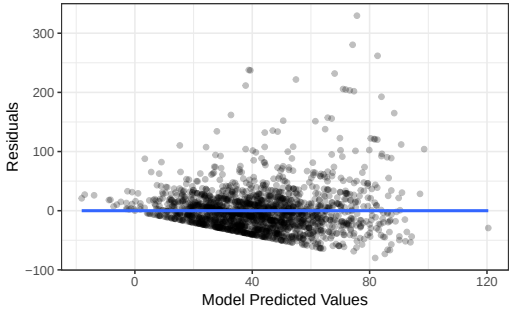
Today's Agenda

Practice fitting, evaluating and making point estimates using multiple linear regression models (ch 6)

Justin Leinaweaver (Spring 2022)

	Earnings (2021 USD)
Age	0.47*
	(0.05)
Education	5.42*
	(0.35)
Exercise	0.95*
	(0.41)
Height	2.84*
	(0.24)
Mother's Education	−241.27*
	(16.34)
Observations	1,813
Adjusted R^2	0.21
Residual Std. Error	37.43 (df = 1808)
F Statistic	118.04* (df = 4; 1808)
Note:	*p < 0.05



	age	education	exercise	height
age	1	-0.15	-0.33	-0.14
education	-0.15	1	0.18	0.11
exercise	-0.33	0.18	1	0.22
height	-0.14	0.11	0.22	1

For Today - Make Predictions (w/ 95% PIs)

Establish a baseline prediction for a hypothetical person who is 25 (Age), Education 13, Exercise 1, Height 67

Then calculate the predicted income if:

1. Finish college? (16)
2. Finish grad school? (18)
3. Increase exercise to 1x / week? (4)
4. Increase exercise to 3x / week? (7)

	Earnings (2021 USD)
Age	0.47*
	(0.05)
Education	5.42*
	(0.35)
Exercise	0.95*
	(0.41)
Height	2.84*
	(0.24)
Mother's Education	−241.27*
	(16.34)
Observations	1,813
Adjusted R^2	0.21
Residual Std. Error	37.43 (df = 1808)
F Statistic	118.04* (df = 4; 1808)
Note:	*p < 0.05

Prediction	Low	Estimate	High
Baseline	-44.9	29.9	104.7
Finish College	-28.7	46.1	120.9
Finish Grad School	-17.9	56.9	131.7

Prediction	Low	Estimate	High
Baseline	-44.9	29.9	104.7
Exercise 1x / week	-42.2	32.6	107.4
Exercise >3x	-39.5	35.3	110.1

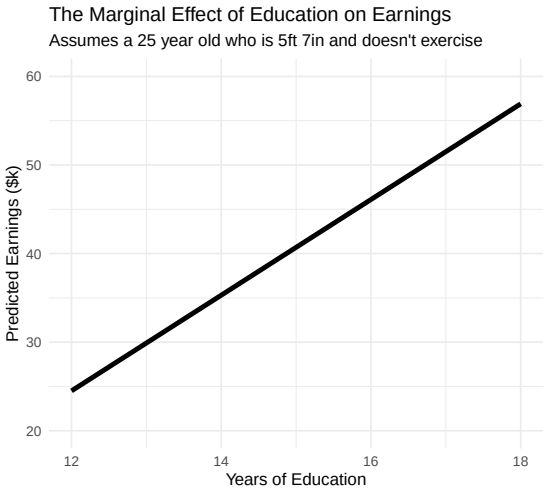
	Earnings (2021 USD)
Age	0.47*
	(0.05)
Education	5.42*
	(0.35)
Exercise	0.95*
	(0.41)
Height	2.84*
	(0.24)
Mother's Education	−241.27*
	(16.34)
Observations	1,813
Adjusted R^2	0.21
Residual Std. Error	37.43 (df = 1808)
F Statistic	118.04* (df = 4; 1808)
Note:	*p < 0.05

Education	Prediction
12	
13	
14	
15	
16	$46.1k
17	
18	$56.9k

	Earnings (2021 USD)
Age	0.47*
	(0.05)
Education	5.42*
	(0.35)
Exercise	0.95*
	(0.41)
Height	2.84*
	(0.24)
Mother's Education	−241.27*
	(16.34)
Observations	1,813
Adjusted R^2	0.21
Residual Std. Error	37.43 (df = 1808)
F Statistic	118.04* (df = 4; 1808)
Note:	*p < 0.05

Education	Prediction
12	$24.5k
13	$29.9k
14	$35.3k
15	$40.7k
16	$46.1k
17	$51.5k
18	$56.9k

Education	Prediction
12	$24.5k
13	$29.9k
14	$35.3k
15	$40.7k
16	$46.1k
17	$51.5k
18	$56.9k

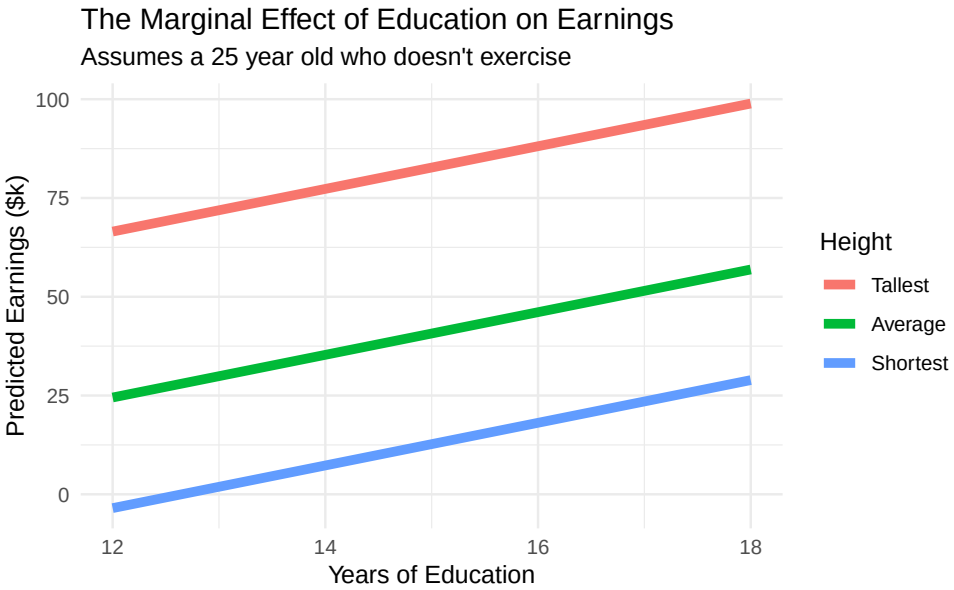


Average Height (5'7")

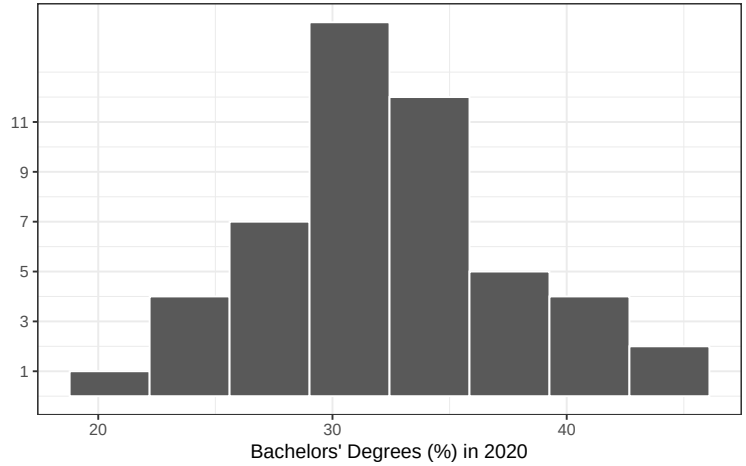
Education	Prediction
12	$24.5
13	$29.9
14	$35.3
15	$40.7
16	$46.1
17	$51.5
18	$56.9

Tallest Height (6'10")

Education	Prediction
12	$66.5
13	$71.9
14	$77.3
15	$82.7
16	$88.1
17	$93.5
18	$98.9


The Marginal Effect of Education on Earnings
Assumes a 25 year old who doesn't exercise
Predicted Earnings ($k)
100
75
50
25
0
12
14
16
18
Years of Education
Height
Tallest
Average
Shortest

What is the "best" model of bachelor's degree completion in dataset 1?



What is the "best" model of bachelor's degree completion in dataset 1?

1. Choose the logical predictors
2. Fit a simple OLS regression to each predictor
3. Fit a multiple regression with the "best" of those
4. Evaluate the model using all five steps
5. Use the model to make predictions

What is the "best" model of bachelor's degree completion in dataset 1?

Outcome

- Bachelors' Degrees

Predictors to Consider

- GDP (Billions), GDP (Rate), Homeownership, Manufacturing employment, Minimum wage, Population, Rental Vacancy Rate, State Tax Rate on Wages, Unemployment

Common Regression Mistakes (Wheelan ch12)

1. Linear regression on nonlinear relationships
2. Correlation does not equal causation
3. Reverse causality
4. Omitted variable bias (too few variables)
5. Highly correlated explanatory variables (multicollinearity)
6. Extrapolating beyond the data
7. Data mining (too many variables)