IS5 in R: Sample Surveys (Chapter 10)

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Introduction and background

This document is intended to help describe how to undertake analyses introduced as examples in the Fifth Edition of *Intro Stats* (2018) by De Veaux, Velleman, and Bock. More information about the book can be found at http://wps.aw.com/aw_deveaux_stats_series. This file as well as the associated R Markdown reproducible analysis source file used to create it can be found at http://nhorton.people.amherst.edu/is5.

This work leverages initiatives undertaken by Project MOSAIC (http://www.mosaic-web.org), an NSF-funded effort to improve the teaching of statistics, calculus, science and computing in the undergraduate curriculum. In particular, we utilize the `mosaic` package, which was written to simplify the use of R for introductory statistics courses. A short summary of the R needed to teach introductory statistics can be found in the mosaic package vignettes (http://cran.r-project.org/web/packages/mosaic). A paper describing the mosaic approach was published in the *R Journal*: https://journal.r-project.org/archive/2017/RJ-2017-024.

Chapter 10: Sample Surveys

```
library(mosaic)
library(readr)
library(janitor)
```

Section 10.1: The Three Big Ideas of Sampling

Section 10.2: Populations and Parameters

Section 10.3: Simple Random Samples

Random Matters

```
Births <- read_csv("http://nhorton.people.amherst.edu/is5/data/AllBirths1998.csv")
```

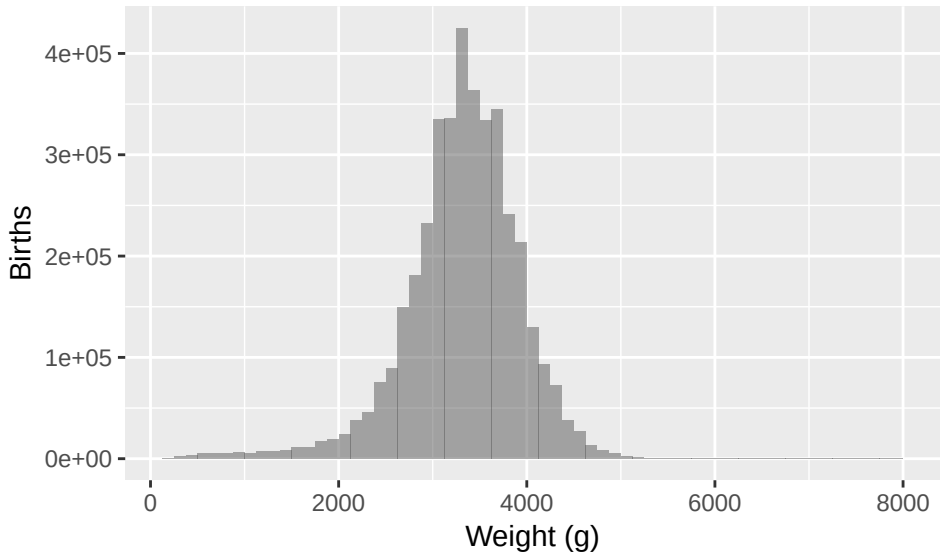
```
## Warning: Missing column names filled in: 'X1' [1]
```

```
## Parsed with column specification:
## cols(
##   X1 = col_integer(),
##   birthweight = col_integer()
## )
```

By default, `read_csv()` prints the variable names. These messages can be suppressed using the `message=FALSE` code chunk option to save space and improve readability.

```
# Histogram of known population
gf_histogram(~ birthweight, data = Births, binwidth = 125, center = 62.5) %>%
  gf_labs(x = "Weight (g)", y = "Births")
```

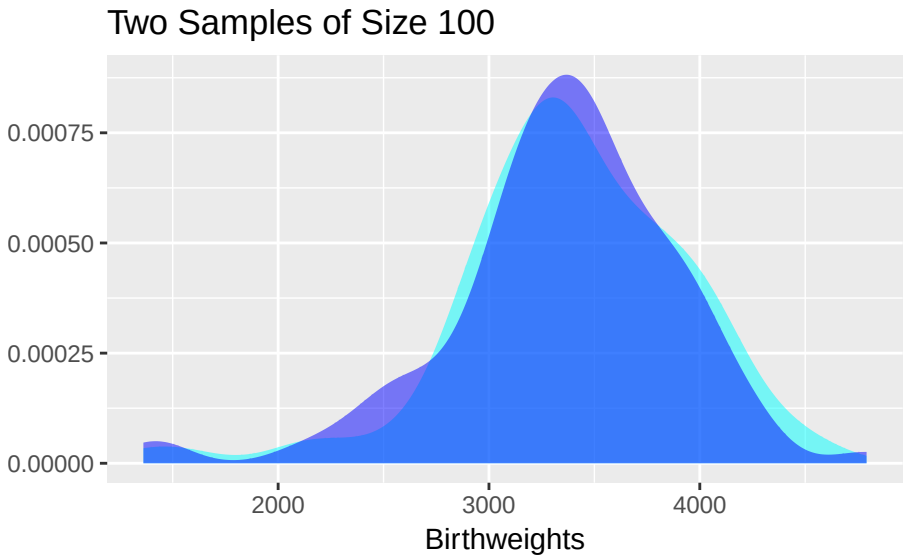
```
## Warning: Removed 4640 rows containing non-finite values (stat_bin).
```



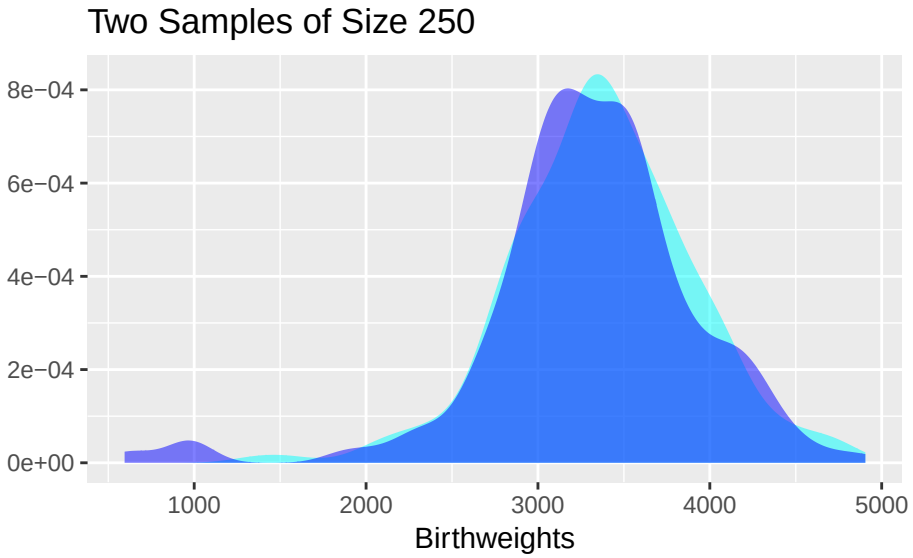
The histogram shows the distribution of the population of nearly four million births.

Figure 10.2 (page 326):

```
# Samples of 100
set.seed(12452)
gf_density(~ birthweight, data = sample(Births, size = 100), fill = 5) %>%
  gf_density(~ birthweight, data = sample(Births, size = 100),  fill = 4) %>%
  gf_labs(x = "Birthweights", y = "", title = "Two Samples of Size 100")
```



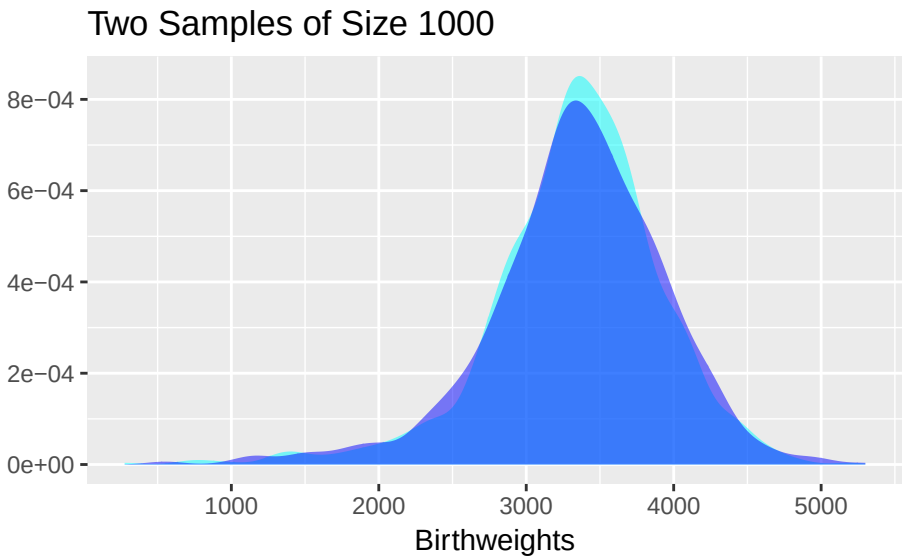

```
# Samples of 250
set.seed(12452)
gf_density(~ birthweight, data = sample(Births, size = 250), fill = 5) %>%
  gf_density(~ birthweight, data = sample(Births, size = 250), fill = 4) %>%
  gf_labs(x = "Birthweights", y = "", title = "Two Samples of Size 250")
```




```
# Samples of 1000
set.seed(12452)
gf_density(~ birthweight, data = sample(Births, size = 1000), fill = 5) %>%
  gf_density(~ birthweight, data = sample(Births, size = 1000), fill = 4) %>%
  gf_labs(x = "Birthweights", y = "", title = "Two Samples of Size 1000")
```

```
## Warning: Removed 3 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 1 rows containing non-finite values (stat_density).
```



Section 10.4: Other Sampling Designs

Section 10.5: From the Population to the Sample: You Can't Always Get What You Want

Section 10.6: The Valid Survey

Section 10.7: Common Sampling Mistakes, or How to Sample Badly