**Figure 1**

**Figure 2**

**Figure 3**

**Figure 4**

```
lm_mod <- lm(life_exp_at_birth ~ internet_usage_proportion, data = cia)
obs_slope <- lm_mod$coefficients[2]
summary(lm_mod)
```

```
##
## Call:
## lm(formula = life_exp_at_birth ~ internet_usage_proportion, data = cia)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -16.2903  -2.8736   0.1377   4.4186  11.1027
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 63.7069     0.6732   94.63   <2e-16 ***
## internet_usage_proportion   23.4594     1.6731   14.02   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.066 on 175 degrees of freedom
## Multiple R-squared:  0.5291, Adjusted R-squared:  0.5264
## F-statistic: 196.6 on 1 and 175 DF,  p-value: < 2.2e-16
```

```
plot4 <- lm_mod
```

**Figure 5**

```
set.seed(1009)
perm_slope <- cia %>%
   specify(life_exp_at_birth ~ internet_usage_proportion) %>%
   hypothesize(null = "independence") %>%
   generate(reps = 1000, type = "permute") %>%
   calculate(stat = "slope")

plot5 <- ggplot(data=perm_slope, aes(x=stat)) +
   geom_histogram(bins=100) +
   geom_vline(xintercept = obs_slope,
              color = "#F05133") + ggtitle("Figure 5")
  xlim(-30,30)
```

```
## <ScaleContinuousPosition>
##  Range:
##  Limits:  -30 --   30
```

**Figure 6**

```
lm_res <- resid(lm_mod)
lm_res <- data.frame(resid = lm_res)
```

```
lm_res <- lm_res %>% mutate(internet_usage_proportion = cia$internet_usage_proportion)
plot6 <- ggplot(data=lm_res, aes(x=resid))+
  geom_histogram(binwidth=1, color="black") +
  xlab("Residuals") +
  ylab("Frequency") +
  ggtitle("Figure 6: Histogram of Residuals")
```

**Figure 7**

```
plot7 <- ggplot(data=lm_res, aes(x = internet_usage_proportion, y =resid)) + geom_point(size = 1.5) +
  xlab("Internet Usage Proportion") +  ylab("Residual")  +
  geom_hline(yintercept=0, linetype='dashed', col = 'red') +
  ggtitle("Figure 7: Internet Usage Proportion vs Residuals")
```

**Figure 8**

```
set.seed(34209)
perm_ci <- cia %>%
  specify(life_exp_at_birth ~ internet_usage_proportion) %>%
  generate(reps = 1000, type = "bootstrap") %>%
  calculate(stat = "slope")
plot8 <- visualize(perm_ci)
```

**Figure 9**

```
alpha <- .05

#lower percentile cutoff
p_lower <- .025

#upper percentile cutoff
p_upper <- 1-(.025)

# Create a confidence interval of stat using quantiles
quantile(perm_ci$stat,c(p_lower,p_upper))
```

```
##     2.5%    97.5%
## 20.39227 26.50567
```

**Figure 10**

```
noafrica <- cia %>%
  filter(continent != "Africa")

plot10 <- ggplot (data=noafrica, aes(x=internet_usage_proportion, y=life_exp_at_birth)) +
  geom_point(aes(color = continent,size=density)) +
  xlab('Internet users / population') +
  ylab('Life Expentancy at birth') +
  ggtitle('Figure 10:  Africa Excluded')
```

**Figure 11**

```
lm_mod_noafrica <- lm(life_exp_at_birth ~ internet_usage_proportion, data=noafrica)
obs_slope_noafrica <- lm_mod_noafrica$coefficients[2]
obs_slope_noafrica
```

```
## internet_usage_proportion
##                  13.52906
```

```
summary(lm_mod_noafrica)
```

```
##
## Call:
## lm(formula = life_exp_at_birth ~ internet_usage_proportion, data = noafrica)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -19.4508  -2.3693   0.0082   2.6411   7.0030
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 69.5157     0.5602  124.08   <2e-16 ***
## internet_usage_proportion  13.5291     1.2007   11.27   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.678 on 127 degrees of freedom
## Multiple R-squared:  0.4999, Adjusted R-squared:  0.496
## F-statistic:   127 on 1 and 127 DF,  p-value: < 2.2e-16
```

```
plot11 <- lm_mod_noafrica
```

**Figure 12**

```
set.seed(1010)
perm_slope_noafrica <- noafrica %>%
   specify(life_exp_at_birth ~ internet_usage_proportion) %>%
   hypothesize(null = "independence") %>%
   generate(reps = 1000, type = "permute") %>%
   calculate(stat = "slope")

plot12 <- ggplot(data=perm_slope_noafrica, aes(x=stat)) +
   geom_histogram(bins=100) +
   geom_vline(xintercept = obs_slope_noafrica,
              color = "#F05133") +
   ggtitle("Figure 12")
  xlim(-20,20)
```

```
## <ScaleContinuousPosition>
##  Range:
##  Limits:  -20 --   20
```

**Figure 13**

```
set.seed(34210)
perm_ci_noafrica <- noafrica %>%
  specify(life_exp_at_birth ~ internet_usage_proportion) %>%
  generate(reps = 1000, type = "bootstrap") %>%
  calculate(stat = "slope")
plot13 <- visualize(perm_ci_noafrica)
```

**Figure 14**

```
alpha <- .05

#lower percentile cutoff
p_lower <- .025

#upper percentile cutoff
p_upper <- 1-(.025)

# Create a confidence interval of stat using quantiles
quantile(perm_ci_noafrica$stat,c(p_lower,p_upper))
```

```
##     2.5%    97.5%
## 11.10236 15.85847
```

**Figure 15**

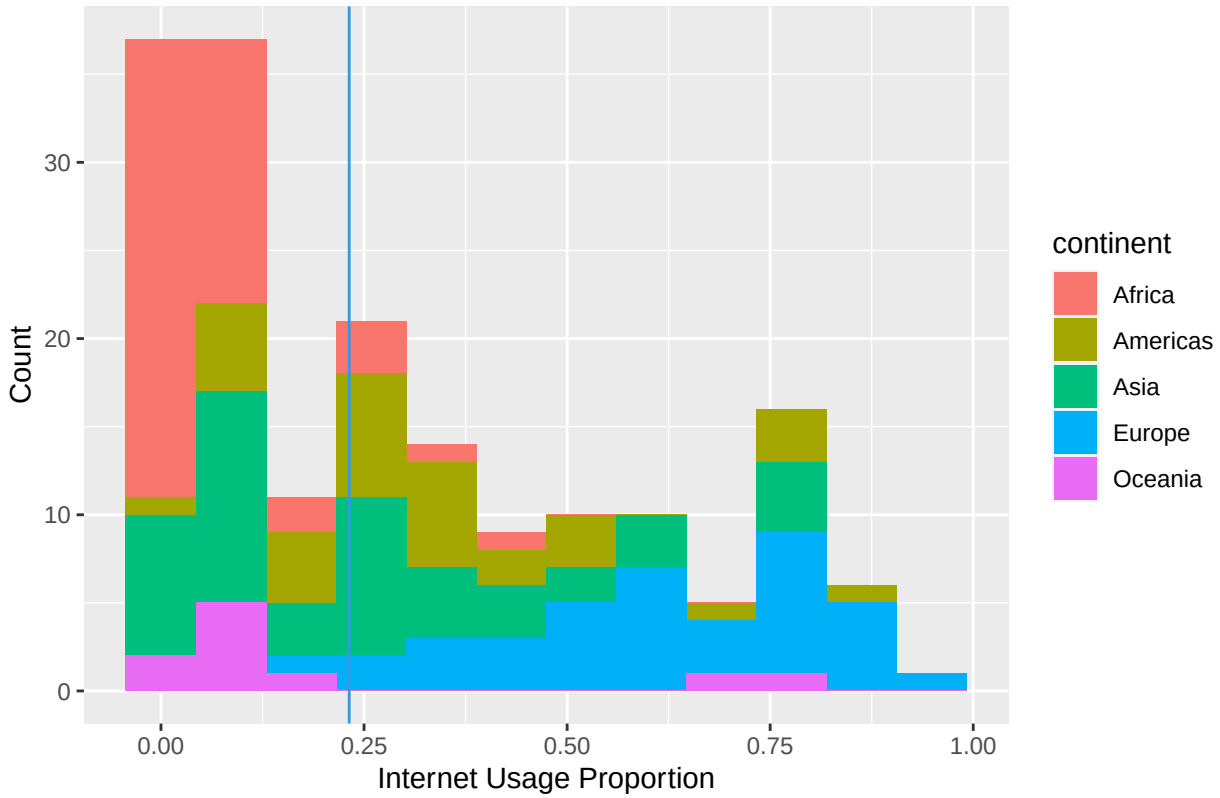
```
lm_res_noafrica <- resid(lm_mod_noafrica)
lm_res_noafrica <- data.frame(resid = lm_res_noafrica)
lm_res_noafrica <- lm_res_noafrica %>% mutate(internet_usage_proportion = noafrica$internet_usage_propo
plot15 <- ggplot(data=lm_res_noafrica, aes(x=resid)) + geom_histogram(binwidth=1, color="black") +
  xlab("Residuals") +  ylab("Frequency") + ggtitle("Figure 15: Histogram of Residuals with Africa Exclu
```

**Figure 16**

```
plot16 <- ggplot(data=lm_res_noafrica, aes(x = internet_usage_proportion, y =resid)) + geom_point(size =
  xlab("Internet Usage Proportion") +  ylab("Residual")  +
  geom_hline(yintercept=0, linetype='dashed', col = 'red') +
  ggtitle("Figure 16: Internet Usage Proportion vs Residuals with Africa Excluded")
```

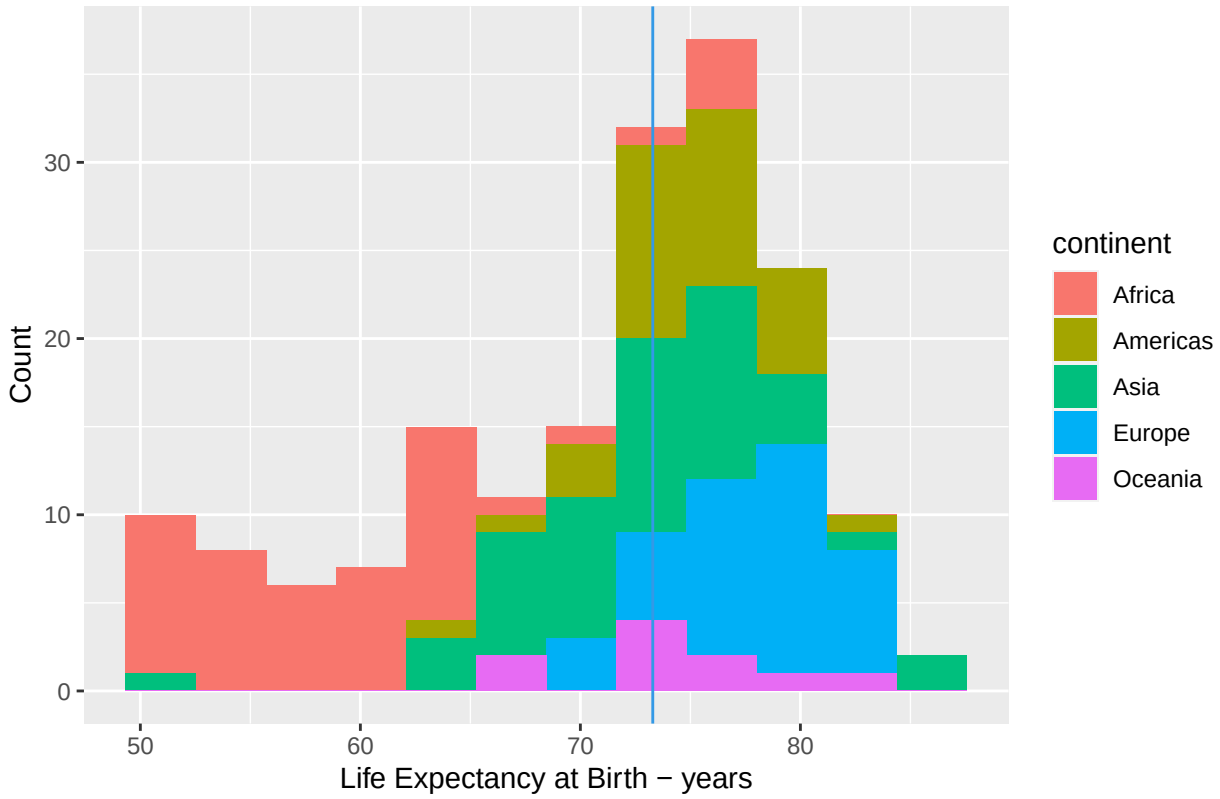
```
plot2
```

Figure 2




```
plot3
```

Figure 3




```
grid.arrange(plot1, plot10, ncol=2)
```

Figure 1

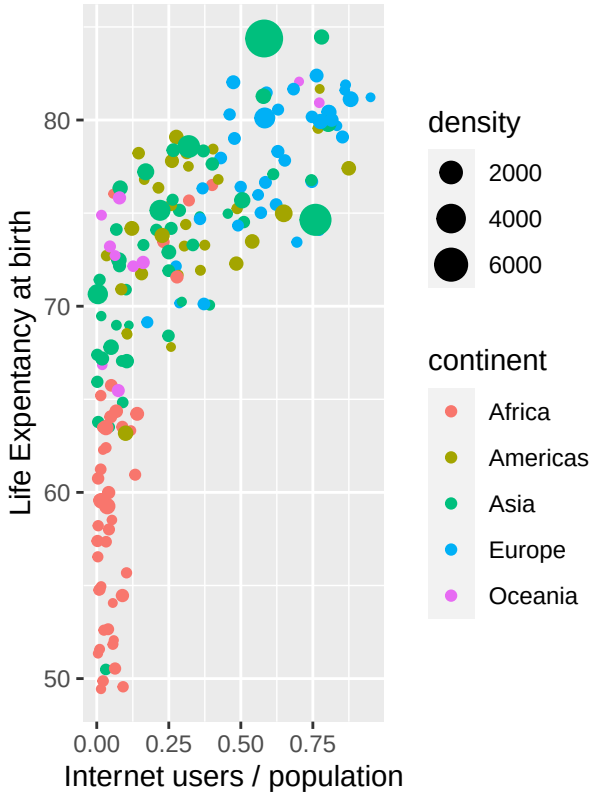
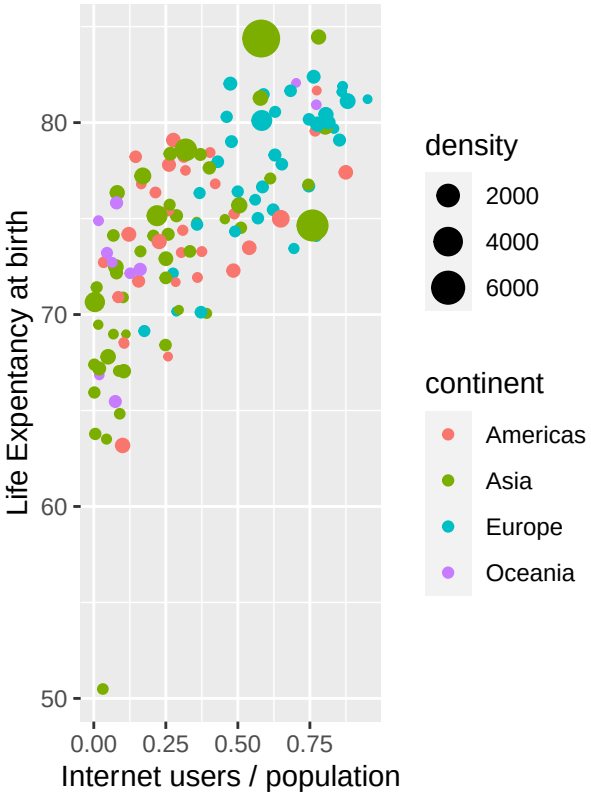
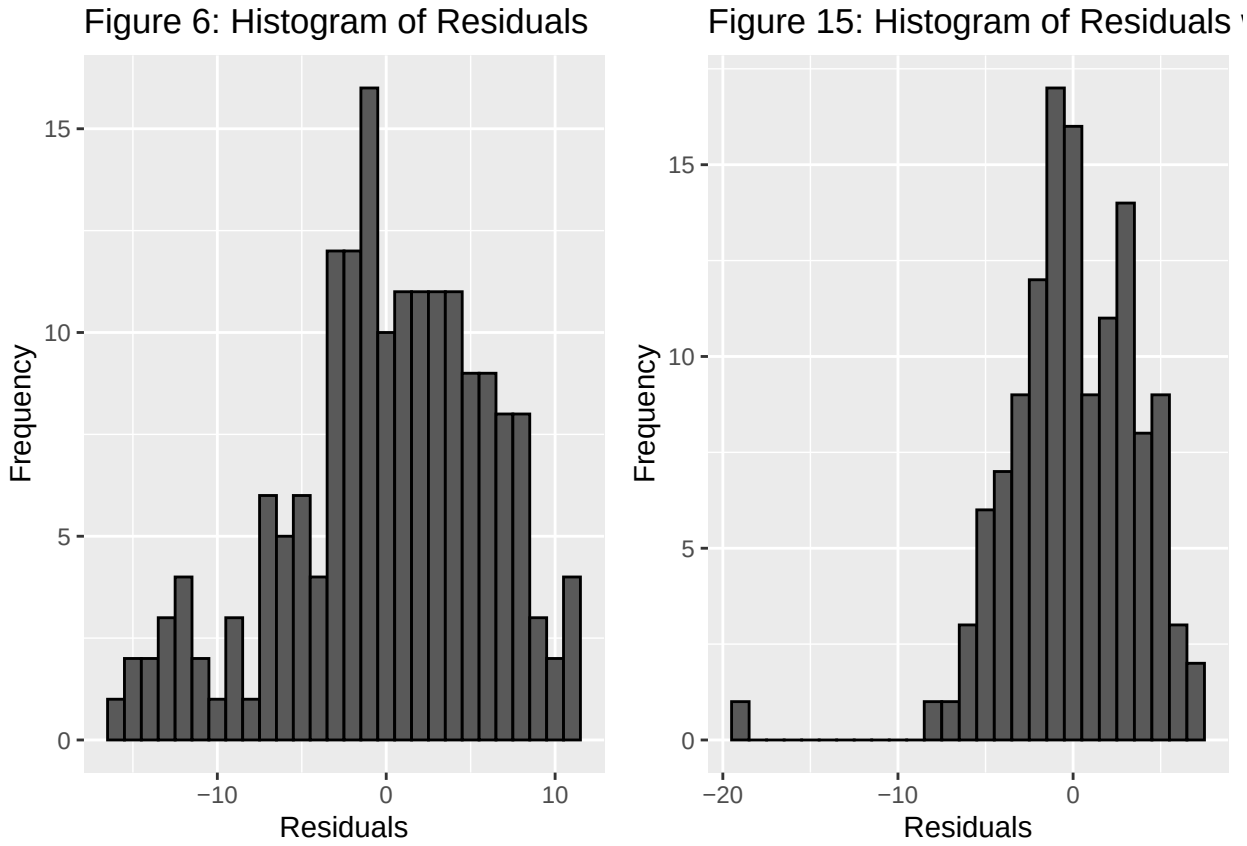



Figure 10: Africa Excluded




```
grid.arrange(plot6, plot15, ncol=2)
```




```
grid.arrange(plot7, plot16, ncol=2)
```

Figure 7: Internet Usage Proportic

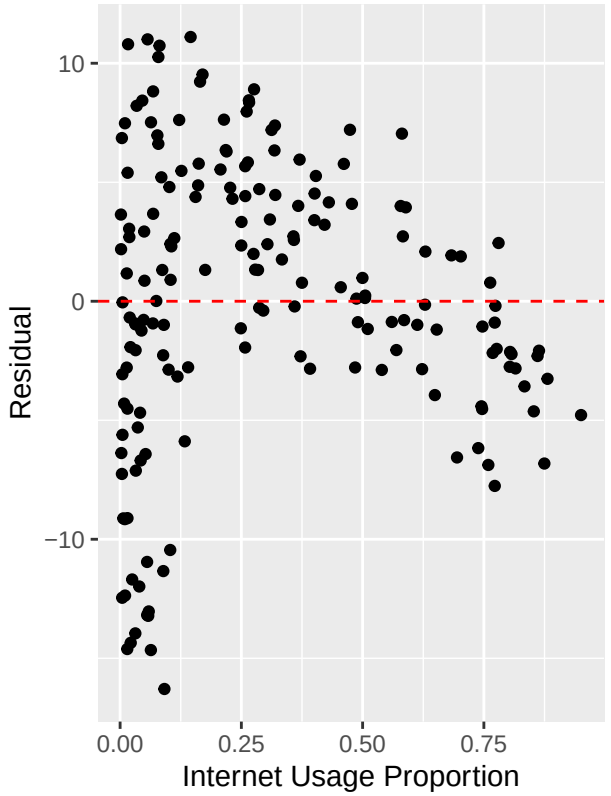
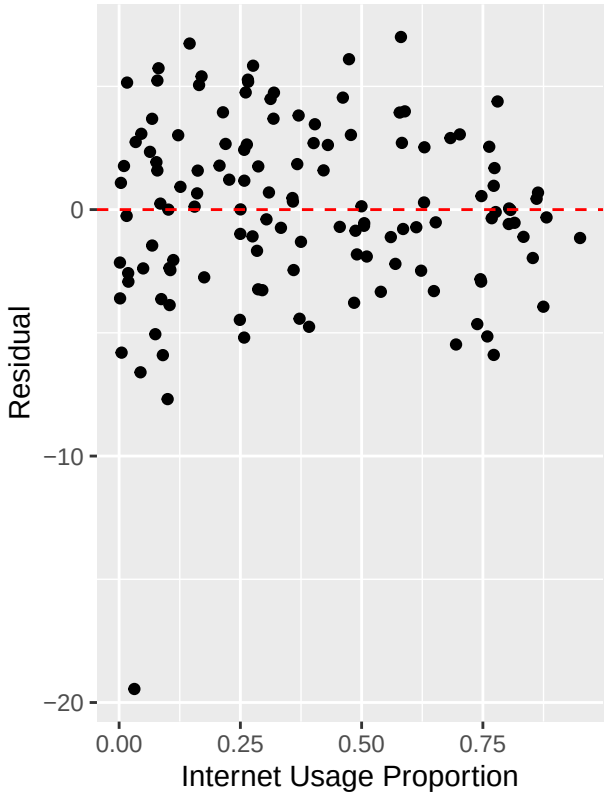


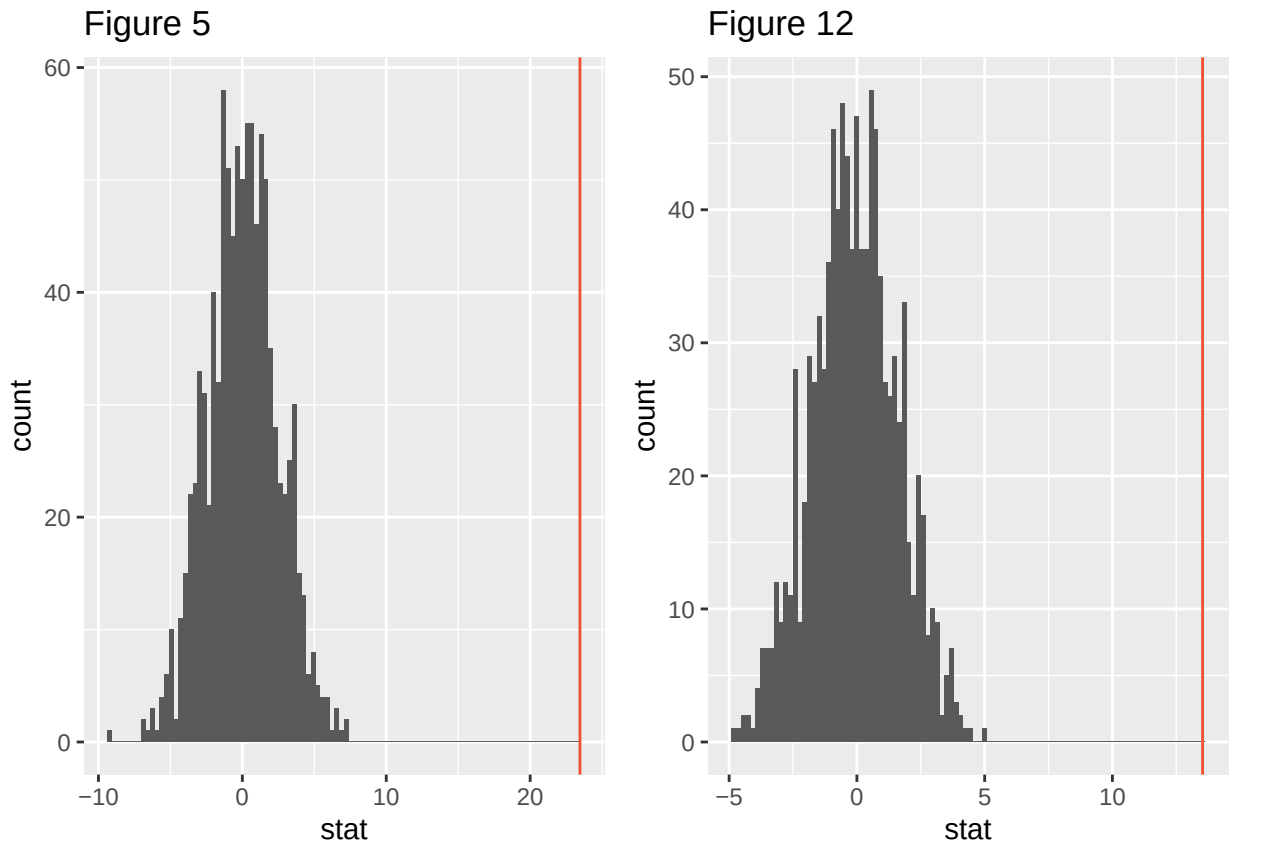

Figure 16: Internet Usage Proport



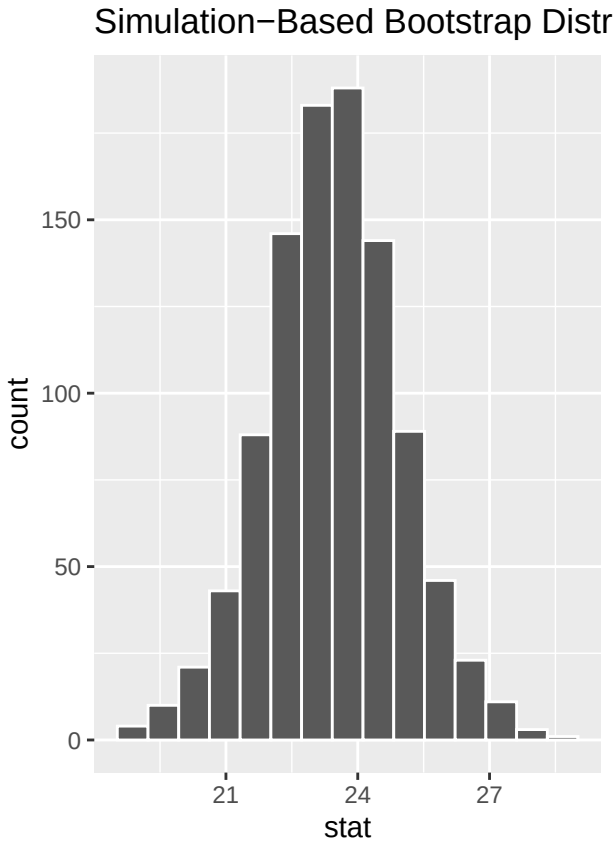

```
plot4
```

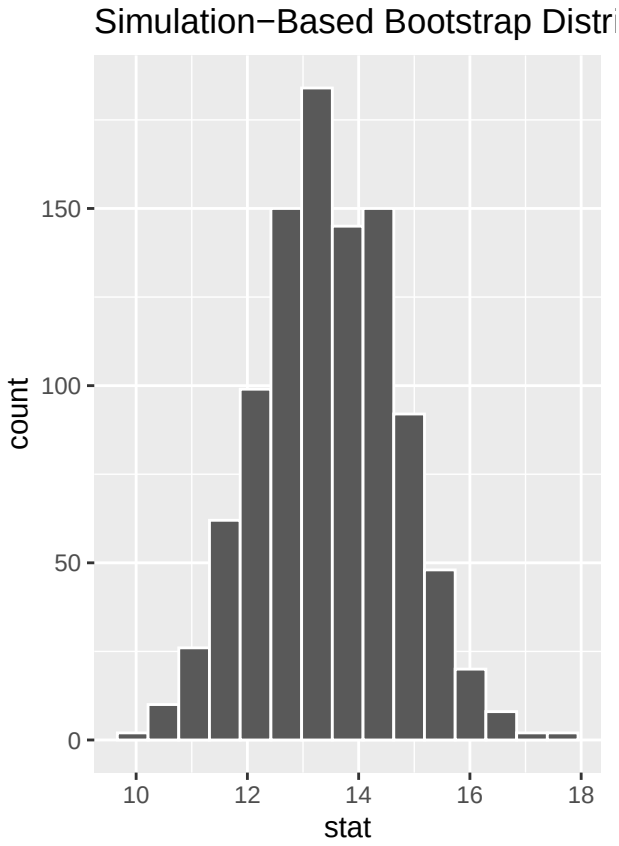
```
##
## Call:
## lm(formula = life_exp_at_birth ~ internet_usage_proportion, data = cia)
##
## Coefficients:
##                (Intercept)  internet_usage_proportion
##                      63.71                     23.46
```

```
grid.arrange(plot5, plot12, ncol=2)
```




```
grid.arrange(plot8, plot13, ncol=2)
```


Simulation−Based Bootstrap Distr
count
150
100
50
0
21
24
27
stat


Simulation−Based Bootstrap Distri
count
150
100
50
0
10
12
14
16
18
stat