Developing an R Shiny Interactive Dashboard to Increase Interpretability of Data: Medical Residency Statistics Over Time

R Medicine 2023
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Goals

- Showcase how R and Shiny can make data more intelligible
  - Identify limitations of large data tables and isolated figures as a means of sharing information
  - Briefly discuss Shiny
  - Demonstrate how it addresses said limitations
- Example
  - Residency data
  - Broadly applicable

Annual reports on residency data are useful but cumbersome

ACGME-Accredited Specialties	Description of Test or Experience	Number	Average	Standard Deviation	10th Percentile	25th Percentile	50th Percentile
Anesthesiology	COMLEX Level 1 Score	291	589.1	76.0	500.0	535.0	579.0
	COMLEX Level 2-CE Score	291	611.8	83.4	508.0	557.0	613.0
	USMLE STEP 1 Score	1,643	232.7	14.8	212.0	223.0	234.0
	USMLE STEP 2 CK Score	1,642	243.3	13.5	226.0	234.0	244.0
	Number of research experiences	1,653	2.7	2.1	0.0	1.0	2.0
	Number of abstracts, presentations, and publications	1,653	5.3	7.8	0.0	1.0	3.0
	Number of work experiences	1,653	3.4	2.4	1.0	2.0	3.0
	Number of volunteer experiences	1,653	6.6	3.8	2.0	4.0	6.0
Child Neurology	COMLEX Level 1 Score	10	555.1	78.3	445.1	497.0	576.0
	COMLEX Level 2-CE Score	10	585.2	73.3	517.0	536.0	586.0
	USMLE STEP 1 Score	147	230.6	17.5	205.0	219.0	232.0
	USMLE STEP 2 CK Score	145	242.9	15.4	220.4	232.0	243.0
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Pediatrics[1]	COMLEX Level 1 Score	456	518.9	67.3	436.0	466.0	514.0
	COMLEX Level 2-CE Score	456	556.2	76.6	456.0	501.0	557.0
	USMLE STEP 1 Score	2,760	226.4	16.5	204.0	214.0	226.0
	USMLE STEP 2 CK Score	2,719	241.1	14.6	221.0	231.0	242.0
	Number of research experiences	2,739	2.6	1.9	0.0	1.0	2.0
	Number of abstracts, presentations, and publications	2,739	4.7	6.0	0.0	1.0	3.0
	Number of work experiences	2,739	3.7	2.8	1.0	2.0	3.0
	Number of volunteer experiences	2,739	8.3	4.4	3.0	5.0	8.0

- 2.5 of 20+ specialties
- Source: AAMC

Table 1 Number of Applicants and Positions in the 2022 Main Re
by Preferred Specialty*

Preferred Specialty	Total Positions Offered	Total Number of All Applicants	Number of All Applicants Per Position	Number of U.S. MD Se	
				Matched	Not Matched
Anesthesiology	1,969	2,560	1.30	1,267	148
Child Neurology	188	182	0.97	102	2
Dermatology	544	834	1.53	426	169
Diagnostic Radiology	1,155	1,568	1.36	758	153
Emergency Medicine	2,921	2,813	0.96	1,564	30
Family Medicine	4,916	5,055	1.03	1,468	32
General Surgery	1,622	2,400	1.48	984	222
Internal Medicine	9,809	11,598	1.18	3,616	73
Internal Medicine/Pediatrics	392	458	1.17	328	35
Interventional Radiology	169	226	1.34	131	30
Neurological Surgery	240	379	1.58	202	70
Neurology	1,014	1,249	1.23	549	13
Obstetrics and Gynecology	1,503	2,044	1.36	1,103	212
Orthopaedic Surgery	875	1,435	1.64	703	365
Otolaryngology	361	556	1.54	315	140
Pathology	631	827	1.31	224	6
Pediatrics	3,016	3,153	1.05	1,655	27
Physical Medicine and Rehabilitation	532	725	1.36	267	43
Plastic Surgery	194	340	1.75	173	103
Psychiatry	2,047	2,560	1.25	1,225	104
Radiation Oncology	185	162	0.88	102	2
Vascular Surgery	84	143	1.70	72	23

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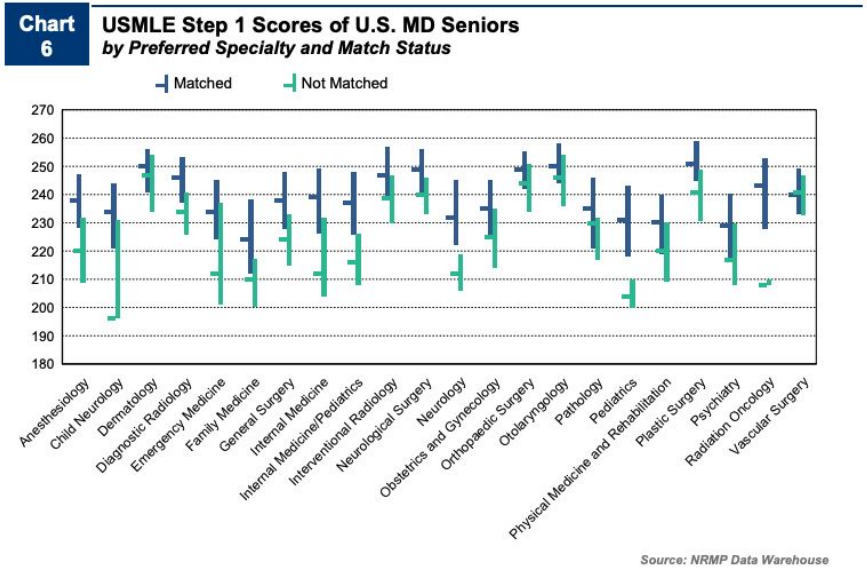
- Source: NRMP

Limitations

- Disjointed
  - Multiple sources
  - Difficult to locate
  - *Some* different information in different places
- Size
- Snapshots
  - Lack longitudinal information
- Lack of context
  - Other specialties
  - Over time
- Non-interactive

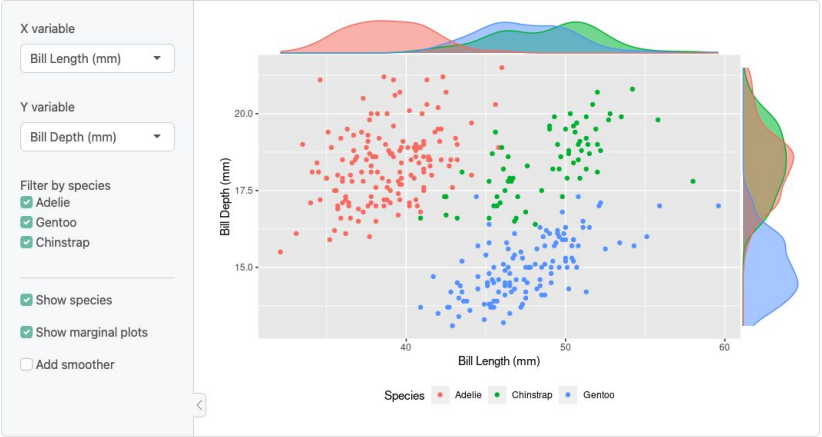


ACGME-Accredited Specialties	Description of Test or Experience	Number	Average	Standard Deviation	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
Anesthesiology	COMLEX Level 1 Score	291	589.1	76.0	500.0	535.0	579.0	641.0	684.0
	COMLEX Level 2-CE Score	291	611.8	83.4	508.0	557.0	613.0	669.0	707.0
	USMLE STEP 1 Score	1,643	232.7	14.8	212.0	223.0	234.0	243.0	252.0
	USMLE STEP 2 CK Score	1,642	243.3	13.5	226.0	234.0	244.0	253.0	260.0
	Number of research experiences	1,653	2.7	2.1	0.0	1.0	2.0	4.0	5.0
	Number of abstracts, presentations, and publications	1,653	5.3	7.8	0.0	1.0	3.0	7.0	12.0
	Number of work experiences	1,653	3.4	2.4	1.0	2.0	3.0	5.0	6.0
	Number of volunteer experiences	1,653	6.6	3.8	2.0	4.0	6.0	9.0	11.0
Child Neurology	COMLEX Level 1 Score	10	555.1	78.3	445.1	497.0	576.0	605.8	620.1
	COMLEX Level 2-CE Score	10	585.2	73.3	517.0	536.0	586.0	637.5	668.2
	USMLE STEP 1 Score	147	230.6	17.5	205.0	219.0	232.0	243.0	252.4
	USMLE STEP 2 CK Score	145	242.9	15.4	220.4	232.0	243.0	255.0	261.6

How R and Shiny can help

What is Shiny?

- Package
  - R and Python
- Building interactive web apps
- Components
  - User interface object: layout and display
  - Server function: instructions
  - shinyApp function: creates the paired object
- Highly user-friendly



https://shiny.posit.co/

Med Stats

- Link to the interactive dashboard