# STAT 217: Quiz 23

1. A high respiratory rate is a potential diagnostic indicator of respiratory infection in children. To judge whether a respiratory rate is truly high, a physician must have a clear picture of the distribution of normal respiratory rates. To this end, Italian researchers measured the respiratory rates of 618 children between the ages of 15 days and 3 years.

```
##
## Call:
## lm(formula = log.rate ~ Age, data = kids)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -0.626 -0.132 -0.004  0.135  0.548
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.845119   0.012628   304.5   <2e-16 ***
## Age         -0.019009   0.000736   -25.8   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.196 on 616 degrees of freedom
## Multiple R-squared:  0.52,Adjusted R-squared:  0.519
## F-statistic:  668 on 1 and 616 DF,  p-value: <2e-16
##                 2.5 %   97.5 %
## (Intercept)  3.82032  3.86992
## Age         -0.02045 -0.01756
```

   (a) Conduct a hypothesis test for the slope coefficient and write your conclusion in the context of the problem. Only write your evidence sentence here.

   (b) Provide an interpretation of $b_1$ on the original scale.

2. Biological Pest Control. In a study of the effectiveness of biological control of the exotic weed tansy ragwort, researches manipulated the exposure to the ragwort flea beetle on 15 plots that had been planted with high density of ragwort. Harvesting the plots the next season, they measured the average dry mass of ragwort remaining (grams/plant) and the flea beetle load (beetles/gram of ragwort dry mass) to see if the ragwort plants in plots with high flea beetle loads were smaller as a result of herbivory by the beetles.

```
##
## Call:
## lm(formula = log.mass ~ log.load)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.5422 -1.0413  0.0641  1.4054  2.2460
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)    7.988      1.384    5.77  6.4e-05 ***
## log.load      -1.685      0.264   -6.38  2.4e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.65 on 13 degrees of freedom
## Multiple R-squared:  0.758,Adjusted R-squared:  0.739
## F-statistic: 40.7 on 1 and 13 DF,  p-value: 2.41e-05
##              2.5 % 97.5 %
## (Intercept)  4.999 10.977
## log.load    -2.256 -1.115
```

(a) Conduct a hypothesis test for the slope coefficient and write your conclusion in the context of the problem. Only write your evidence sentence here.

(b) Provide an interpretation of $b_1$ on the original scale.

3. The data come from the United Nations website showing CO2 consumption per capita (in metric tons) between the years of 1990 to 2010. We will examine this relationship.

```
##
## Call:
## lm(formula = Value ~ log.year, data = c02)
##
## Residuals:
##    Min     1Q Median     3Q    Max
##  -5.13  -4.33  -2.49   1.96  63.75
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -302.8      265.1   -1.14     0.25
## log.year        40.5       34.9    1.16     0.25
##
## Residual standard error: 6.85 on 4270 degrees of freedom
## Multiple R-squared:  0.000315,Adjusted R-squared:  8.13e-05
## F-statistic: 1.35 on 1 and 4270 DF,  p-value: 0.246
##               2.5 % 97.5 %
## (Intercept) -822.53  217.0
## log.year     -27.89  108.9
```

(a) Conduct a hypothesis test for the slope coefficient and write your conclusion in the context of the problem. Only write your evidence sentence here.

(b) Provide an interpretation of $b_1$ on the original scale.