# DEMG609: Problem Set 2

*Nick Graetz*

*September 20, 2017*

## A.(1)

```
# Load data.
data <- fread("C:/Users/ngraetz/Documents/repos/demg609/hw2_data.csv")
data[, pop := as.numeric(pop)]
data[, deaths := as.numeric(deaths)]

# Calculate CDR.
cdr_usa <- sum(data[country == "USA", deaths]) / sum(data[country == "USA", pop])
cdr_russia <- sum(data[country == "Russia", deaths]) / sum(data[country == "Russia", pop])
```
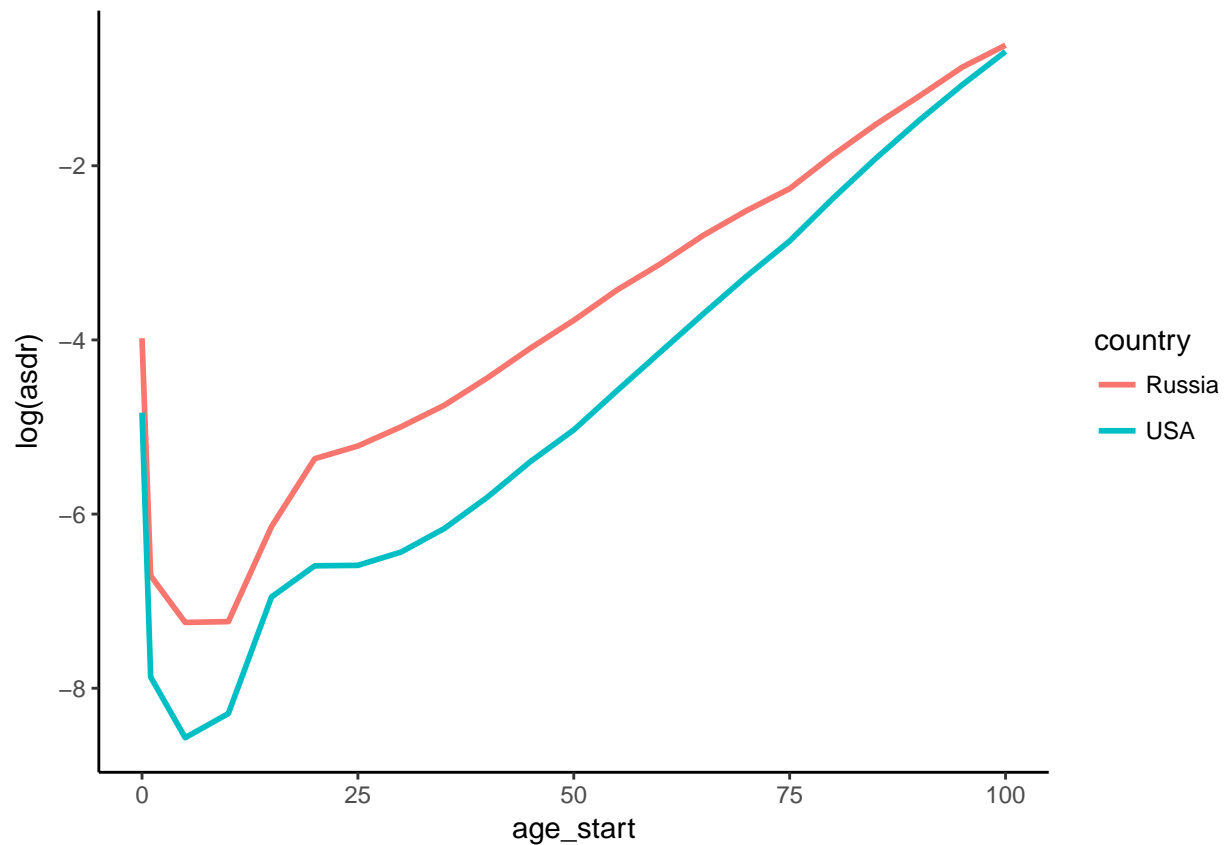
**Answer:**
USA: 0.0086735
Russia: 0.0171224

## A.(2)

```
data[, asdr := deaths / pop]

ggplot(data = data) +
  geom_line(aes(x = age_start,
                y = log(asdr),
                color = country),
            size = 1) +
  theme_classic()
```
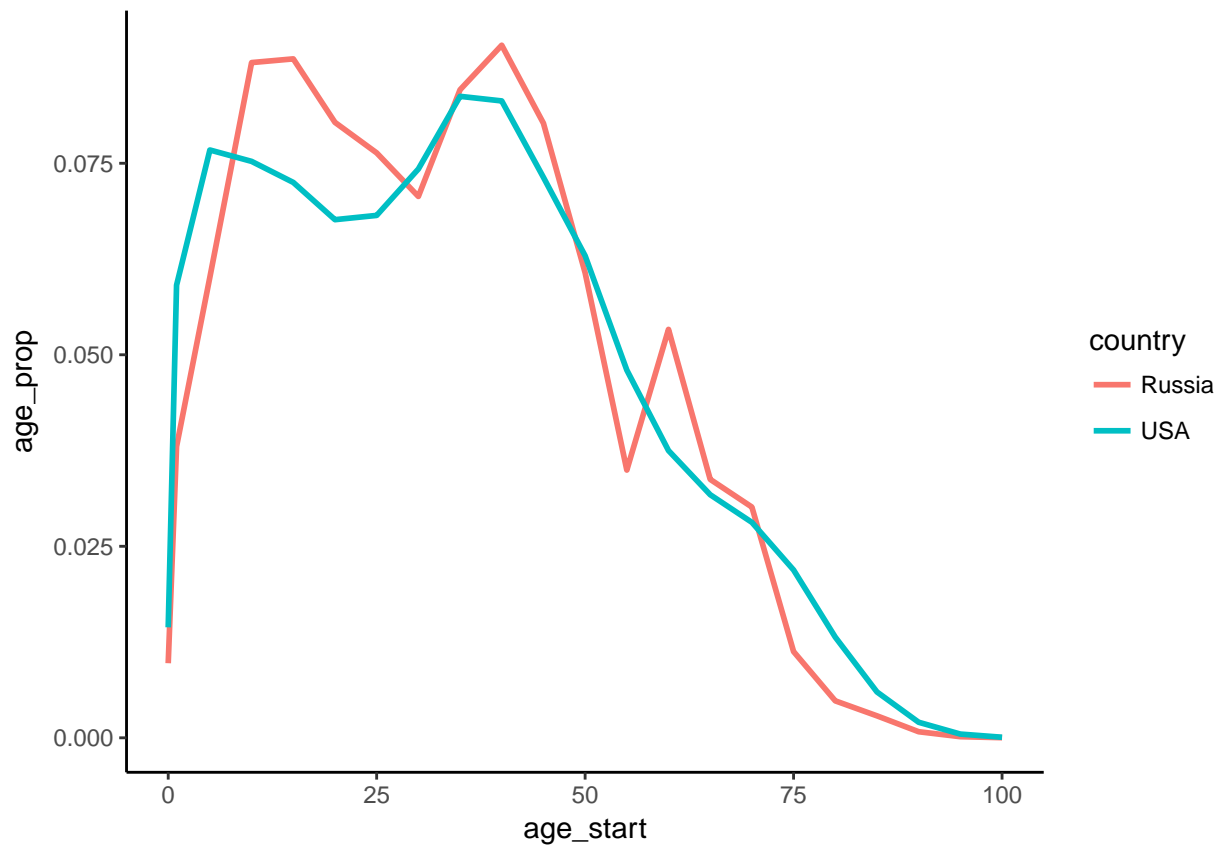
A.(3)
We have to make a linear assumption as we only have midpoint populations.

A.(4)

```r
data[country == "USA", age_prop := pop / sum(pop)]
data[country == "Russia", age_prop := pop / sum(pop)]
ggplot(data = data) +
  geom_line(aes(x = age_start,
                y = age_prop,
                color = country),
            size = 1) +
  theme_classic()
```

A.(5)

```
cdr_usa_wt <- weighted.mean(data[country == "USA", asdr],
                            data[country == "USA", age_prop])
cdr_russia_wt <- weighted.mean(data[country == "Russia", asdr],
                               data[country == "Russia", age_prop])
cdr_usa_wt
```

```
## [1] 0.008673529
```

```
cdr_russia_wt
```

```
## [1] 0.01712236
```

A.(6)

```
usa_ascdr <- weighted.mean(data[country == "USA", asdr],
                           data[country == "Russia", age_prop])
```

**Answer:**
USA ASCDR: 0.0066852
The difference must be attributable to differences in the age-specific mortality rates between
the US and Russia, as we have controlled for differences in the age-specific populations.

## A.(7)

```r
# Calculate CMR.
cmr <- sum(data[country == "Russia", deaths]) / sum(data[country == "USA", asdr] * data[country == "Russia", pop])
cmr
```

```
## [1] 2.561247
```

```r
# Compare to ratio of Russia CDR and USA ASCDR.
cdr_russia / usa_ascdr
```

```
## [1] 2.561247
```

## A.(8)

```r
c_age <- sum((data[country == "Russia", age_prop] - data[country == "USA", age_prop]) *
             ((data[country == "USA", asdr] + data[country == "Russia", asdr]) / 2))
c_asdr <- sum((data[country == "Russia", asdr] - data[country == "USA", asdr]) *
             ((data[country == "USA", age_prop] + data[country == "Russia", age_prop]) / 2))
# Calculate relative contributions to the net absolute difference.
total_diff <- abs(c_age) + abs(c_asdr)
abs(c_age)/total_diff
```

```
## [1] 0.1830943
```

```r
abs(c_asdr)/total_diff
```

```
## [1] 0.8169057
```