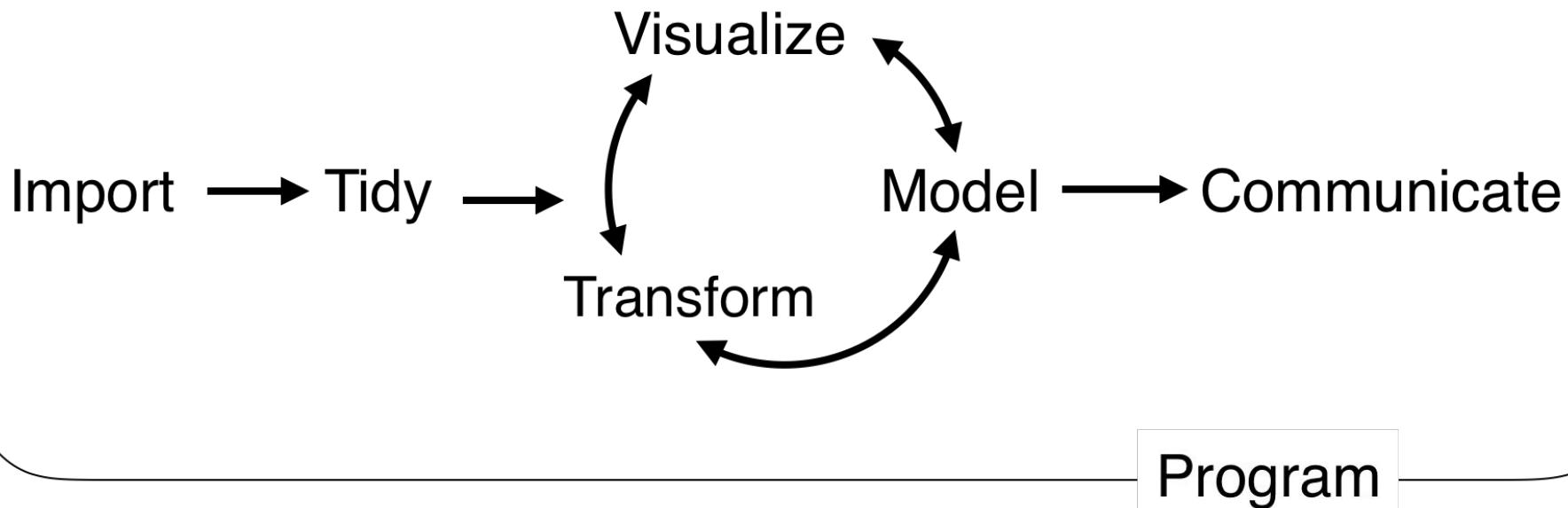
The incredibly important scientific research  
happening at governmental organizations,  
phasmas, life sciences companies, healthcare  
organizations, and public health institutions  
around the world.

# What are R packages?

# R packages

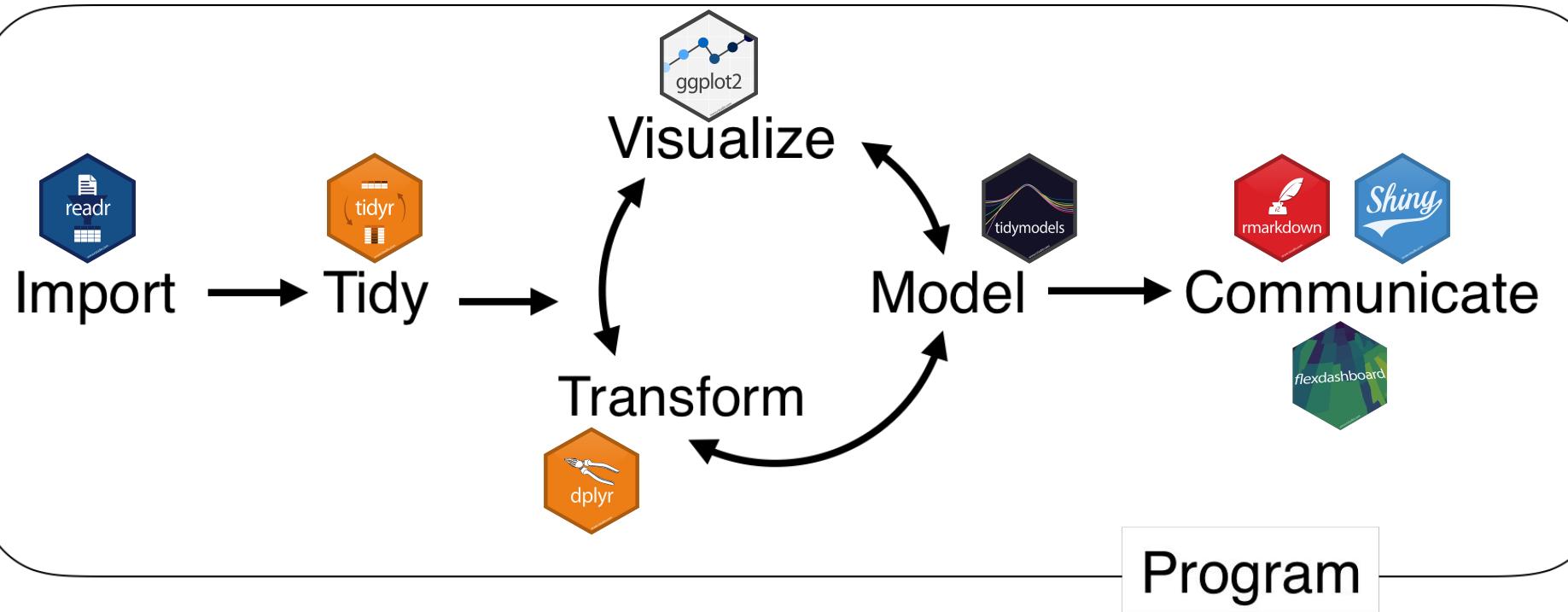
- The R language consists of “base R” and additional packages
- When writing code, we call functions, which are like recipes for the computer to accomplish a task
- R packages add functions to let us do even more with our data
- Tens of thousands of packages exist on [CRAN](#), the largest public *repository* of packages

# How we think about data science...

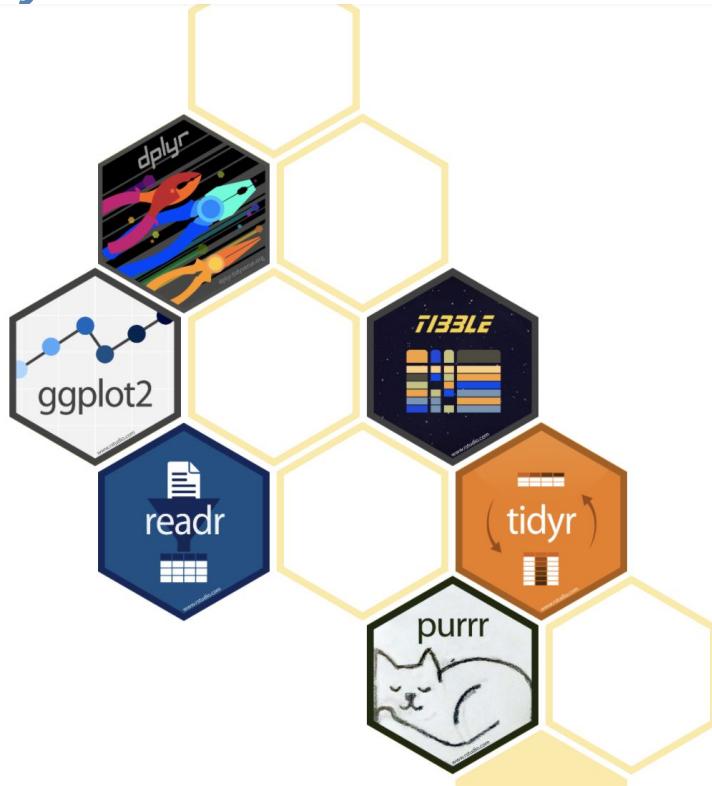


<https://r4ds.had.co.nz/>

# How we think about data science...



# Tidyverse



R packages for data science

The tidyverse is an opinionated **collection of R packages** designed for data science. All packages share an underlying design philosophy, grammar, and data structures.

Install the complete tidyverse with:

```
install.packages("tidyverse")
```

Let's take a tour of the IDE...

# Learn more!

## RStudio's Education site



## R for Data Science Book

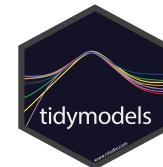
A screenshot of the 'R Studio Primmers' website. The page has a blue header with the text 'R Studio Primmers' and 'Learn data science basics with the interactive tutorials below.' Below the header, there are several sections with icons and descriptions:

- The Basics**: Shows three numbered circles (1, 2, 3) and a grid icon. Description: 'Start here to learn the skills that you will rely on in every analysis (and every primer that follows). Learn how to extract values from a table, calculate summary statistics, and transform your data, as well as how to run code.'
- Work with Data**: Shows a 2x2 grid icon with numbers 1, 2, 3, 4. Description: 'Learn the most important data handling skills in R: how to extract values from a table, calculate summary statistics, and derive new variables.'
- Visualize Data**: Shows a triangle of dots icon. Description: 'Learn how to use `ggplot2` to make the best of plots with your data. Then learn the best ways to visualize data: how to choose values and relationships between variables.'
- Tidy Your Data**: Shows a circle of dots icon. Description: 'Unlock the `tidyverse` by learning how to make and use tidy data, the data format designed for it.'
- Iterate**: Shows a potted plant icon. Description: 'Master a core programming paradigm with the `purrr` package for each ... do ...'
- Write Functions**: Shows a robot icon. Description: 'Functions are the key to programming in R. This primer will teach you how to write and use your own reusable functions.'
- Report Reproducibly**: Shows a row of bunnies icon. Description: 'Learn to report, reproduce, and parameterize your work with the best authoring format for Data Science: R Markdown.'
- Build Interactive Web Apps**: Shows a hand icon pointing at a screen. Description: 'Say hello to Shiny, R's toolkit for building interactive web apps. Learn to turn your analyses into elegant tools to share with others.'

## RStudio Cloud tutorials



## Get Started with R markdown



## Learn Tidymodels



## Shiny Tutorials



## Using Flexdashboard



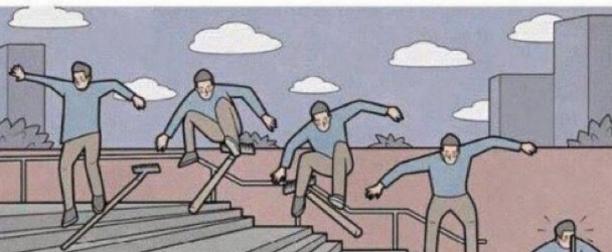


# RStudio Community

All things RStudio

[RStudio Community](#)

# FIRST TIME USING R



AFTER YEARS OF  
EXPERIENCE WITH R

imgflip.com

Code and slides: [https://github.com/jaclynjanis/nhanes\\_mph677](https://github.com/jaclynjanis/nhanes_mph677)



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Thank you