Putting the *R* in Institutional *Research*

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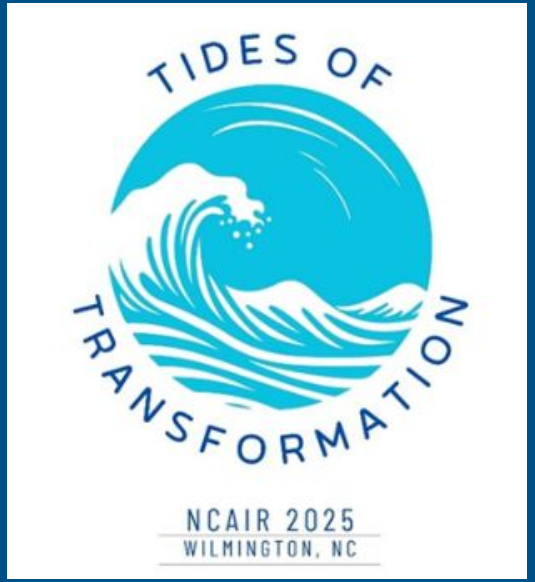


Two IR Departments, One Common Tool

Private Institution

Students: 2,000

IR Staff: 2 FTE

Primary Responsibilities: Compliance Reporting, Survey Research, Analytics

Public Institution

Students: 32,400

IR Staff: ~14 FTE

Primary Responsibilities: Accreditation, Analytics, Assessment, Survey Research, Reporting

Session Goals

- Attendees should be able to:
  - articulate the benefits of using R for Institutional Research work.
  - describe practical examples of how adopting R has improved upon legacy processes for reporting.
  - understand how R can be leveraged in different IR office settings (at both small and large institutions).

Benefits of Using R

- Open Source – Free with a large community
- Reproducibility – Readable syntax for consistent data management and reporting
- Flexibility – Ability to ingest, or export to, other data formats (e.g., SQL, Excel, SPSS)
- Complexity – Easily handle large datasets

Practical examples to demonstrate why we love using R in IR

Ex. 1: Census Reporting & Cohort Tracking

Ex. 2: Survey Codebooks & Reporting

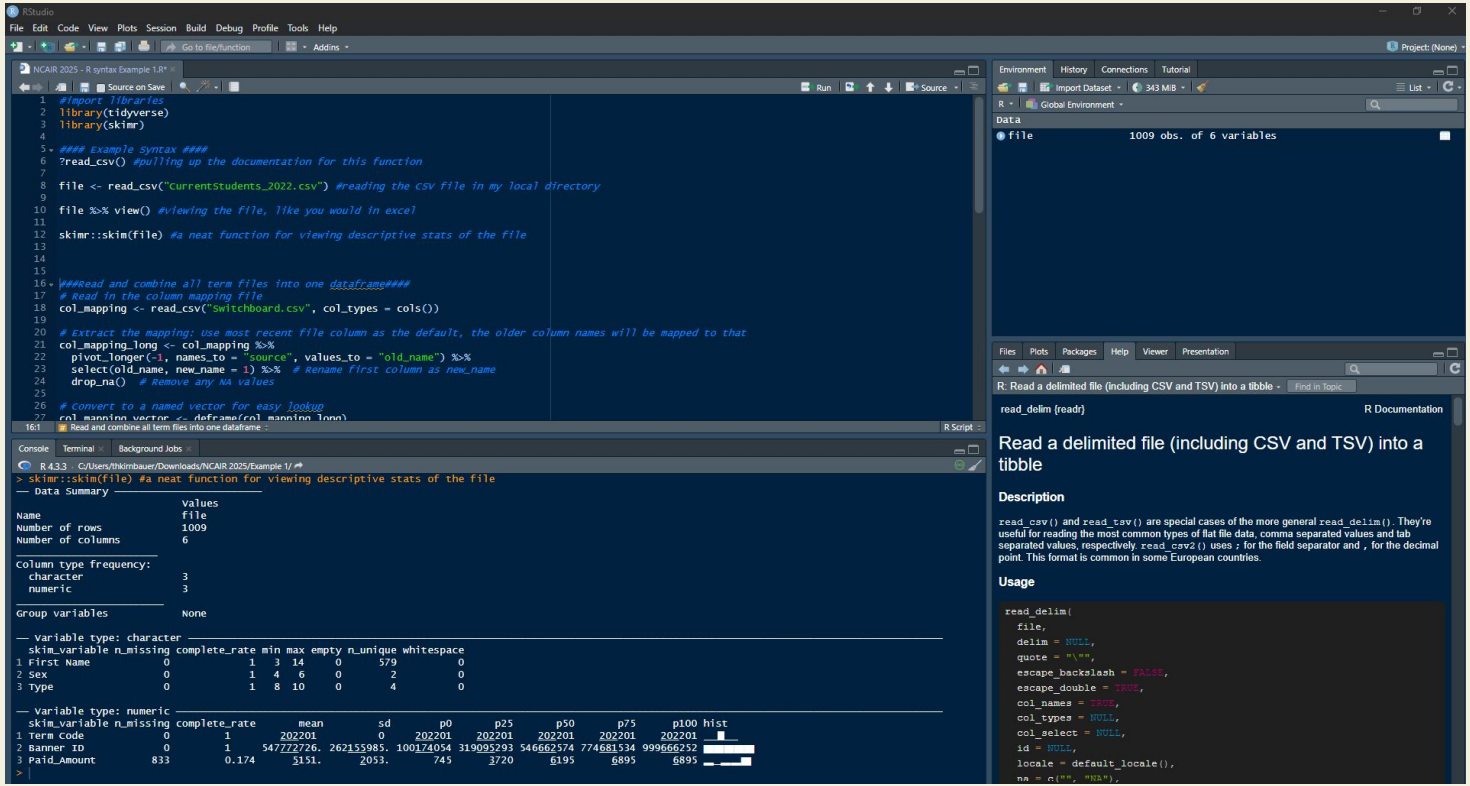
A brief look at R…

Syntax, Libraries, #Comments

Output (shown: SkimR)

View Data, Connections, Values, etc.

View R Docs, Files, Graphs



Note: We will not be showing R Syntax during the presentation, but it will be made available after the session

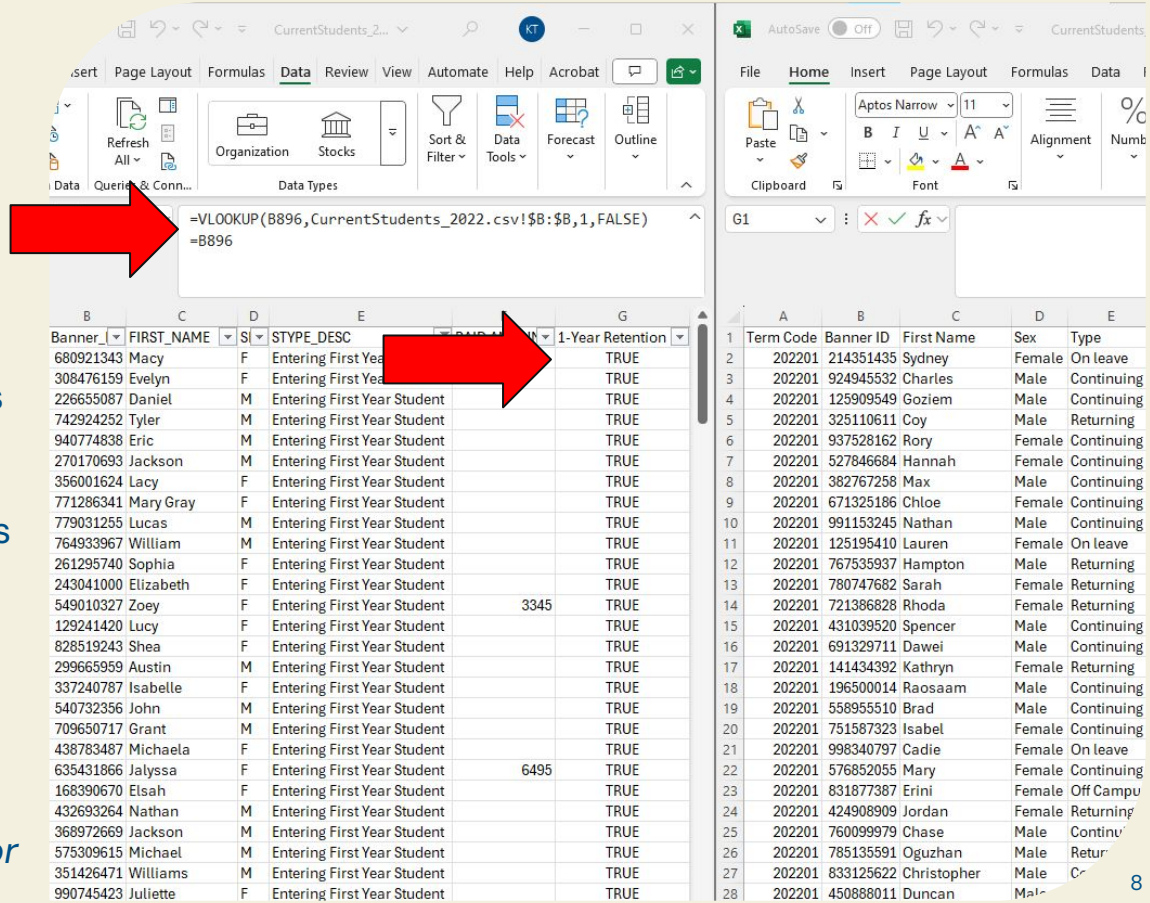
Example 1: *Census Enrollment & Cohort Tracking*

Ex 1: Legacy process for calculating retention/graduation

Legacy process relied heavily on VLOOKUPs. The process was…

- Inefficient/slow to do calculations
- No documentation - difficult to replicate with staff turnover
- Tedious to calculate values across cohorts (1-YR Retention, 4-YR Grad, 6-YR grad, etc.)
- Incompatible with BI Tools

Note: *Data included are "dummy data" to illustrate the analysis and insights for this conference session*



Ex 1: Modernizing the process

Goal: Create a systemized, efficient approach to calculate enrollment, retention and graduation rates, across multiple cohorts

Challenges with a *messy data* across 20+ term files:

- Different column names (ID vs Banner_ID)
- Different values (Female vs. F)
- Different formatting ($3,000 vs 3000.00)
- Different missing values (NA, “ ”, 0)

Table: Fall 2019

Column	*Example*
FILE_TERM	201901
ID	107XXXXXX
Sex	Female, Male
Paid	$6195.00, NA

Table: Fall 2020

Column	*Example*
Term	202001
ID	107XXXXXX
SEX	F, M
PAID AMT	$6,345, $0

Table: Fall 2021

Column	*Example*
Term_Code	202101
Banner_ID	107XXXXXX
SEX	F, M
PAID AMOUNT	6495, NA

Table: Fall 2022

Column	*Example*
Term Code	202201
Banner ID	107XXXXXX
Gender	F, M
PAID AMOUNT	6895, $0

Ex 1: Master Enrollment Table

Process includes:

- Ingesting data in bulk
- Dynamically renaming columns
- Bind Rows (i.e., Data Union)
- Data Cleaning on existing info
- Creating/Joining new data

Table: Fall 2019	Table: Fall 2020	Table: Fall 2021	Table: Fall 2022
FILE_TERM	Term	Term Code	Term Code
ID	ID	Banner_ID	Banner ID
Sex	SEX	SEX	Gender

Cohort Term	Student ID	Sex	Student Type	Paid Amount
2019	XXX102	Female	First-Year	$6,195
2020	XXX102	Female	Continuing	
2021	XXX107	Male	Transfer	$6,495

Ex 1: Cohort Tracking Output

Process Includes:

- Leveraging master enrollment file
- Dynamically calculating ret/grad rates
  - Lots of data joins!

Benefits:

- Reporting data across cohorts
- 0/1 values make it easy for calculating sums and averages
- Import into BI Tool (i.e., PowerBI)

Table: Fall 2019	Table: Fall 2020	Table: Fall 2021	Table: Fall 2022
FILE_TERM	Term	Term Code	Term Code
ID	ID	Banner_ID	Banner ID
S Type	S Type	STYPE_DESC	Type

Cohort Term	Student ID	Type	1-Yr Retention	2-Yr Retention
2019	XXX119	First-Year	1	0
2020	XXX120	First-Year	1	1
2021	XXX121	Transfer	1	0

Example 2: *Survey Codebooks & Reporting*

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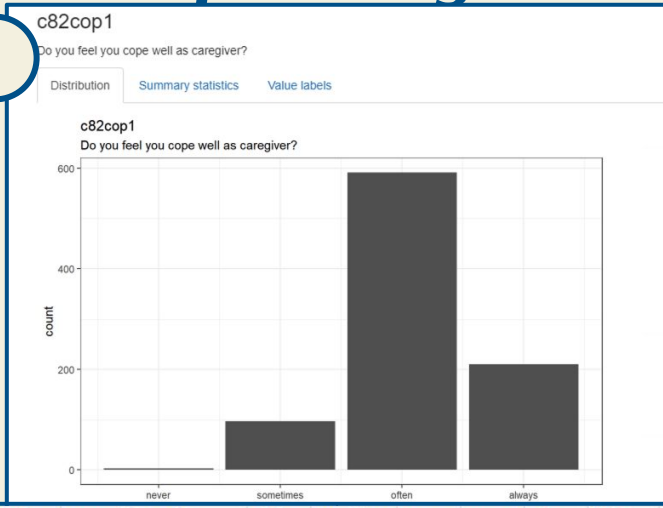
1. Generate graphs to see data across an entire dataframe
2. Create a codebook with variable, label, data type, value labels & descriptives into a concise format & export to excel, csv, etc.

1



Benefit: Consistent format allows combining codebooks to create a repository that can be built-out in Tableau

2

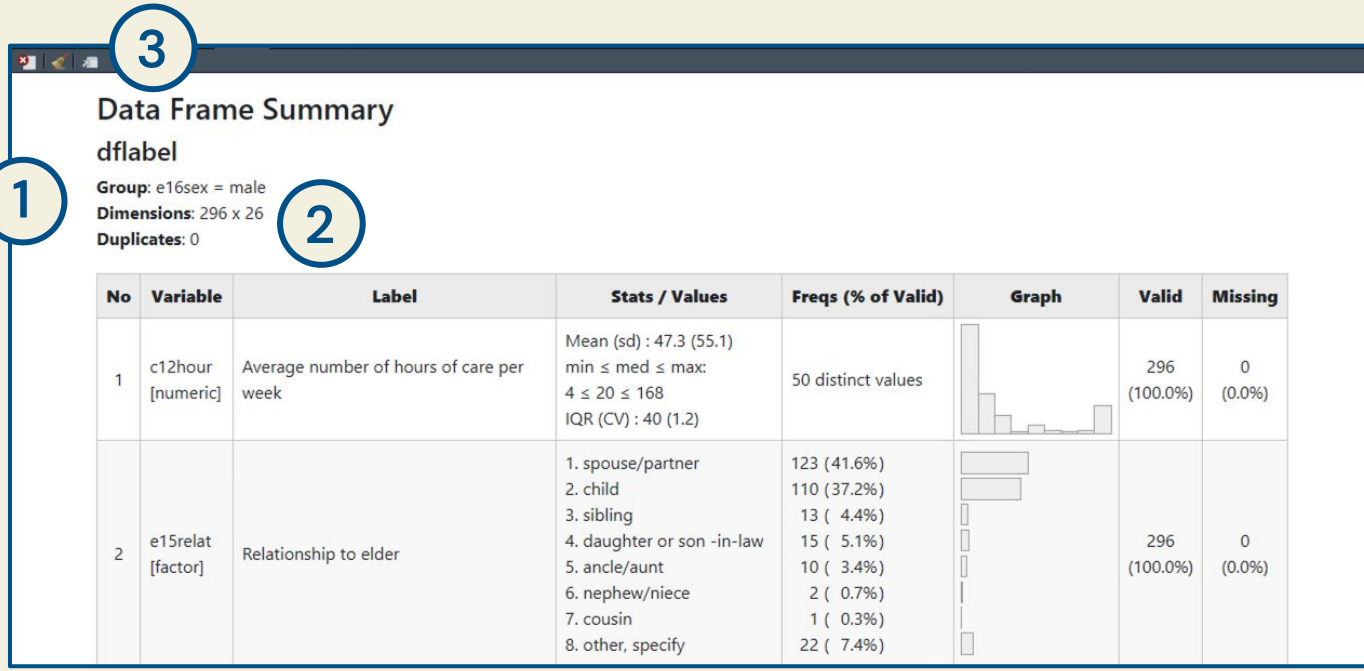
name	label	data_type	value_labels	n_missing	complete_rate	min	median	max	mean	sd	hist
c12hour	Average number of hours of care per week	numeric		6	0.99	4	20	168	42	51	
e15relat	Relationship to elder	numeric	1. spouse/partner,2. child,3. sibling,4. daughter or son -in-law	7	0.99	1	2	8	2.9	2.1	
e16sex	Elder's gender	numeric	1. male,2. female	7	0.99	1	2	2	1.7	0.47	
e17age	Elder' age	numeric		17	0.98	65	79	103	79	8.1	
e42dep	Elder's dependency	numeric	1. independent,2. slightly dependent,3. moderately depende	7	0.99	1	3	4	2.9	0.94	
c82cop1	Do you feel you cope well as caregiver?	numeric	1. never,2. sometimes,3. often,4. always	7	0.99	1	3	4	3.1	0.58	

sjlabelled tidyverse codebook 0.9.5

Example 2: *Survey Codebooks & Reporting*

1. Add grouping variables
2. Choose variables or the whole df
3. Exported to word, excel, pdf

Benefit: quick to see what's going on or little time for a task.



Data Frame Summary

dflabel

Group: e16sex = male
Dimensions: 296 x 26
Duplicates: 0

No	Variable	Label	Stats / Values	Freqs (% of Valid)	Graph	Valid	Missing
1	c12hour [numeric]	Average number of hours of care per week	Mean (sd) : 47.3 (55.1) min ≤ med ≤ max: 4 ≤ 20 ≤ 168 IQR (CV) : 40 (1.2)	50 distinct values		296 (100.0%)	0 (0.0%)
2	e15relat [factor]	Relationship to elder	1. spouse/partner 2. child 3. sibling 4. daughter or son -in-law 5. ancle/aunt 6. nephew/niece 7. cousin 8. other, specify	123 (41.6%) 110 (37.2%) 13 (4.4%) 15 (5.1%) 10 (3.4%) 2 (0.7%) 1 (0.3%) 22 (7.4%)		296 (100.0%)	0 (0.0%)

Example 2: *Survey Codebooks & Reporting*

1. Customize headers & footnotes
2. Two grouping variables
3. Descriptives & statistical analyses

Benefit: answers more specific client questions.

Table of Items by Sex & Education

Characteristic	Male				Female			
	low level of education N = 41[1]	intermediate level of education N = 113[1]	high level of education N = 47[1]	p-value[2]	low level of education N = 138[1]	intermediate level of education N = 393[1]	high level of education N = [illegible][1]	p-value[2]
Average number of hours of care per week	41 (44)	33 (47)	39 (55)	0.6	53 (55)	44 (53)	35 (42)	0.033
Do you find caregiving too demanding?				0.14				0.047
Never	13 (32%)	30 (27%)	9 (19%)		26 (19%)	73 (19%)	20 (18%)	
Sometimes	20 (49%)	70 (62%)	26 (55%)		81 (59%)	253 (64%)	61 (56%)	
Often	5 (12%)	12 (11%)	10 (21%)		19 (14%)	51 (13%)	25 (23%)	
Always	3 (7.3%)	1 (0.9%)	2 (4.3%)		12 (8.7%)	16 (4.1%)	3 (2.8%)	

[1] Mean (SD); n (%)

[2] One-way analysis of means; Pearson's Chi-squared test

-Data: sjlabelled::efc

-Missing data listwise removed

Perspectives on *R* Journey

Reflecting on our R Journey

- Increased efficiency in daily workflow. Working smarter, not harder!
- Improved collaboration with colleagues
- Building robust documentation for projects (Syntax & Codebooks)
- Potential for advanced statistical analysis to further our work
- Remembering Roche's Maxim: "Data should be transformed as far upstream as possible, and as far downstream as necessary."

Challenges

- Colleagues may not use R and institutions (or other departments) may prefer another tool or be tool agnostic

- Training staff on using R - There can be a steep initial learning curve coming from Excel or SPSS (point-and-click)

- Replacing legacy processes can be more tedious than anticipated. It's usually not ideal to replicate an old process.

Free Resources

- RforIR.com: IR-specific resources from colleagues at Furman University. *** Highly Recommended ***
- RStudio: Beginners resources
- R for Data Science: The seminal resource for learning R, written by the creator of R
- R for Excel Users: A useful aid for converting Excel users
- Data Transformation Cheat Sheet: Print it out & Hang it!

Questions?

- presentation, data, & code available on: github.com/kfassett/NCAIR_2025

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Bonus Slide – Conversation Prompts

1. Do you have any notable case examples of how you use R at your institution?
2. Do you have any concerns or barriers preventing you from using R at your institution?
3. How can institutional research pros advocate for improving data processes at your institution?

Bonus Slide - Our Favorite R functions!

- SkimR::skim() - Provides descriptives of all variables (missing, mean, std dev, quartiles, histogram)
- Janitor::clean_names() - Cleans column names
- Clipr::write_clip() - Copies your dataframe to your clipboard
- dbplyr::show_query() - Converts syntax into SQL query
- styler:style_file() - Cleans script to make code format consistent