1. Two quantitative variables – plots and linear models. \( \hat{y} = b_0 + b_1 x \).

2. Data collection schemes – the same three (one population, many populations, an experiment)

3. A statistical model.
   
   (a) The mean of \( y \) given \( x \) is \( \mu_y = \beta_0 + \beta_1 x \).
   
   (b) An individual observation \( y \) is given by \( y = \beta_0 + \beta_1 x + \varepsilon \) where \( \varepsilon \) is a random error.

4. Conditions on \( \varepsilon \)
   
   (a) The mean of \( \varepsilon \) is 0
   
   (b) The variance of \( \varepsilon \) is a constant, \( \sigma^2 \)
   
   (c) \( \varepsilon \) follows a normal model

5. Push the magic regression button

   ```r
   > lcensus=lm(undercount~minority,data=Ericksen)
   > summary(lcensus)
   ```

   Call:
   `lm(formula = undercount ~ minority, data = Ericksen)`

   Residuals:
   Min 1Q Median 3Q Max
   -3.9302 -1.2390 0.0676 0.9355 4.0625

   Coefficients:
   Estimate Std. Error t value Pr(>|t|)
   (Intercept) -0.005076 0.327215 -0.016 0.988
   minority 0.099100 0.012549 7.897 4.9e-11 ***
   ---
   Signif. codes: 0 *** 0.001 ** 0.01 * 0.05 . 0.1 1

   Residual standard error: 1.772 on 64 degrees of freedom
   Multiple R-squared: 0.4935, Adjusted R-squared: 0.4856
   F-statistic: 62.36 on 1 and 64 DF, p-value: 4.9e-11

6. Assumptions and conditions

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>Straight enough</td>
</tr>
<tr>
<td>Independence</td>
<td>Randomization</td>
</tr>
<tr>
<td>Equal variance</td>
<td>Plot thickens</td>
</tr>
<tr>
<td>Normal population</td>
<td>Nearly normal, Outlier</td>
</tr>
</tbody>
</table>

**Homework**

1. Read Chapter 27, pages 672–681.

2. For practice do problems 27.1, 3

3. To turn in on Friday, April 23, do problem 27.20.
> lcensus

Call:
  lm(formula = undercount ~ minority, data = Ericksen)

Coefficients:
(Intercept) minority
  -0.005076  0.099100

> summary(lrust)

Call:
  lm(formula = loss ~ Fe, data = corrosion)

Residuals:
  Min 1Q Median 3Q Max
-3.7980 -1.9464  0.2971  0.9924  5.7429

Coefficients:
  Estimate Std. Error t value Pr(>|t|)
(Intercept)  129.787  1.403   92.52  < 2e-16 ***
Fe          -24.020  1.280  -18.77  1.06e-09 ***
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1 1

Residual standard error: 3.058 on 11 degrees of freedom
Multiple R-squared:  0.9697, Adjusted R-squared:  0.967
F-statistic: 352.3 on 1 and 11 DF, p-value: 1.055e-09

> lclass

Call:
  lm(formula = Hand ~ Height, data = class)

Coefficients:
(Intercept) Height
  -4.7883  0.3756

> lmorley

Call:
  lm(formula = Speed[-1] ~ Speed[-100])

Coefficients:
(Intercept) Speed[-100]
  396.0836   0.5355