AHRQ
Agency for Healthcare Research and Quality

In with the New: a Shiny App for Exploring Summary Data Tables from the Medical Expenditure Panel Survey

Emily Mitchell

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Disclaimer

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How to build a Shiny app

Download R and Shiny

- From CRAN

Create ui / server components

- Using R functions

Deploy app

- On shinyapps.io

How to build a Shiny app

GOVERNMENT EDITION

Download R and Shiny

- ~~From CRAN~~ **Need to submit a ticket to IT**

Create ui / server components

- ~~Using R functions~~ **Not 508 compliant**

Deploy app

- ~~On shinyapps.io~~ **Need more security**

Motivation: MEPS

Medical Expenditure Panel Survey

Annual data from 1996-2014

Nationally representative

Examples:

- Number of health care events by age group
- Percent of people that are uninsured
- Total expenditures for prescription medicines

Motivation: MEPS

Data dissemination

Stat briefs + publications ⟵ We do the work

1996-2014 public use files ⟵ You do the work

Motivation: MEPS

Data dissemination

Stat briefs + publications	⇦	We do the work
Summary data tables	⇦	A little of both
1996-2014 public use files	⇦	You do the work

Summary data tables (current)

Expenditures per person by health care service

- All event types
- Prescription medicines
- Dental services*
- Other medical equipment*
- Hospital inpatient*
- Emergency room
- Hospital outpatient*
- Office-based services*
- Home health services*

26 tables / year x 19 years
= **494 tables**

* Contains sub-categories

Summary data tables (current)

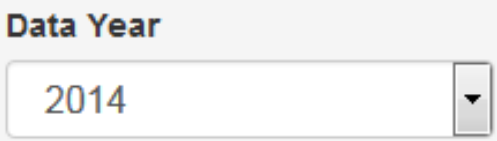
Table 1: Total Health Services-Median and Mean Expenses per Person With Expense and Distribution of Expenses by Source of Payment: United States, 2014

Population Characteristic	Population (in thousands)	Percent with expense	Per person with an expense		Total Expenses (in millions)	Percent distribution of total expenses by source of payment				
			Median	Mean		Out of pocket	Private insurance [a]	Medicare	Medicaid	Other [b]
Total	318,440	85.1	1,373	5,531	1499365	12.4	39.3	28.4	11.5	8.3
Age in years										
Under 65	270,479	83.1	1,040	4,430	996,059	12.9	51.9	10.2	15.7	9.3
Under 5	19,912	90.7	599	2,588	46,742	5.8	60.7	0.1*	25.8	7.6
5-17	53,888	86.1	632	2,294	106,395	14.9	53.9	0.3*	27.4	3.4
18-44	112,965	76.4	893	3,522	303,930	14.8	53.1	5.0	19.3	7.8
45-64	83,714	88.5	2,165	7,274	538,992	12.0	50.0	16.0	10.5	11.4
65 and over	47,961	96.4	4,875	10,890	503,306	11.5	14.5	64.4	3.1	6.5
Sex										
Male	155,866	80.9	1,138	5,427	684,561	12.0	39.1	28.2	9.2	11.5
Female	162,574	89.1	1,606	5,622	814,804	12.8	39.5	28.6	13.5	5.6

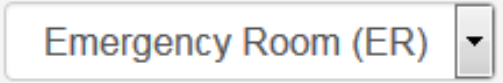
Shiny app: Version 1

UI

selectInput("year", label="Data Year", choices=2014:1996)



selectInput("event", label="Event Type", choices=event_list)



tableOutput("meps")

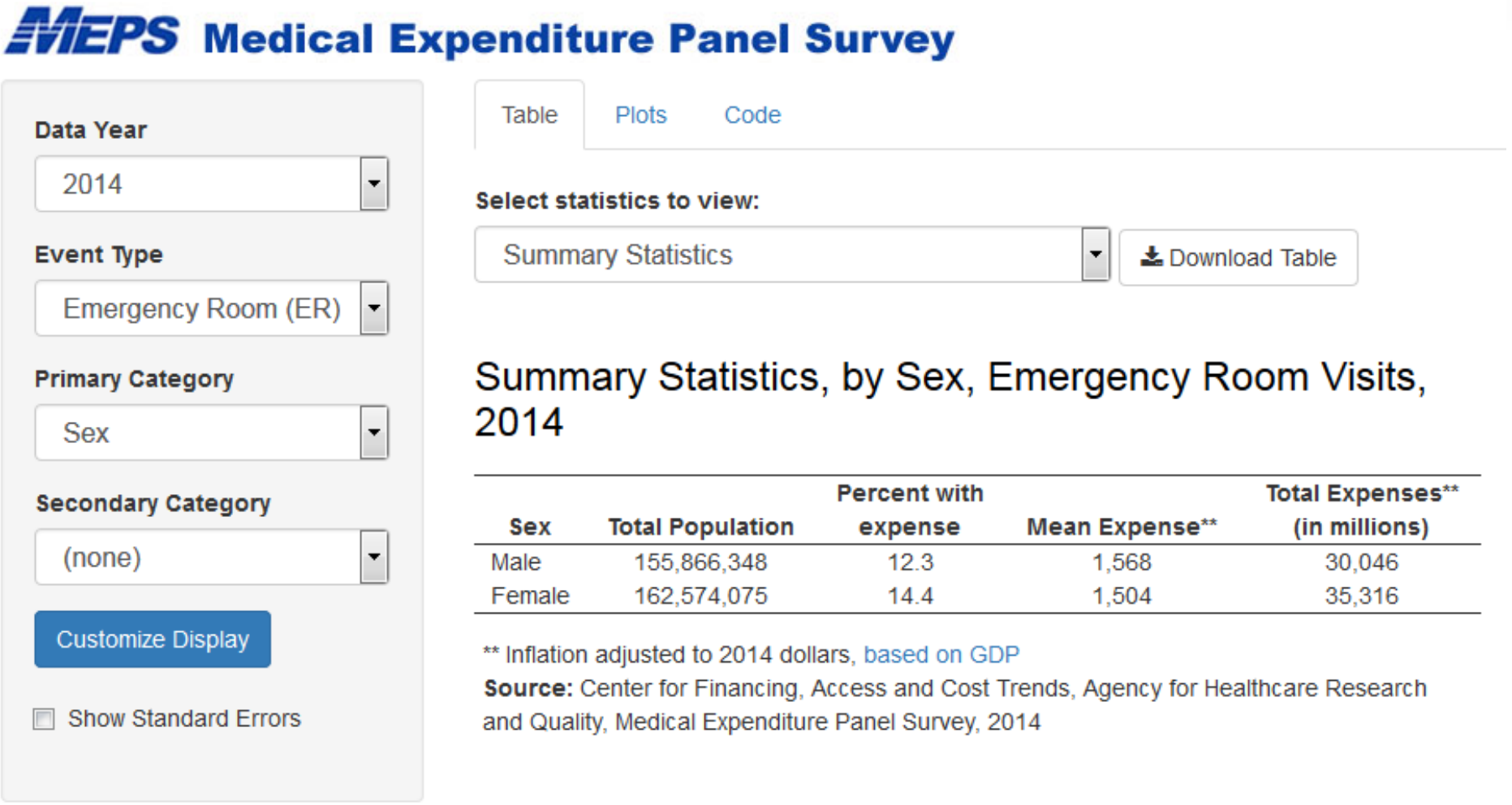
Summary Statistics, by Sex, Inpatient Events, 2014

Sex	Total Population	Percent with expense	Mean Expense**	Total Expenses** (in millions)
Male	155,866,348	5.3	22,986	188,851
Female	162,574,075	7.8	15,167	193,081

SERVER

```
output$meps <-
    renderTable(meps_tables %>% filter(Year == input$year, event == input$event)
```

Shiny app: Version 1



Web Accessibility

GOVERNMENT EDITION

AHRQ Agency for Healthcare Research and Quality

GSA Section508.gov
GSA Government-wide Section 508 Accessibility Program

Site Map | About Us | Accessibility | Contact Us | Plug-Ins

Home » Learn About Section 508 Requirements and Responsibilities » Section 508 Law and Related Laws and Policies

Section 508 Law and Related Laws and Policies

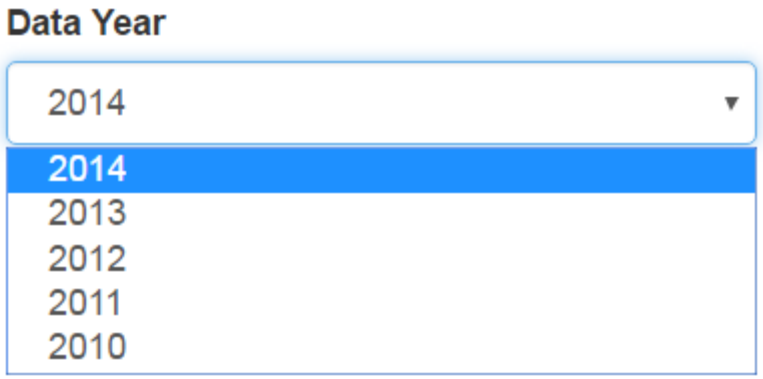
Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794 (d))

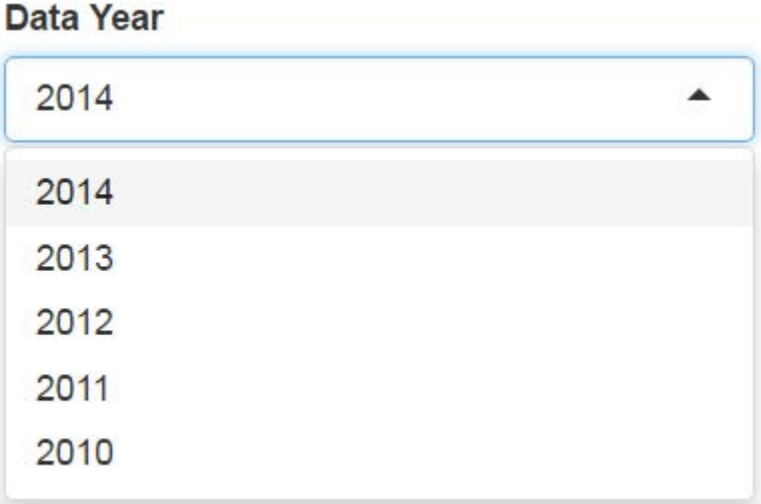
In 1998, Congress amended the Rehabilitation Act of 1973 to require Federal agencies to make their electronic and information technology (EIT) accessible to people with disabilities. The law (29 U.S.C. § 794 (d)) applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under Section 508, agencies must give disabled employees and members of the public access to information that is comparable to access available to others. The United States Access Board discusses the Section 508 law and its responsibility for developing accessibility standards for EIT to incorporate into regulations that govern Federal procurement practices.

Web Accessibility

Who is affected?	How do they access web content?
Visually impaired	
blind	Screen reader (html)
colorblind	Non-color cues
low vision	Zoom
Hearing impaired	
deaf	Closed caption
hard of hearing	
Motor disabilities	Keyboard only

Web Accessibility: HTML





Web Accessibility: HTML

Data Year

2014

```
<select id="year">
  <option value="2014" selected>
       2014
  </option>
  <option value="2013">2013</option>
  <option value="2012">2012</option>
  <option value="2011">2011</option>
  <option value="2010">2010</option>
</select>
```

Data Year

2014

```
<select id="year">
  <option value="2014" selected="selected">
    2014
  </option>
</select>
<div class="selectize-control">
   …
  <div data-value="2013">2013</div>
  <div data-value="2012">2012</div>
  <div data-value="2011">2011</div>
  <div data-value="2010">2010</div>
</div>
<script
   type="application/json"
   data-for="year"
   data-nonempty="">{}
</script>
```

How to build a Shiny app

GOVERNMENT EDITION

Create ui / server components

- ~~Using R functions~~ **Not 508 compliant**
- Create custom functions (508 compliant)

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- Create custom functions (508 compliant)
- Use custom HTML Template

Shiny Default: fluidPage()

```
<!DOCTYPE html>
<html>
  <head>…</head>
  <body>…</body>
</html>
```

508 compliant: htmlTemplate()

```
<!DOCTYPE html>
<html lang = “en”>
  <head>…</head>
  <body>…</body>
</html>
```

How to build a Shiny app

GOVERNMENT EDITION

Deploy App

- On shinyapps.io
- Get your contractor to do it!
- Using Shiny Server (need SSL / https)
  - FedRamp compliance

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Create ui / server components

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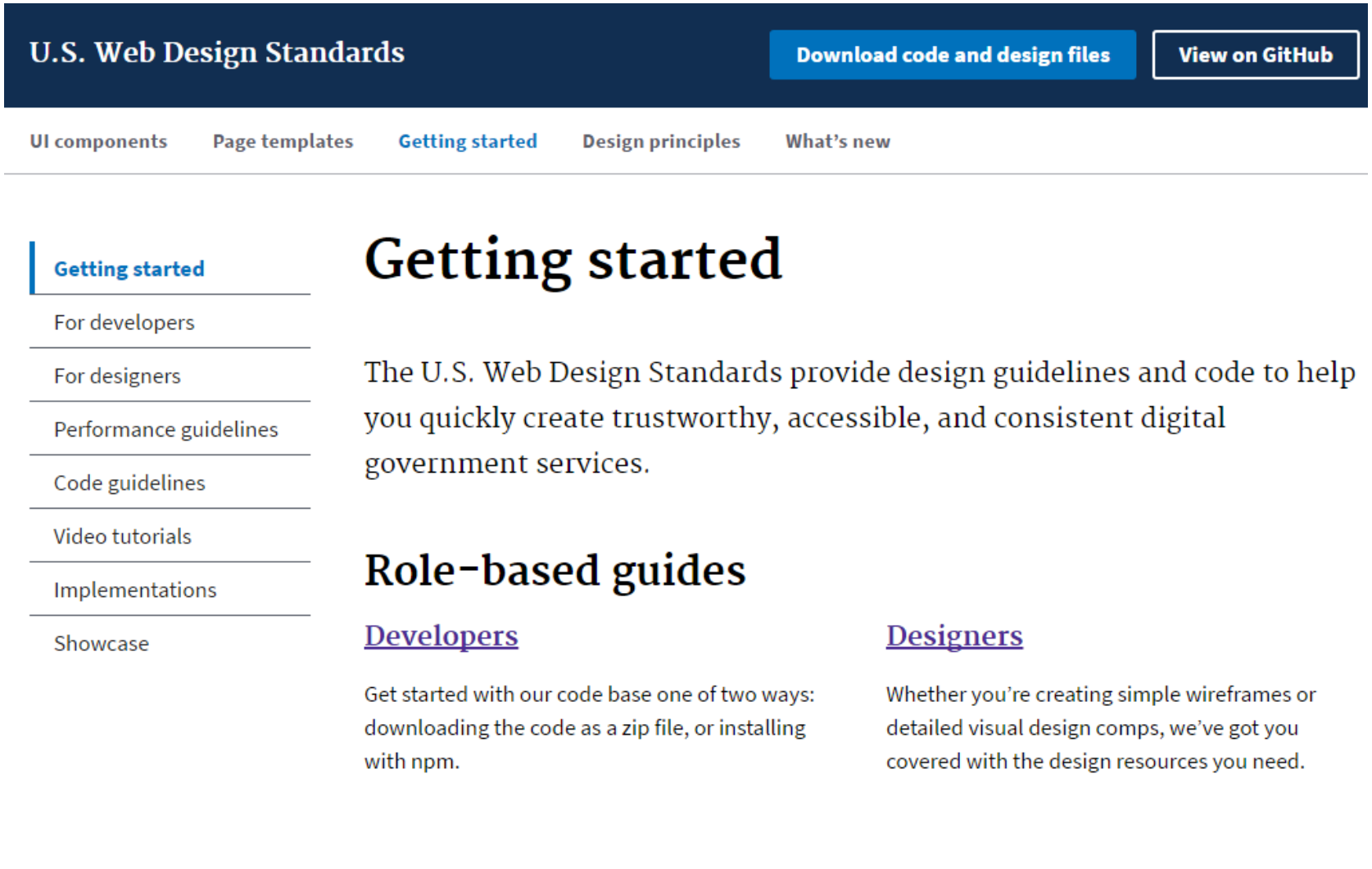
Finishing Touches

- Government-approved Cascading Style Sheets (CSS)

How to build a Shiny app

GOVERNMENT EDITION



How to build a Shiny app

GOVERNMENT EDITION

UI COMPONENTS

Buttons

Use buttons to signal actions.

PRIMARY BUTTONS

Default | Active | Hover

Default | Active | Hover

Code

```
<h6>Primary Buttons</h6>
<div class="button_wrapper">
  <button>Default</button>
  <button class="usa-button-active">Active</button>
  <button class="usa-button-hover">Hover</button>
</div>
<div class="button_wrapper">
  <button class="usa-button-primary-alt">Default</button>
  <button class="usa-button-primary-alt usa-button-active">Active</button>
  <button class="usa-button-primary-alt usa-button-hover">Hover</button>
</div>
```

Version 3

demo

https://ahrq-meps.com/shiny/meps_summary_tables/mepstrends/hc_tables/hc1_use/

Updated Version

Use, Expenditures, and Population Characteristics

The MEPS online summary tables provide an interactive platform allowing users to quickly access statistics on health care utilization and expenditures. Some of the types of data available here include: mean and median expenditures per person, total number of healthcare events and average spending per event type. Data can be grouped by event type (such as prescription medicines or dental services), by source of payment (such as Medicare or Medicaid), or by demographic characteristics (such as age, race or sex).

Select statistic:

Number of people

Show Standard Errors

Select data view:

Trends over time

Cross-sectional

Year: 1996 **to:** 2014

Group by:

(none)

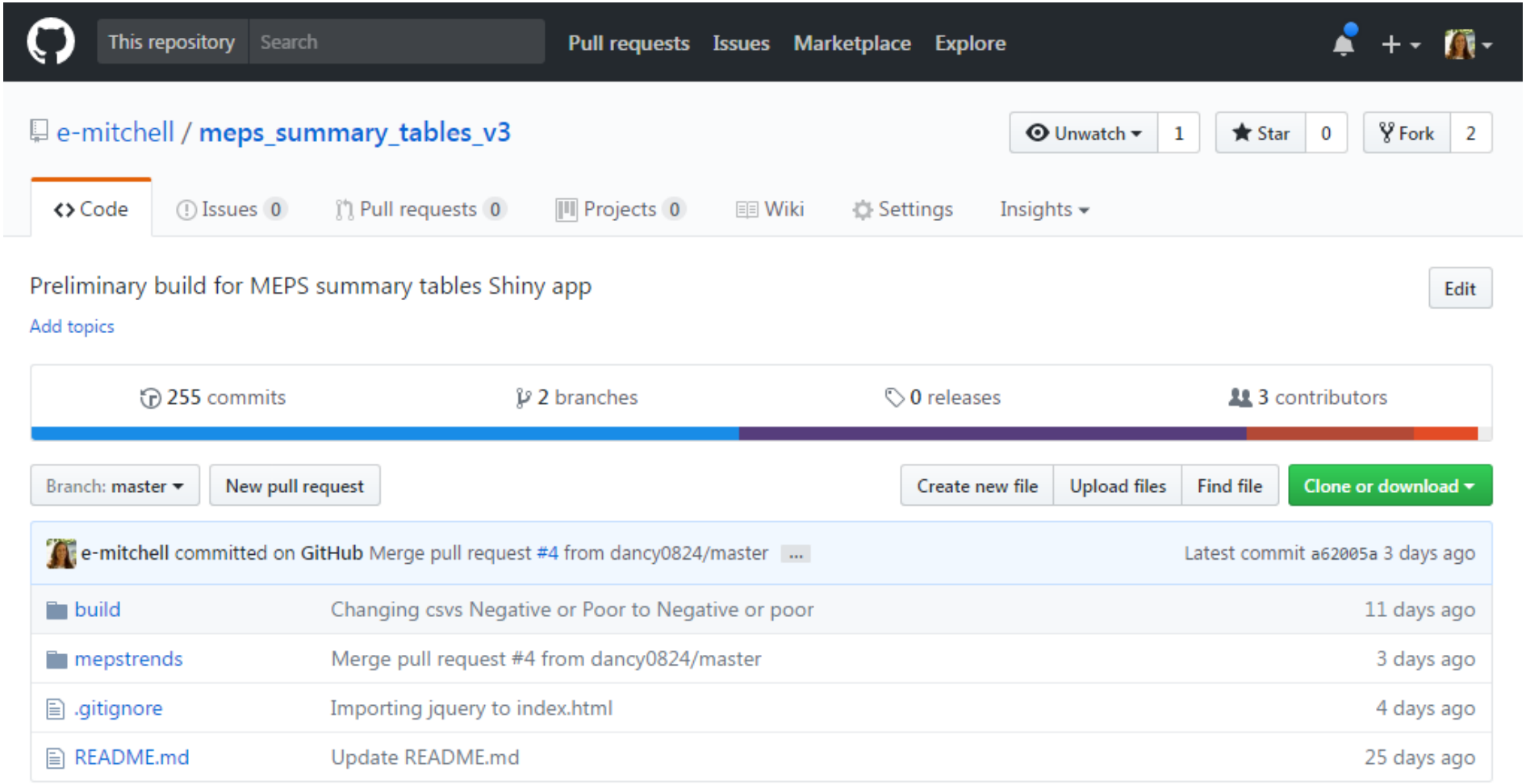
Table | Plot | </> Code

Number of people in thousands, United States, 1996-2014

Year	Number of people in thousands
2014	318,440.4
2013	315,722.0
2012	313,489.9
2011	311,125.8
2010	308,574.0
2009	306,660.6

GitHub

https://github.com/e-mitchell/meps_summary_tables_v3



How to build a Shiny app

BASIC

Create ui / server

- Using R functions

Deploy app

- On shinyapps.io

GOVERNMENT EDITION

Create ui / server

- Custom functions (508 compliant)
- Custom HTML Template (lang='en')

Deploy app

- On shinyapps.io
- Get your contractor to do it!
- Using Shiny Server (need SSL / https)

Finishing Touches

- Government-approved CSS
  - U.S. Web Design Standards

Resources

Web Accessibility (508 compliance): webaim.org

US Web Design Standards: standards.usa.gov/

Shiny HTML templates: shiny.rstudio.com/articles/templates.html

Shiny HTML tags: shiny.rstudio.com/articles/tag-glossary.html

HTML/CSS/Javascript: coursera.org/specializations/web-design

Shiny Server on Digital Ocean:
deanattali.com/2015/05/09/setup-rstudio-shiny-server-digital-ocean/

SSL/https: digitalocean.com/community/tutorials/how-to-secure-nginx-with-let-s-encrypt-on-ubuntu-16-04

Password Authentication : digitalocean.com/community/tutorials/how-to-set-up-password-authentication-with-nginx-on-ubuntu-14-04

emily.mitchell @ahrq.hhs.gov