

Lori Nichols

# Analysis of Acute Care Hospital Quality User Manual

## Product Name:

Analysis of Acute Care Hospital Quality

## User Interfaces:

RStudio IDE (version

- Download: <https://www.rstudio.com/products/rstudio/download/>

Analysis of Acute Care Hospital Quality Report:

- Go to: <https://rbubs.com/LKN56999/AcuteCareHospitalQuality>

Acute Care Hospital Finder Shiny App:

- Go to: [https://444-information-visualization.shinyapps.io/Acute\\_Care\\_Hospital\\_Finder/](https://444-information-visualization.shinyapps.io/Acute_Care_Hospital_Finder/)

## Dependencies

- **Host Websites:**

- Analysis of Acute Care Hospital Quality Report:

<https://rbubs.com/LKN56999/AcuteCareHospitalQuality>

- Acute Care Hospital Finder Shiny app:

[https://444-information-visualization.shinyapps.io/Acute\\_Care\\_Hospital\\_Finder/](https://444-information-visualization.shinyapps.io/Acute_Care_Hospital_Finder/)

- **Version Control and Source Code Location:**

- GitHub Repository:

<https://github.com/ClickyKeys/senior-project>

- **Data Requirements:**

- The data required to run the source code is located on BOX and Github
- Instructions on where to download and how and use the data can be found in the 'Product Use' section

- **Hardware/Software Requirements:**
  - Machine must be capable of:
    - Establishing an internet connection
    - Downloading and storing >15MB of data files
    - Installing and running R and RStudio
    - Opening a web browser and accessing web pages
  - Web Browser required:
    - Confirmed web browser functionality: Google, Microsoft Edge, Firefox
  - R and RStudio must be installed
    - Created using R (v 1.1.1) and RStudio (v 4.1.1717)
    - The packages required to run the code files can be installed in RStudio, and the functions to install packages are included in the code
      - See section “How to Use” for package installation instructions
  - Mobile Compatibility:
    - R and RStudio: Not mobile compatible
      - Cannot be used on mobile devices
    - HTML Report: Mobile Compatible
      - Formatted for all screen sizes
    - Shiny app: Not mobile compatible
      - Formatted for screen widths > 1024px

## Product Use

- **Potential Users:**
  - Source code users:
    - Data analyst/data scientist individual or team
  - HTML and Shiny app users:
    - Researchers studying hospital quality in the US
    - Government officials interested in driving improvements in hospital quality
    - Individuals interested in identifying the best hospital in their county
    - Individuals interested in viewing hospital quality statistics for their county

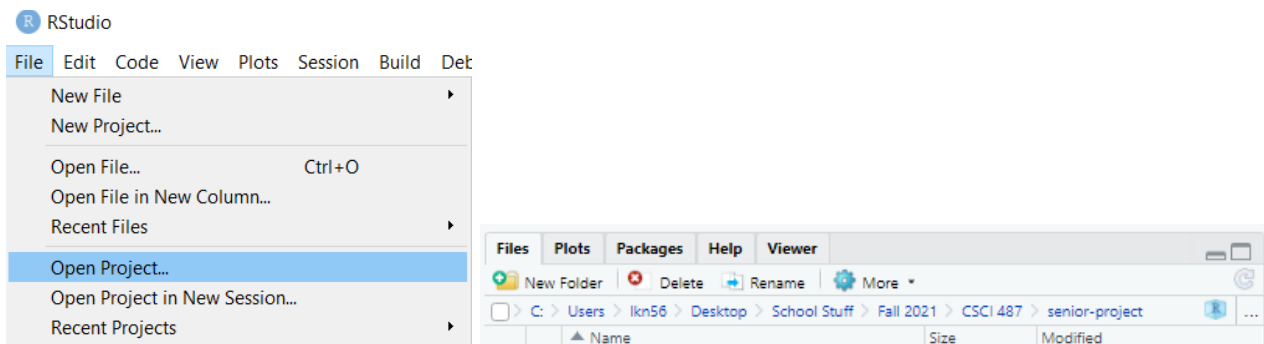
- **User Interfaces:**

- RStudio
- Analysis of Acute Care Hospital Quality Report:
  - Go to <https://rpubs.com/LKN56999/AcuteCareHospitalQuality>
- Acute Care Hospital Finder Shiny App:
  - Go to [https://444-information-visualization.shinyapps.io/Acute\\_Care\\_Hospital\\_Finder/](https://444-information-visualization.shinyapps.io/Acute_Care_Hospital_Finder/)

- **How to Use:**

1. **The data cleaning, HTML final report, and Shiny app source code:**

- Important: The following instructions are for a Windows OS
- The source code may be accessed for changes and maintenance.
- Current source code files can be accessed on GitHub at:
   
<https://github.com/ClickyKeys/senior-project>
- Download all files from GitHub and store them in a desired file path location.
- In RStudio:



*Opening a project*

*Use the bottom-right panel to access files*

1. Go to File – Open Project
  - a) Navigate to the folder containing the downloaded source code
  - b) Click the R project file 'senior-project' and click 'Open'
2. Data cleaning code:
  - a) Navigate to the user panel on the bottom-right of the RStudio IDE UI
  - b) Click the R file 'data-cleanup.R'

1. Important: If running this code for the first time, un-comment the “install.packages” functions before running the code. Example:

```
1 # install.packages("tidyverse")
2 # install.packages("rlist")
3
```


- c) Download the data needed to use this source code by going to:

<https://olemiss.box.com/s/ketgimkx4y26w2pusdy448l33dkl27cs>

1. Download the zip file ‘DATA’
  - x Contains two folders, ‘MEASURES’ and ‘CHARACTERISTICS’
2. Save and extract files in a desired location on your machine
3. Update lines 15 & 16 of ‘data-cleanup.R’ with the location of the folder ‘MEASURES’ on your machine

```
8 Hospital_Data <- list.files(path = "C:/Users/lkn56/Desktop/EVALUATED", pattern = "*.csv", full.names = TRUE)
9 names(Hospital_Data) <- list.files(path = "C:/Users/lkn56/Desktop/EVALUATED", pattern = "*.csv", full.names = FALSE)
```

- x path = “path to folder location”
- x Replace all ‘\’ with ‘/’

- d) Run the code by selecting **all code** and pressing CTRL + Enter OR select all code and click the Run button 

3. The HTML report:



- a) Navigate to the user panel on the bottom-right of the RStudio IDE UI
- b) Click the markdown file ‘Final\_Report.rmd’

1. **Important:** If using this code for the first time, un-comment the “install.packages” functions in the ‘importPackages’ code-block
  - x Highlight the code chunk and press CTRL + Enter to run
  - x Packages should install/update
  - x Comment out the install functions once complete
2. If ‘data-cleanup.R’ has been updated and run with new data, un-comment the code in the following code-blocks: ‘importPackages’, ‘readInitial’, ‘normalizeData’, ‘imputeMissing’, and ‘writeFile’.

- c) Download the data needed to use this source code by going to:

<https://olemiss.box.com/s/ketgimkx4y26w2pusdy448l33dkl27cs>

1. Download the zip file ‘DATA’
  - x Contains two folders, ‘MEASURES’ and ‘CHARACTERISTICS’

2. Save and extract files in a desired location on your machine
3. Update the file path on line 383 in code chunk 'readFiles' with the location of the folder 'CHARACTERISTICS' (from the Box download) on your machine
- d) Run the code by clicking the Knit button 
  1. Note: This may take a few minutes to run, so be patient
4. The Shiny app:
  - a) Navigate to the user panel on the bottom-right of the RStudio IDE UI
  - b) **Important:** Skip this step unless using a new 'hospital general information' dataset updated by CMS
    1. Click 'Shiny\_Data.R' and run the code by selecting all code and clicking the Run button
      - x If running the code for the first time, un-comment the "install.packages" functions before running the code
      - x This code will take ~ 20 minutes to execute
  - c) Click the folder 'Acute\_Care\_Hospital\_Finder'
  - d) Click 'app.R'
    1. If running the code for the first time, un-comment the "install.packages" functions before running the code
      - x Highlight the code chunk and press CTRL + Enter to run
      - x Packages should install/update
      - x Comment out the install functions once complete
  - e) To run, click the 'Run App' button 
5. **Warning:** Introducing different or updated datasets/file paths/file names may require changes to the source code to handle any changes.

## 2. The original data sources:

- data.cms.gov: <https://data.cms.gov/provider-data/topics/hospitals>
  - Important: This is the original data source, attempting to download and use data from this source (instead of the data provided on BOX and GitHub) may require changes to the source code files to use them.
- 1. Click the above link to navigate to the web page.

2. Click the 'Download all datasets' link in the section "About this topic" to download the files
  3. Unzip and store data in a desired folder outside of the RStudio project folder (files are too large to commit to GitHub).
  4. Optional: Click the link "HospitalCompare – Data Dictionary" to download the data dictionary explaining all datasets and variables.
- data.cms.gov: <https://data.cms.gov/provider-characteristics/hospitals-and-other-facilities/provider-of-services-file-hospital-non-hospital-facilities>
    - Description: Provider of services files – Hospital & Non-Hospital information and characteristics
    - Important: This is the original data source, attempting to download and use data from this source may require changes to the source code files to use them.
1. Click the above link to navigate to the webpage.
  2. Scroll down to the section titled "Public Use File (Free)" sub-section "All data available"
  3. Click the desired file (eg. 'Q3 2021'), and a new page will open up
  4. Click 'Export', and a pop-up will appear
  5. Click 'CSV for Excel' to download the files
  6. Unzip and store data in the 'data' folder in the RStudio project folder.

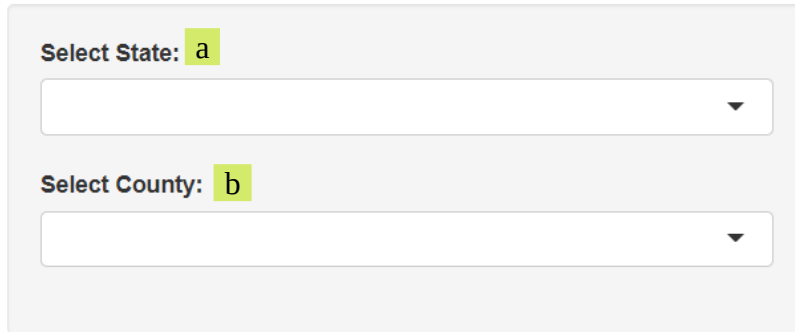
### 3. The HTML final report UI:

- Go to <https://rpubs.com/LKN56999/AcuteCareHospitalQuality>
- The report should open in your web browser
- Scroll to navigate through the report

### 4. The Shiny app User Interface:

1. Go to [https://444-information-visualization.shinyapps.io/Acute\\_Care\\_Hospital\\_Finder/](https://444-information-visualization.shinyapps.io/Acute_Care_Hospital_Finder/)
2. Options panel use:

# Acute Care Hospital Finder

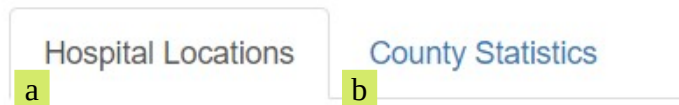


Select State: a

Select County: b

- a) First make a selection from “State”
  - This will render options in the “County” drop-down, including only counties in the selected State
- b) Make a selection from “County”
  - This will render plots in the main output panel

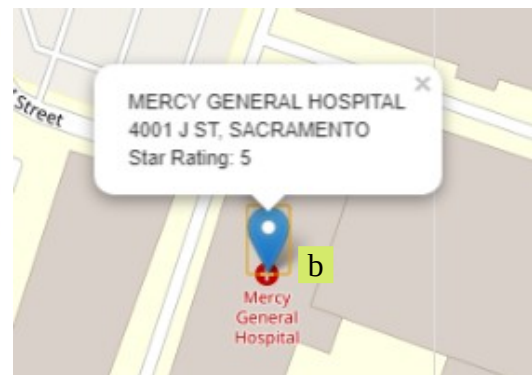
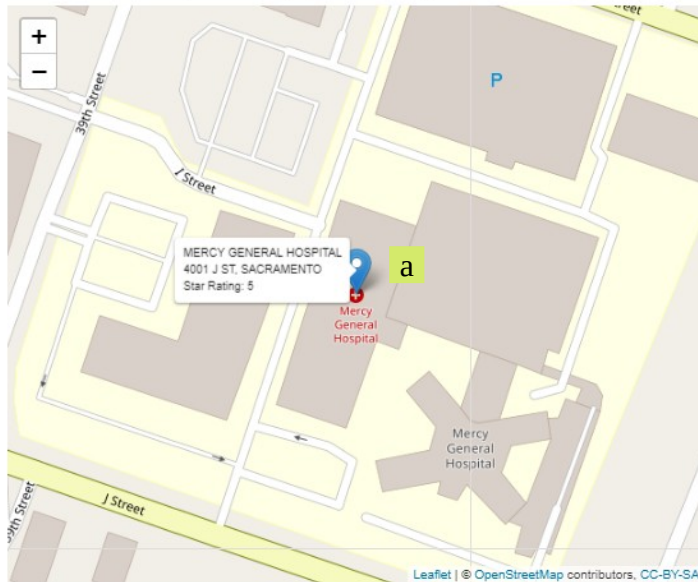
## 3. Main output panel use:



- a) Select ‘Hospital Locations’ to view the map:
  - This will display the leaflet map, which shows the geographic location of the best Acute Care hospital in the selected county:
- b) Select ‘County Statistics’ to view the plot:
  - This will display a bar graph showing the county-level HVBP TPS domain performance scores.

## 4. Map use:

The Best Hospital in your County by Star Rating



- a) Hover over the marker to see a preview of the hospital name, address, and star rating
  - b) Click the marker to freeze a label containing the hospital name, address, and star rating
5. County Statistics use:
- a) Visualization only, the plot does not require any additional interactions

## Administration and Maintenance

- CMS datasets update on a yearly basis. The HTML report and Shiny app source code will need to be updated manually with new data as described in the 'Product Use' section of this document.
  - This could require extensive work, considering CMS may add/remove/change the datasets/variables used to generate the HTML report and Shiny app.
- In the event that the HTML report can no longer be hosted online through Rpubs, another option available through RStudio is RStudio Connect. However, publication on RStudio Connect requires payment. If for any reason all RStudio services are no longer accessible for free, the report can be published in pdf form.



**Future Development Potential:**

- Develop the code and documentation further for modifiable, open-source access
- HTML final report:
  - Additional analysis can be performed and results contributed to the HTML final report
- Shiny app:
  - Optimize to display multiple top-rated hospitals on the leaflet map
  - Determine top hospital based on specific quality metrics, such as patient satisfaction, health outcomes, and efficiency