# R Choropleth Demo: US Arrests for Murder by State

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This code example was found in the book:

> Horton, Nicholas J, and Ken Kleinman. *Using R and Rstudio for Data Management, Statistical Analysis, and Graphics*. Boca Raton, Florida: CRC Press, 2015.

The pages from the book which cover this example have been provided as a excerpt in PDF format, available for download from the author's website.

In this document, we have modified the original script by using a different code block for loading packages and by converting to an Rmd source document.

## Procedure Description

From the text (p. 193):

> We'll use the `ggmap` package to generate the plot. It builds on the `ggplot2` package, which implements ideas related to the "grammar of graphics" [188]. The package uses a syntax where specific elements of the plot are added to the final product using special functions connected by the + symbol. Some additional work is needed to merge the dataset with the state information (2.3.11) and to sort the resulting dataframe (2.3.10) so that the shape data for the states is plotted in order.

[188] H. Wickham. *ggplot2: Elegant Graphics for Data Analysis*. Springer, New York, 2009.

## Load Packages

```
# Install packages (if necessary)
for (pkg in c("ggmap", "dplyr")) {
    if (! suppressWarnings(require(pkg, character.only=TRUE)) ) {
        install.packages(pkg, repos="http://cran.fhcrc.org", dependencies=TRUE)
        if (! suppressWarnings(require(pkg, character.only=TRUE)) ) {
            stop(paste0(c("Can't load package: ", pkg, "!"), collapse = ""))
        }
    }
}
```

## Load Data

```
# From: https://www3.amherst.edu/~nhorton/r2/examples/advanced.R
USArrests.st = mutate(USArrests,
                      region=tolower(rownames(USArrests)),
```

```
                      murder = cut_number(Murder, 5))
us_state_map = map_data('state')
map_data = merge(USArrests.st, us_state_map, by="region")
map_data = arrange(map_data, order)
```

## Generate Choropleth Map

From the text (p. 194):

> The `scale_fill_grey()` function changes the colors from the default unordered multiple colors to an ordered and print-friendly black and white (see also `scale_file_brewer`). The `ggmap` package uses the Mercator projection (see `coord_map()` in the `ggplot2` package and `mapproject` in the `mapproject` package). Another implementation of choropleth maps can be found in the `choroplethr` package.

```
# From: https://www3.amherst.edu/~nhorton/r2/examples/advanced.R
p0 = ggplot(map_data, aes(x=long, y=lat, group=group)) +
    geom_polygon(aes(fill = murder)) +
    geom_path(colour='black') +
    theme(legend.position = "bottom",
          panel.background=element_rect(fill="transparent",
                                        color=NA)) +
    scale_fill_grey(start=1, end =.1) + coord_map();
plot(p0)
```