AndrewBowen_Data606_LAb1

Andrew Bowen

2022-08-26

```
## Loading required package: airports
## Loading required package: cherryblossom
## Loading required package: usdata
##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##     filter, lag
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
data('arbuthnot', package='openintro')

head(arbuthnot, 10)
```

```
## # A tibble: 10 x 3
##     year  boys girls
##    <int> <int> <int>
##  1  1629  5218  4683
##  2  1630  4858  4457
##  3  1631  4422  4102
##  4  1632  4994  4590
##  5  1633  5158  4839
##  6  1634  5035  4820
##  7  1635  5106  4928
##  8  1636  4917  4605
##  9  1637  4703  4457
## 10  1638  5359  4952
```

Exercise 1

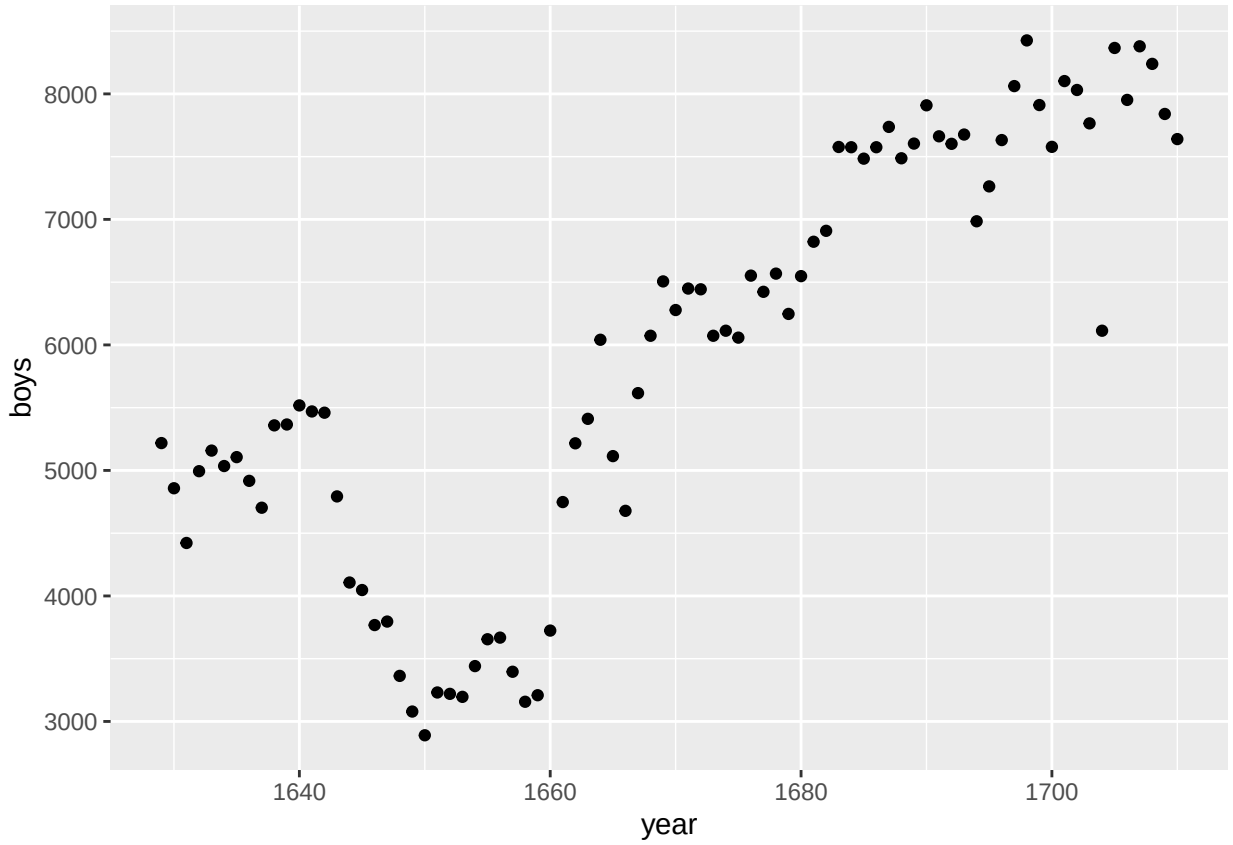
Just want to see the count of girls baptized, calling the `girls` column from our dataframe.

```
arbuthnot$girls
```

```
##  [1] 4683 4457 4102 4590 4839 4820 4928 4605 4457 4952 4784 5332 5200 4910 4617
## [16] 3997 3919 3395 3536 3181 2746 2722 2840 2908 2959 3179 3349 3382 3289 3013
## [31] 2781 3247 4107 4803 4881 5681 4858 4319 5322 5560 5829 5719 6061 6120 5822
## [46] 5738 5717 5847 6203 6033 6041 6299 6533 6744 7158 7127 7246 7119 7214 7101
## [61] 7167 7302 7392 7316 7483 6647 6713 7229 7767 7626 7452 7061 7514 7656 7683
## [76] 5738 7779 7417 7687 7623 7380 7288
```

Plotting our DF

```
ggplot(data=arbuthnot, aes(x=year, y=boys)) + geom_point()
```

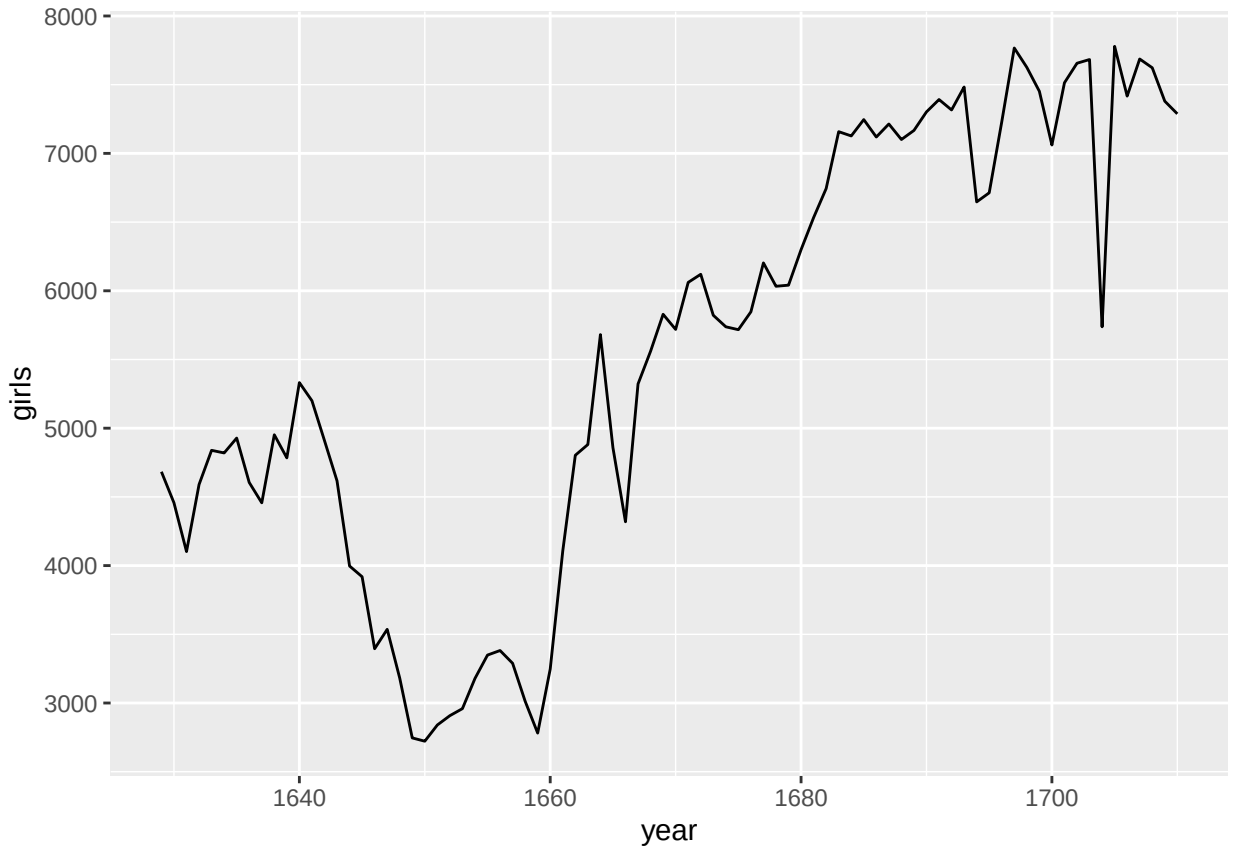


Same plot as above but in line format

Exercise 2

Plotting a line graph the # of girls baptized by year below. There is a general upward trend in baptisms for girls. On a smaller timeframe, there was a relative dip in girl baptisms between 1640 and 1660.

```
ggplot(data=arbuthnot, aes(x=year, y=girls)) + geom_line()
```




```
arbuthnot$boys + arbuthnot$girls
```

```
##  [1]  9901  9315  8524  9584  9997  9855 10034  9522  9160 10311 10150 10850
## [13] 10670 10370  9410  8104  7966  7163  7332  6544  5825  5612  6071  6128
## [25]  6155  6620  7004  7050  6685  6170  5990  6971  8855 10019 10292 11722
## [37]  9972  8997 10938 11633 12335 11997 12510 12563 11895 11851 11775 12399
## [49] 12626 12601 12288 12847 13355 13653 14735 14702 14730 14694 14951 14588
## [61] 14771 15211 15054 14918 15159 13632 13976 14861 15829 16052 15363 14639
## [73] 15616 15687 15448 11851 16145 15369 16066 15862 15220 14928
```

Adding `total` field to dataframe as demo'd in the lab sheet.

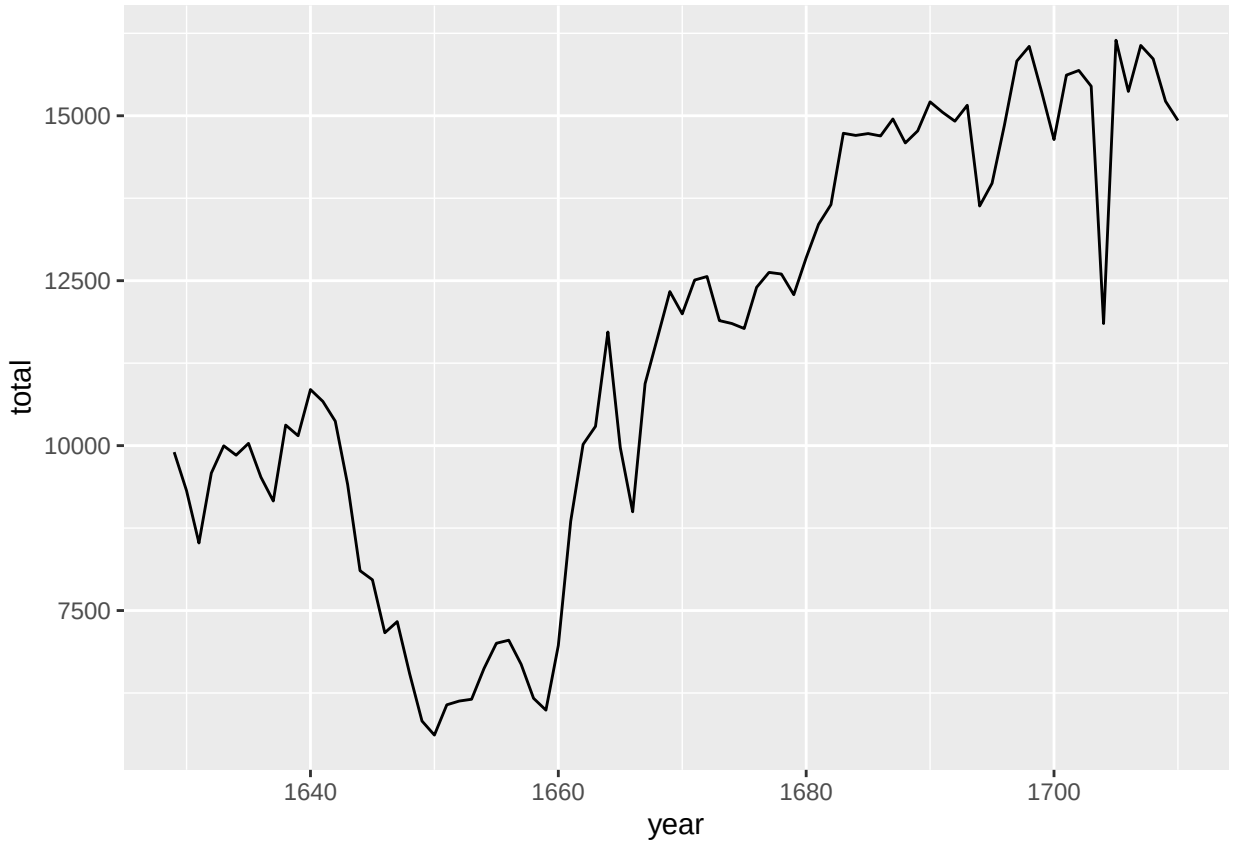
```
arbuthnot <- arbuthnot %>% mutate(total = boys + girls)

head(arbuthnot, 10)
```

```
## # A tibble: 10 x 4
##     year  boys girls total
##    <int> <int> <int> <int>
##  1  1629  5218  4683  9901
##  2  1630  4858  4457  9315
##  3  1631  4422  4102  8524
##  4  1632  4994  4590  9584
##  5  1633  5158  4839  9997
##  6  1634  5035  4820  9855
##  7  1635  5106  4928 10034
##  8  1636  4917  4605  9522
##  9  1637  4703  4457  9160
```

```
## 10  1638  5359  4952 10311
```

Plotting `total` over time

```
ggplot(data=arbuthnot, aes(x=year, y=total)) + geom_line()
```



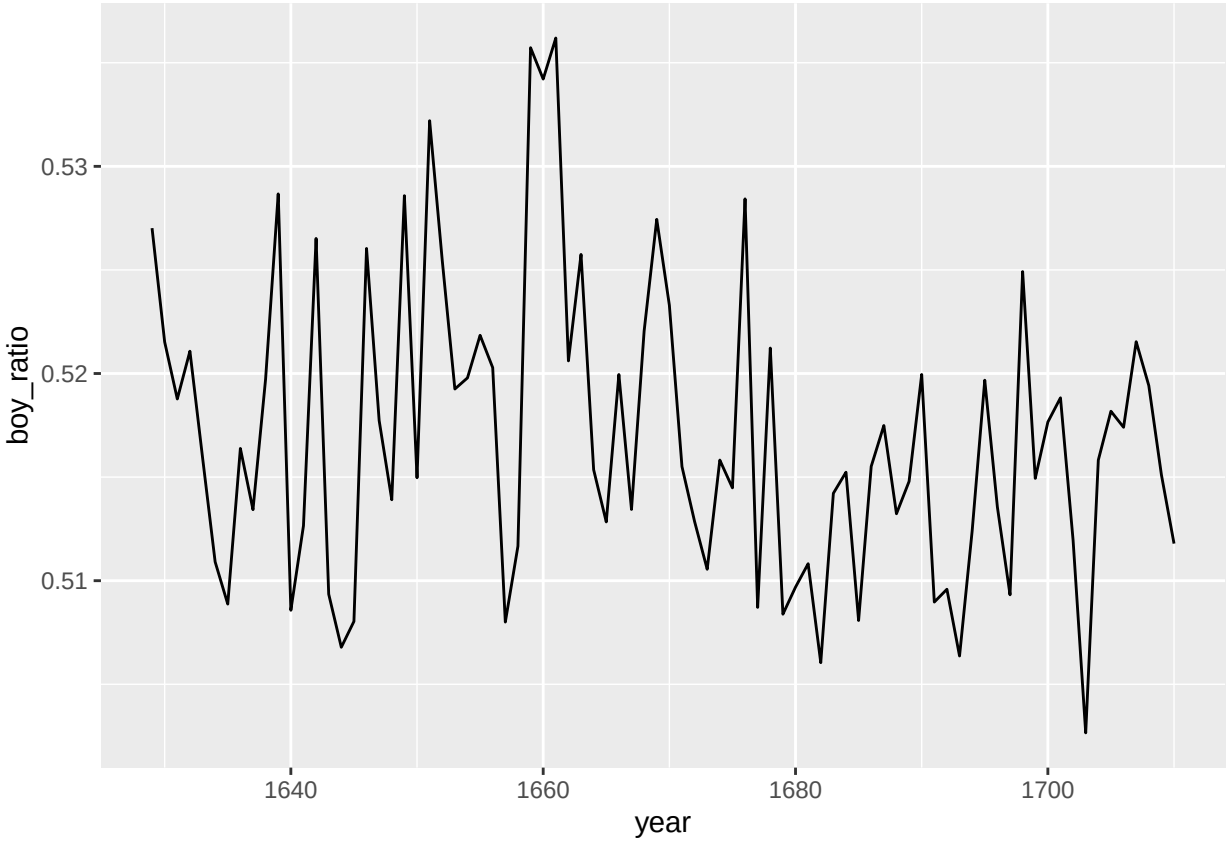
Calculationg boy-to-girl ratio

```
arbuthnot <- arbuthnot %>% mutate(boy_to_girl_ratio = boys / girls)
```

Exercise 3

Calculating the ratio of boys baptized to total. This graph shows some variability in the baptism rate of boys. One other thing to note is that the ratio of boys baptized over our dataset's timeframe is above 50% over the entire period.

```
arbuthnot <- arbuthnot %>% mutate(boy_ratio = boys / total)

# Generating plot of proportion of boys born over time (relative to total)
ggplot(data=arbuthnot, aes(x=year, y=boy_ratio)) + geom_line()
```



Finding years where more boys were present than girls. Adding in a boolean flag column to represent

```
arbuthnot <- arbuthnot %>% mutate(more_boys = boys > girls)
```

Let's take a look at our DF with all our added columns!

```
head(arbuthnot, 10)
```

```
## # A tibble: 10 x 7
##     year  boys girls total boy_to_girl_ratio boy_ratio more_boys
##    <int> <int> <int> <int>             <dbl>     <dbl> <lgl>
##  1  1629  5218  4683  9901              1.11     0.527 TRUE
##  2  1630  4858  4457  9315              1.09     0.522 TRUE
##  3  1631  4422  4102  8524              1.08     0.519 TRUE
##  4  1632  4994  4590  9584              1.09     0.521 TRUE
##  5  1633  5158  4839  9997              1.07     0.516 TRUE
##  6  1634  5035  4820  9855              1.04     0.511 TRUE
##  7  1635  5106  4928 10034              1.04     0.509 TRUE
##  8  1636  4917  4605  9522              1.07     0.516 TRUE
##  9  1637  4703  4457  9160              1.06     0.513 TRUE
## 10  1638  5359  4952 10311              1.08     0.520 TRUE
```

More Practice

```
data('present', package='openintro')
```

```
head(present, 10)
```

```
## # A tibble: 10 x 3
##     year    boys   girls
##    <dbl>   <dbl>   <dbl>
##  1  1940 1211684 1148715
##  2  1941 1289734 1223693
##  3  1942 1444365 1364631
##  4  1943 1508959 1427901
##  5  1944 1435301 1359499
##  6  1945 1404587 1330869
##  7  1946 1691220 1597452
##  8  1947 1899876 1800064
##  9  1948 1813852 1721216
## 10  1949 1826352 1733177
```

Exercise 4

Let's see our data range in the year column first (using `min` & `max`). It looks to be the years between 1940 and 2002.

```
print(min(present$year))
```

```
## [1] 1940
```

```
print(max(present$year))
```

```
## [1] 2002
```

```
# Alternatively, we can use the summarize function to find these values
summarize(present, min(year), max(year))
```

```
## # A tibble: 1 x 2
##   `min(year)` `max(year)`
##         <dbl>       <dbl>
## 1        1940        2002
```

Finding out our data frame dimensions (nrows x ncols)

```
print(ncol(present))
```

```
## [1] 3
```

```
print(nrow(present))
```

```
## [1] 63
```

Getting out dataframe columns with the built-in `colnames` function

```
colnames(present)
```

```
## [1] "year"  "boys"  "girls"
```

Exercise 5

Going to use the median count for boys and girls from each data set (`present` vs `arbuthnot`) to compare magnitudes of counts in each data set

```
p_boys_med = median(present$boys)
p_girls_med = median(present$girls)
```

```
a_boys_med = median(arbuthnot$boys)
a_girls_med = median(arbuthnot$girls)

# Calculating ratio of present boy/girl counts
boys_ratio = p_boys_med / a_boys_med
girls_ratio = p_girls_med / a_girls_med
print(boys_ratio)
```

```
## [1] 316.955
```

```
print(girls_ratio)
```

```
## [1] 320.3356
```

It looks like the median present day birth counts are ~320 times higher than the birth counts listed in our `arbuthnot` dataset. We used median counts to summarize the data set, so it won't be exactly this ratio for the whole data set, but modern birth counts are significantly higher.

Exercise 6

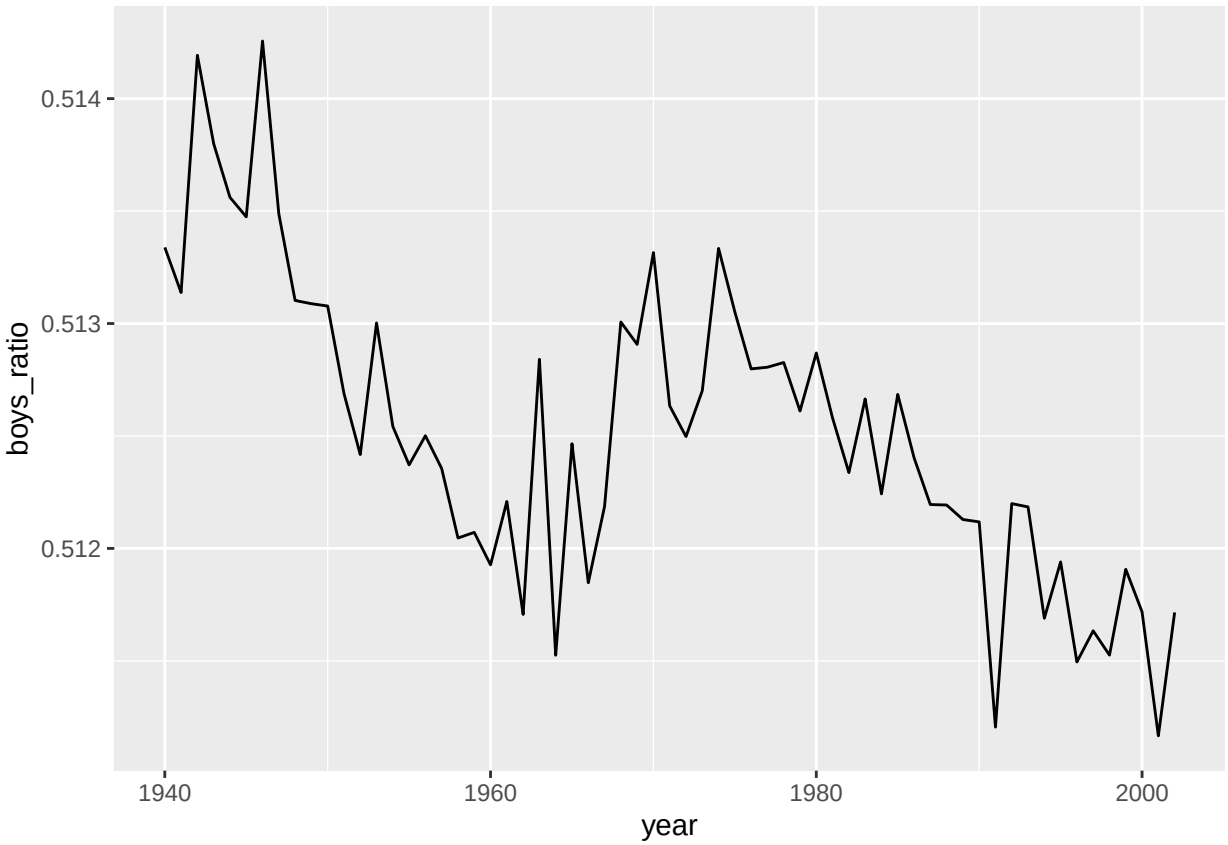
Setting up our boy-girl ratio column

```
present <- present %>% mutate(total = boys + girls)
present <- present %>% mutate(boys_ratio = boys / total)
head(present, 10)
```

```
## # A tibble: 10 x 5
##     year    boys   girls   total boys_ratio
##    <dbl>   <dbl>   <dbl>   <dbl>      <dbl>
##  1  1940 1211684 1148715 2360399      0.513
##  2  1941 1289734 1223693 2513427      0.513
##  3  1942 1444365 1364631 2808996      0.514
##  4  1943 1508959 1427901 2936860      0.514
##  5  1944 1435301 1359499 2794800      0.514
##  6  1945 1404587 1330869 2735456      0.513
##  7  1946 1691220 1597452 3288672      0.514
##  8  1947 1899876 1800064 3699940      0.513
##  9  1948 1813852 1721216 3535068      0.513
## 10  1949 1826352 1733177 3559529      0.513
```

Let's plot the ratio of boys born over time in our `present` dataset:

```
ggplot(data=present, aes(x=year, y=boys_ratio)) + geom_line()
```



While the ratio of boys born has stayed over 50%, it is experiencing a downward trend over time since 1940, the beginning of our dataset. The observation of boys being born more than girls from the `arbuthnot` dataset does hold up, but has decreased since 1940 in the US.

Exercise 7

```
# Truncating output to 10 rows for readability
head(present %>% arrange(desc(total)), 10)
```

```
## # A tibble: 10 x 5
##     year    boys   girls   total boys_ratio
##    <dbl>   <dbl>   <dbl>   <dbl>      <dbl>
##  1  1961 2186274 2082052 4268326      0.512
##  2  1960 2179708 2078142 4257850      0.512
##  3  1957 2179960 2074824 4254784      0.512
##  4  1959 2173638 2071158 4244796      0.512
##  5  1958 2152546 2051266 4203812      0.512
##  6  1962 2132466 2034896 4167362      0.512
##  7  1956 2133588 2029502 4163090      0.513
##  8  1990 2129495 2028717 4158212      0.512
##  9  1991 2101518 2009389 4110907      0.511
## 10  1963 2101632 1996388 4098020      0.513
```

We see the highest number of total births in the US come in 1961 with 4268326 total births (boys & girls). It's interesting to note that 8 of the top 10 years in terms of total births came during the baby boom years in the post-war era.