Simple Linear Regression

Used to characterize the relationship between two variables, usually called the independent variable (x) and the dependent variable (y)

$$y = b_0 + b_1 x + \text{random error}$$

Dependent Variable = Intercept + Slope x Independent Variable + Random Error

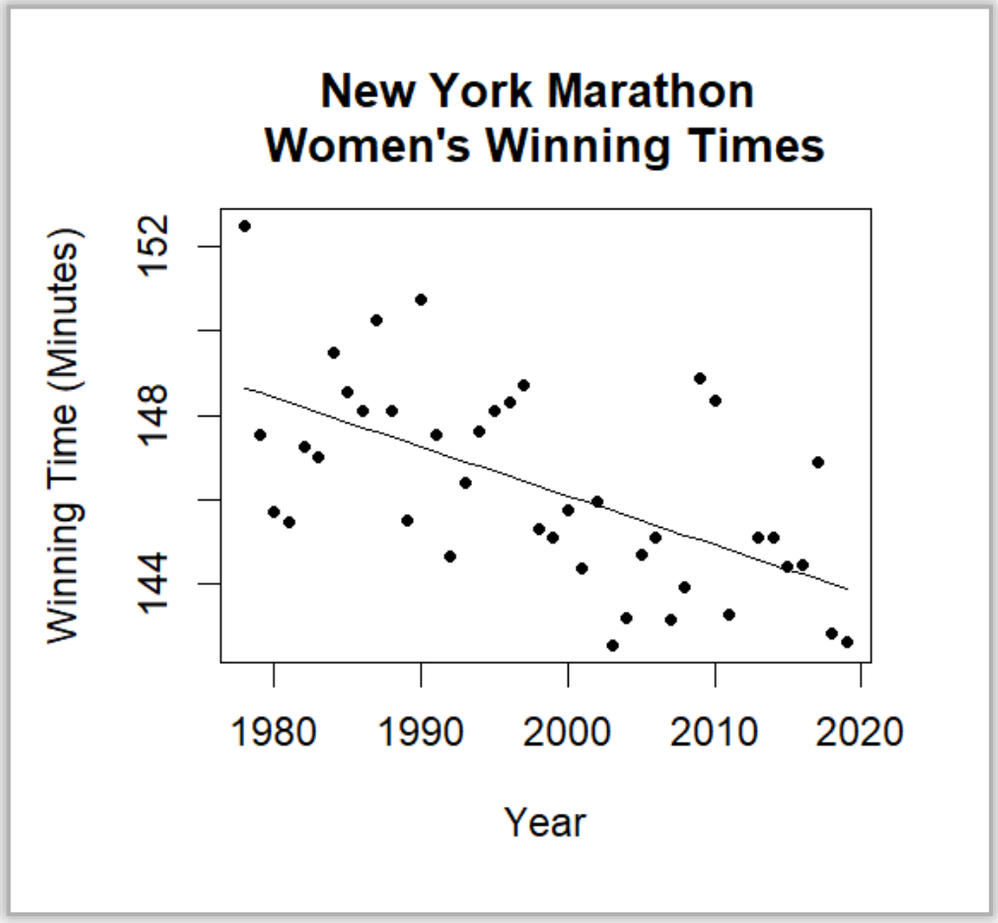
Linear Regression Example

- Women's winning times in the New York Marathon, 1978-2019

Parameter	Estimate (Est.)	Std. Error (SE)	t value (=Est./SE)	P-Value
b_0	379	49.78	7.613	3.13E-09
b_1	-0.1165	0.02491	-4.674	3.48E-05

- The P-Values are: =0.000000000313 and 0.00000348

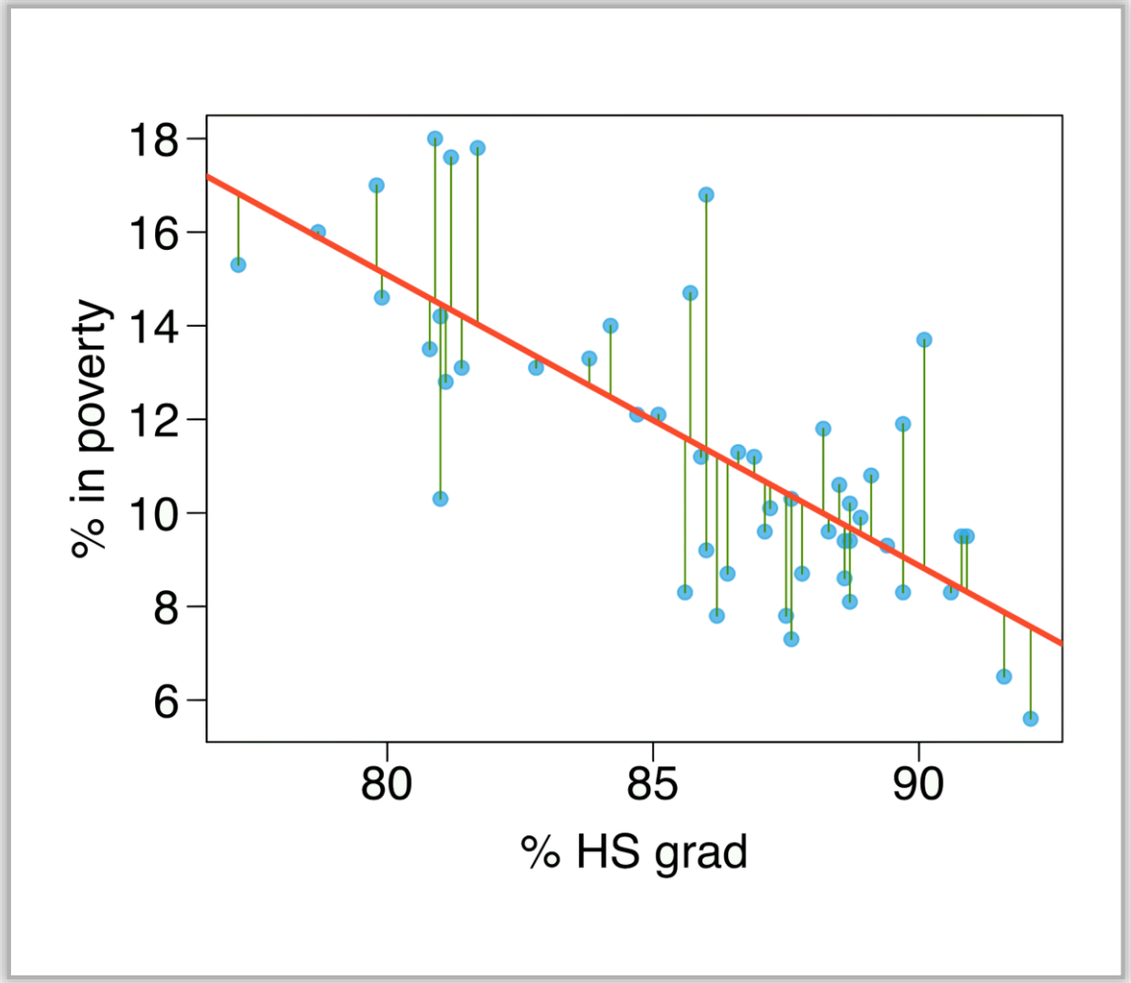
- Overwhelming evidence of a downward trend



From Diez et al, Open Intro Statistics

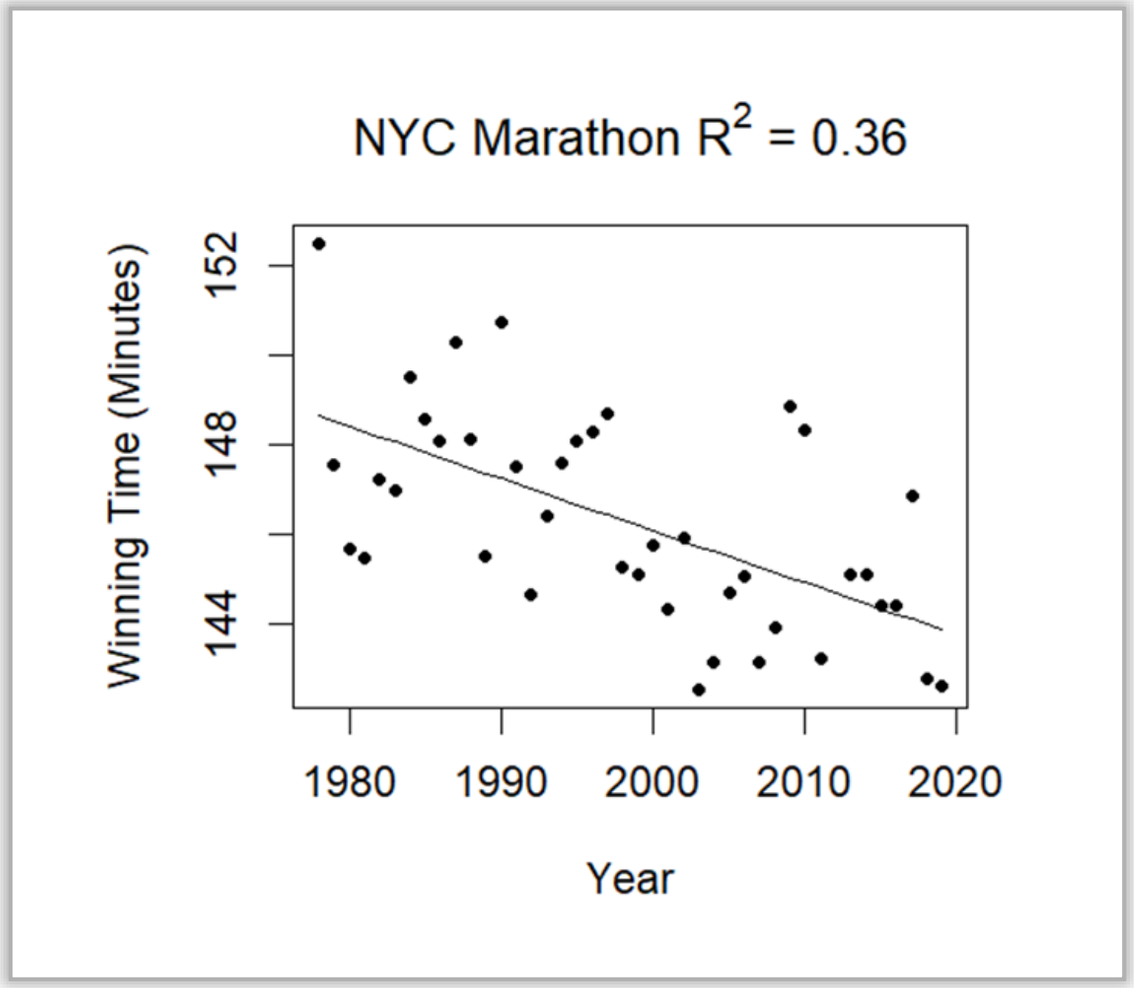
Linear Regression

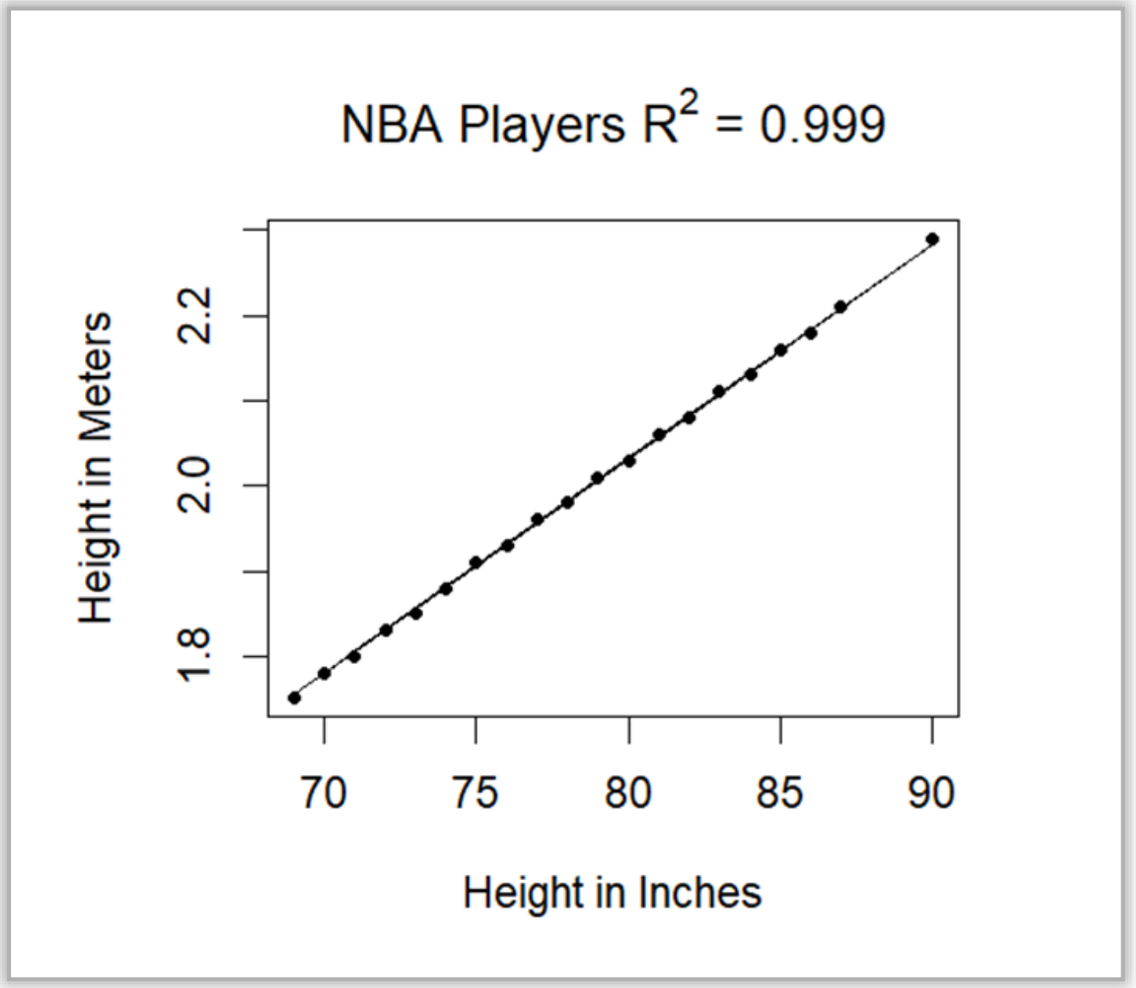
R2 (“R-squared”)
is a common measure
of how close
the regression is
to a straight line



From Diez et al, Open Intro Statistics

Linear Regression





From Diez et al, Open Intro Statistics

Tobacco Road Marathon (2024)