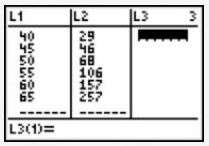
CASE CLOSED

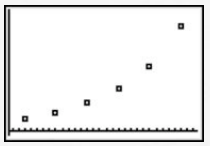
It's a Matter of Life and Death
Chapter 4

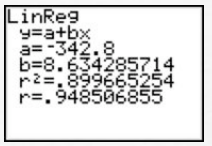
AP Stats at LSHS

Mr. Molesky

I: Determining Premiums



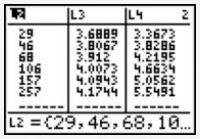


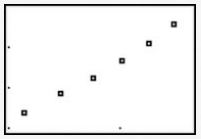


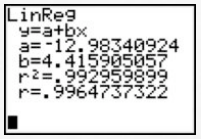
- ☑ There appears to be a moderate, positive, nonlinear relationship between age and monthly premium.
- ☑ A linear prediction model {premium = a + b(age)} may produce decent predictions, but we can probably do better with one of the following…
  - ☑ Exponential: premium = AB^x
  - ☑ Power: premium = Ax^B

I: Power Model?

Transform data and plot (ln(age), ln(premium)):



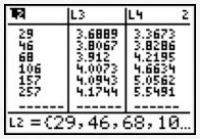


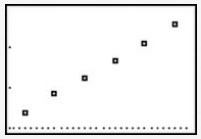


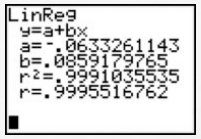
- ☑ There is a strong positive linear relationship between ln(age) and ln(premium). Therefore, a power model may be appropriate to predict premium from age.
  - ☑ ln(premium) = -12.983 + 4.416(ln(age))
  - ☑ Power Model: premium = $(0.0000023)x^{4.416}$

I: Exponential Model?

Transform data and plot (age, ln(premium)):



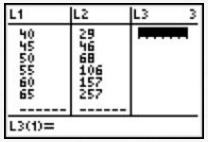


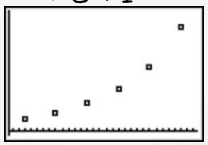


- ☑ There is a strong positive linear relationship between age and ln(premium). So, an exponential model may be appropriate to predict premium from age.
  - ☑ ln(premium) = -0.063 + 0.086(age)
  - ☑ Exponential Model: premium = $(0.939)(1.089)^x$

I: Prediction Model

Based on the transformed data, an exponential model best fits the original (age, premium) data.

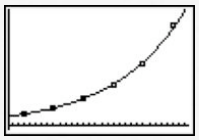


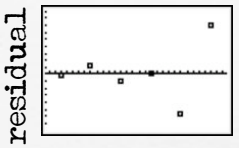


- Exponential Model: $\hat{premium} = (0.939)(1.089)^{x}$
- 58 year-old : premium $= (0.939)(1.089)^{58}$
- 58 year-old : premium $= \$136.99$
- 68 year-old : premium $= \$323.47$

I: How Comfortable are you?

Construct and Interpret a Residual Plot.

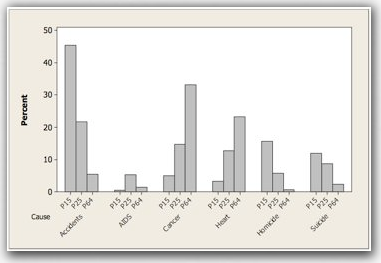


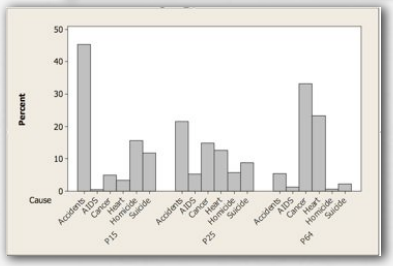


- The exponential function "fits" the data well. The residual plot shows no clear pattern, suggesting the exponential model provides an excellent fit. It does seem to be more accurate for younger ages, though.
- The r and r^2 suggest an excellent fit as well.

II: Death Statistics

	15 to 24 years	25 to 44 years	45 to 64 years
Accidents	45.32%	21.60%	5.42%
AIDS	0.52%	5.34%	1.35%
Cancer	4.93%	14.77%	33.16%
Heart disease	3.28%	12.63%	23.27%
Homicide	15.59%	5.71%	0.63%
Suicide	11.87%	8.73%	2.30%





- Leading cause of death differs by age group.
  - Accidents are leading cause for younger
  - Cancer and Heart disease lead for older…

III: Stay Fitter, Live Longer

a. The chance of dying for men over 65 is cut in half for those who walk 2 miles a day compared to those who don't.

Why can't we say exercise causes lower mortality?

Confounding….individuals who exercise regularly may have other characteristics that contribute to longer lives {diet, habits, etc.}.