R FOR LUNCH

Import data and install RStudio / Tidyverse

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TODAY'S TOPICS

- How to import data
- Tour of RStudio IDE
- Coding notebooks

Preceded by where to download RStudio and R

HOUSEKEEPING

- Drew / Lauren / breakout rooms
- CDVS
  - Themes
    - Data Management (Plans, Reproducibility, Repositories)
    - Data Science
    - Data Visualization
    - GIS and Spatial Analysis
    - Data Sources

HOUSEKEEPING CONTINUED

- Website - https://library.duke.edu/data
- Workshops
  - https://library.duke.edu/data/workshops
- Consulting in the Lab
  - askData@duke.edu
  - my schedule: https://is.gd/littleconsult

R FOR LUNCH AS A SERIES

R for Lunch is a series that meets 8 times (till EOM Oct.)
After today it will meet regularly on Thursdays at noon.

- Sign-up for each workshop individually
- Each episode has a unique zoom link

EAT YOUR OWN DOG FOOD

Model how R can work for practical reproducible workflows

- Code in RStudio
- One kind of report is these slides (Quarto Presentation slidedeck - hosted)
- Another report is the *Introduction to R/Tidyverse/Quarto* text.

DEFINITIONS

R/TIDYVERSE/QUARTO

R/Tidyverse/Quarto represents the state of the art for practical reproducibility

R & RSTUDIO

R is a data-first programming language

RStudio is an IDE

REPRODUCIBILITY

- Independently and transparently achieve reliable results with the same data and the same workflow
  - Transparency with reproducible workflows
- Best workflow and ecosystem to achieve reproducible work is to "*do everything with code*"
  - Import data, analyze, visualize, and publish/share

TIDYVERSE

- An opinionated set of packages for data manipulation and analysis
- A meta-package of eight symbiotic packages

PACKAGES

- Extend R into your subject domain
- And/or make it easier to accomplish a computational task
- There are thousands
  - MetaCRAN, CRAN, BioConductor, GitHub

QUARTO

works with R and Python

- A scientific publishing system (workflow)
  - dashboards, manuscripts, MSWord, slides, website, e-book, PDF
- **Coding Notebooks**: Code chunks interspersed with explanatory text (Natural language)
  - Render reproducible, shareable reports
- A next-gen (or modern) Markdown

QUARTO NOTEBOOK

````
---
title: "ggplot2 demo"
author: "Norah Jones"
date: "5/22/2021"
format:
  html:
    fig-width: 8
    fig-height: 4
    code-fold: true
---

## Air Quality

@fig-airquality further explores the impact of temperature on
ozone level.

```{r}
#| label: fig-airquality
#| fig-cap: "Temperature and ozone level."
#| warning: false

library(ggplot2)
ggplot(airquality, aes(Temp, Ozone)) +
  geom_point() +
  geom_smooth(method = "loess")
```
````

ggplot2 demo

Norah Jones

May 22nd, 2021

Air Quality

Figure 1 further explores the impact of temperature on ozone level.

▶ Code

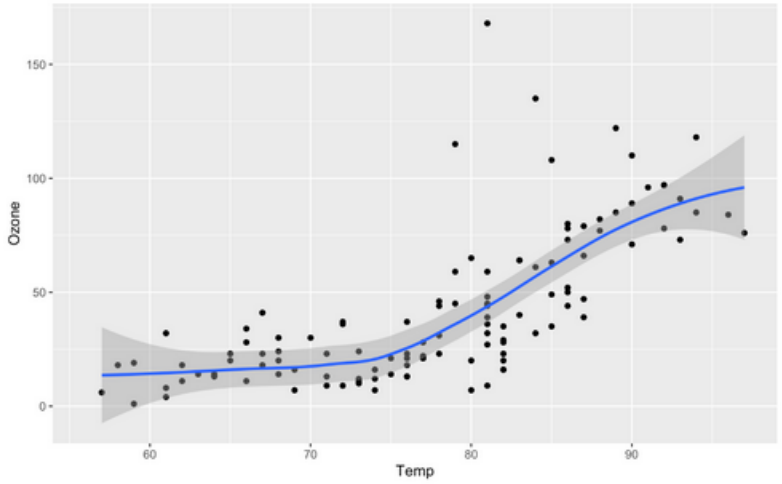

Figure 1: Temperature and ozone level.

A side-by-side view of a Quarto editor and rendered report expression

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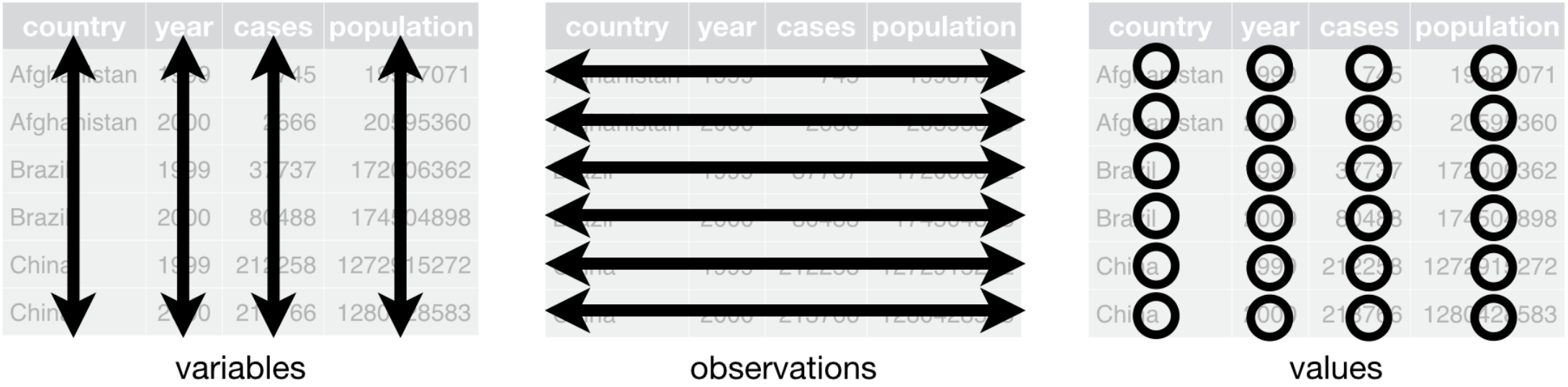
OPINIONATED

> Tidyverse and Quarto is the most practical and developed, reproducible, scientific analysis and publishing workflow available.

TIDY DATA

TIDY DATA[1]



1. A robust discussion of *tidy data* can be found in *R for Data Science* (Wickham, Cetinkaya-Rundel, and Grolemund 2023): *https://r4ds.had.co.nz/tidy-data.html*

TIDY DATA

- Every row is a single observation
- Every column is a variable
- The cells are single data values

WIDE DATA

- Code

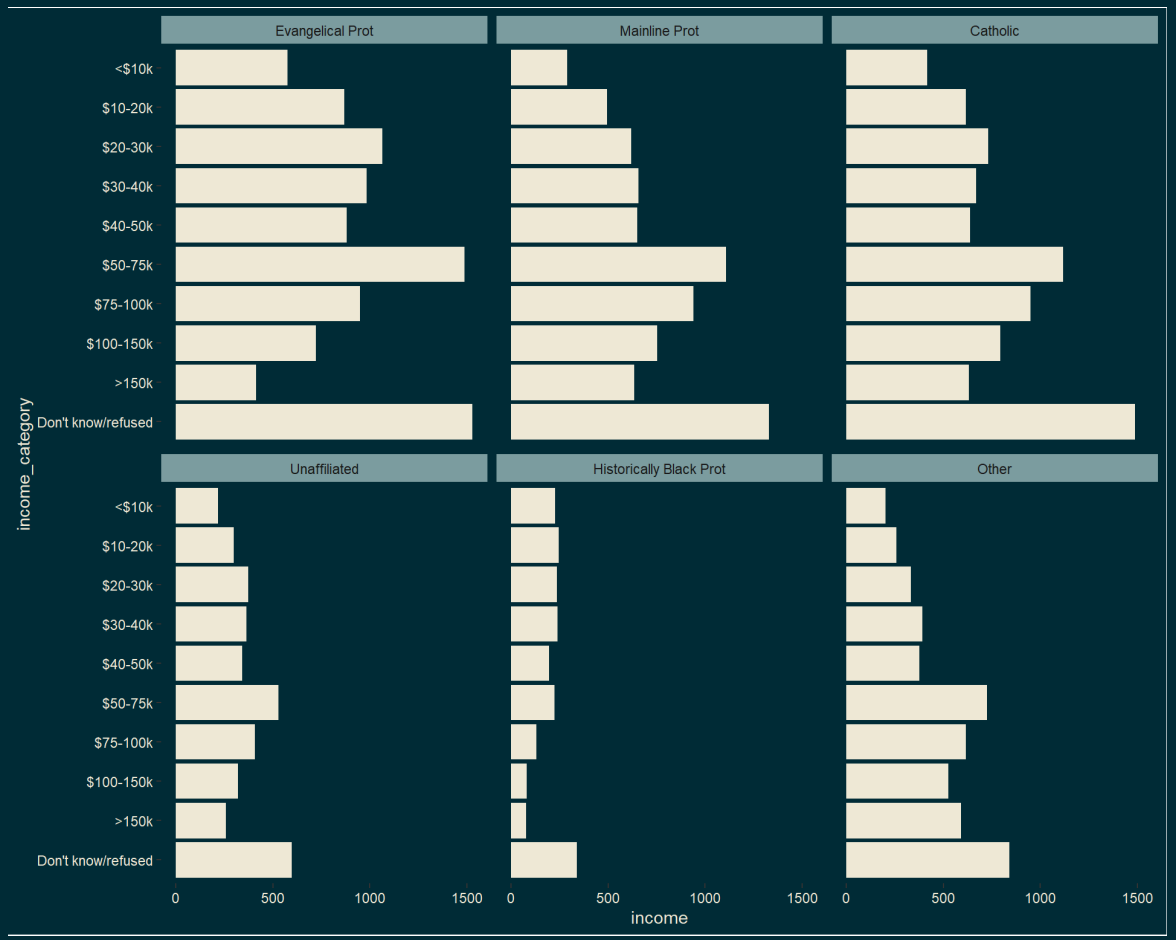
	RELIGION	<$10K	$10-20K	$20-30K	$30-40K	$40-50K	$50-75K	$75-100K	$100-150K	>150K	DON'T KNOW/REFUSED
1	Agnostic	27	34	60	81	76	137	122	109	84	96
2	Atheist	12	27	37	52	35	70	73	59	74	76
3	Buddhist	27	21	30	34	33	58	62	39	53	54
4	Catholic	418	617	732	670	638	1116	949	792	633	1489
5	Don’t know/refused	15	14	15	11	10	35	21	17	18	116
6..17											
18	Unaffiliated	217	299	374	365	341	528	407	321	258	597

TALL DATA

▶ Code

	RELIGION	INCOME_CATEGORY	INCOME
1	Agnostic	<$10k	27
2	Agnostic	$10-20k	34
3	Agnostic	$20-30k	60
4	Agnostic	$30-40k	81
5	Agnostic	$40-50k	76
6..179			
180	Unaffiliated	Don't know/refused	597

▶ Code



CODE

```
relig_income |>
  pivot_longer(cols = -religion, names_to = "income_category") |>
  ggplot(aes(value, income_category)) +
  geom_col() +
  facet_wrap(vars(religion))
```

Image Credit: apreshill | CC BY 4.0 | https://github.com/apreshill/teachthat/blob/master/pivot/pivot_longer_smaller.gif]

POLLS

GRAMMAR (DATA AND GRAPHICS)

By next week you'll have the basic building blocks to

- Leverage reproducible data workflows: import data, analyze data, and generate visualizations.

Along the way

- Rendering reproducible reports (Quarto)
- Practical techniques
- Pro-tips that comprise a fluency of reproducible data analysis

WE ARE HERE TO HELP

- askData@duke.edu
- https://library.duke.edu/data
- https://is.gd/littleconsult

LET'S DO IT

THREE THINGS FOR TODAY

- Tour of the RStudio IDE (Projects)
- How to import data
- Coding notebooks

EXERCISES

1. https://intro2r.library.duke.edu/ > Exercises > Link out > Green **Code** button > Download ZIP
2. Then, Unzip (i.e. Expand) the folder (on your local file system)
3. Then, double click the `rforlunch_exercises.Rproj` file
4. From **RStudio** the Files tab, open the `00_import_answers.qmd`
    - The answer file is in the **RStudio** `rforlunch_exercises` project > `Files Tab > Answers folder`

CLOSING

PIPES AND ASSIGNMENTS

Operator	Operator Name	Keystore	Pnuemonic
<-	assignment	Alt-dash	“Gets value from”
|> or %>%	pipe	Ctrl-Shift-M	“And then”

CITATION MANAGEMENT

RStudio > Quarto Notebook > Insert > Citation

Example DOI: 10.18637/jss.v059.i10

AI-PAIRED CODING

- Data science concepts: **Microsoft copilot** (“More precise” setting)
- Code completion: **GitHub copilot** and RStudio (IDE) or VSCode (IDE)

BYE FOR NOW

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- https://is.gd/littleconsult
- https://library.duke.edu/data