

National Home Values and Pricing Factors

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Cities Becoming Unaffordable

Affordable Housing Crisis Spreads Throughout World

Shortages persist despite millions of dollars invested and hundreds of thousands of units built



“..cities around the world, from New York to London to Stockholm to Sydney, are struggling to solve growing affordable housing crises.”

The IPO Millionaires Are Coming!

As tech companies get ready for initial public offerings, their employees await newfound wealth. Silicon Valley's luxury firms are already making their pitches; heli-skiing in Greenland.



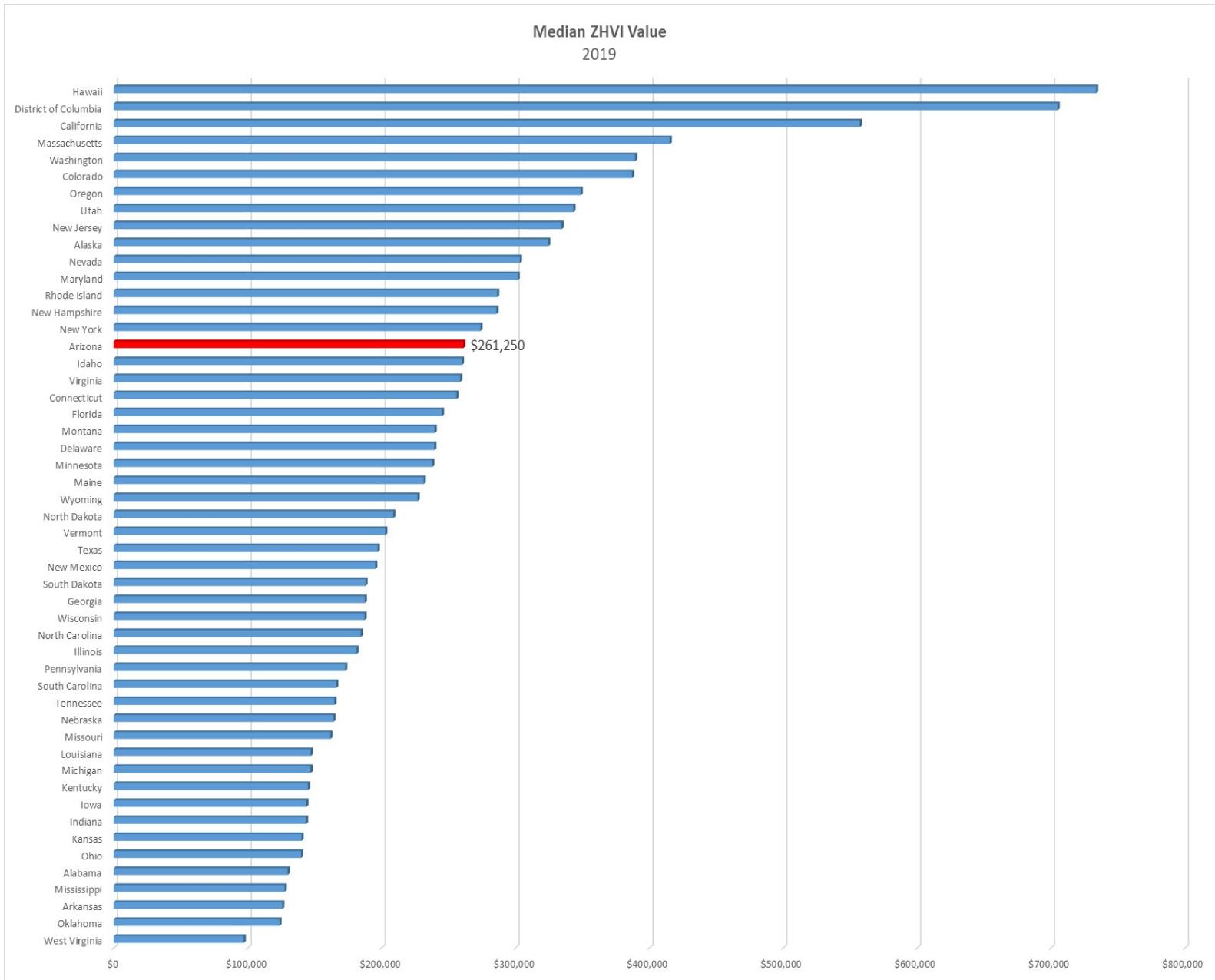
“Restricted housing supply, growing demand and wealth will mean that the minimum price to buy any home in San Francisco’s most desirable neighborhoods, like Pacific Heights, Russian Hill and Cow Hollow, in five years will be \$1 million.”

Data Analysis: National Housing Costs and Pricing Factors

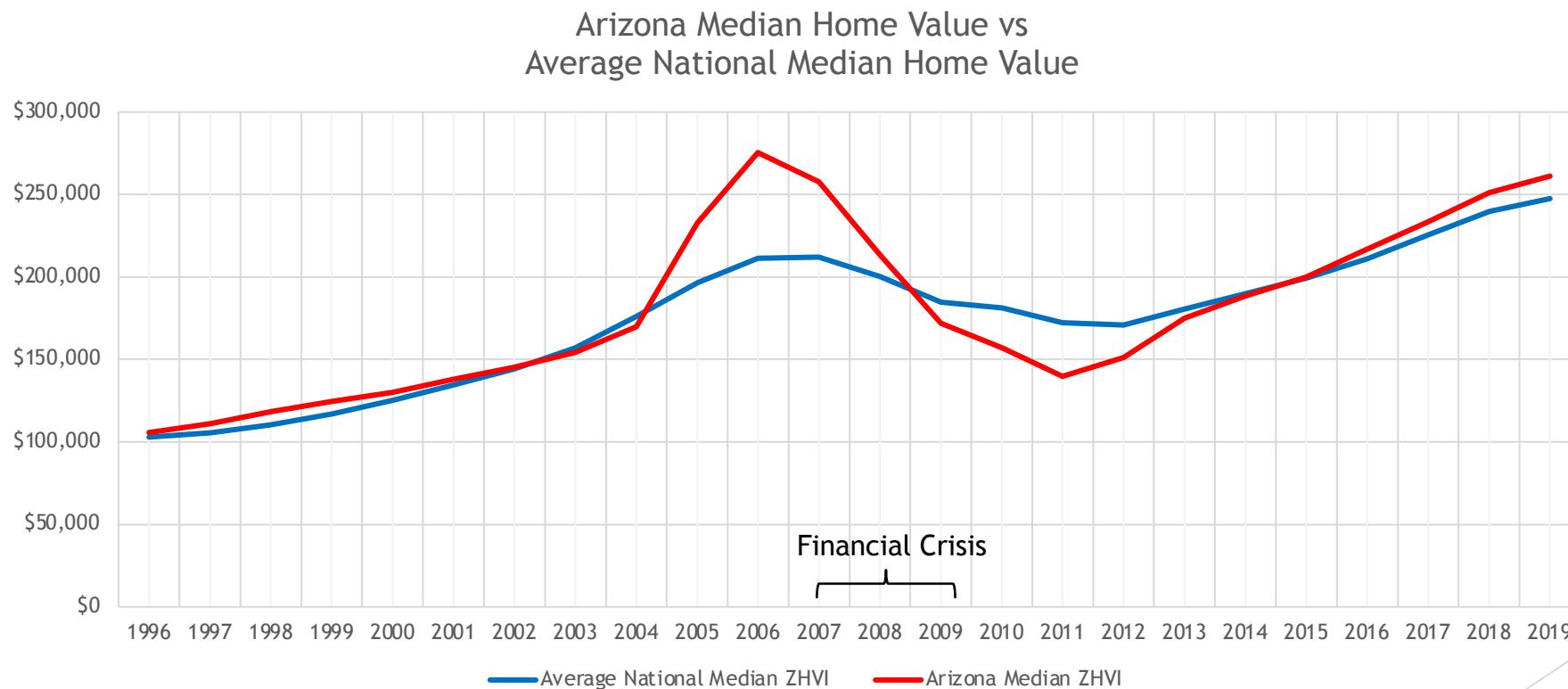
- ▶ National Home Values
 - ▶ Zillow Real Estate
 - ▶ Zillow Home Value Index (ZHVI)
 - ▶ Provides an estimate of residential real estate value using a combination of prior sales, county records, tax assessments, real estate listings, mortgage information and GIS data.
- ▶ Pricing Factors
 - ▶ Market size (geographic & population)
 - ▶ Education Data
 - ▶ Arizona Department of Education
 - ▶ Crime Data
 - ▶ Federal Bureau of Investigation



Median Home Values per State

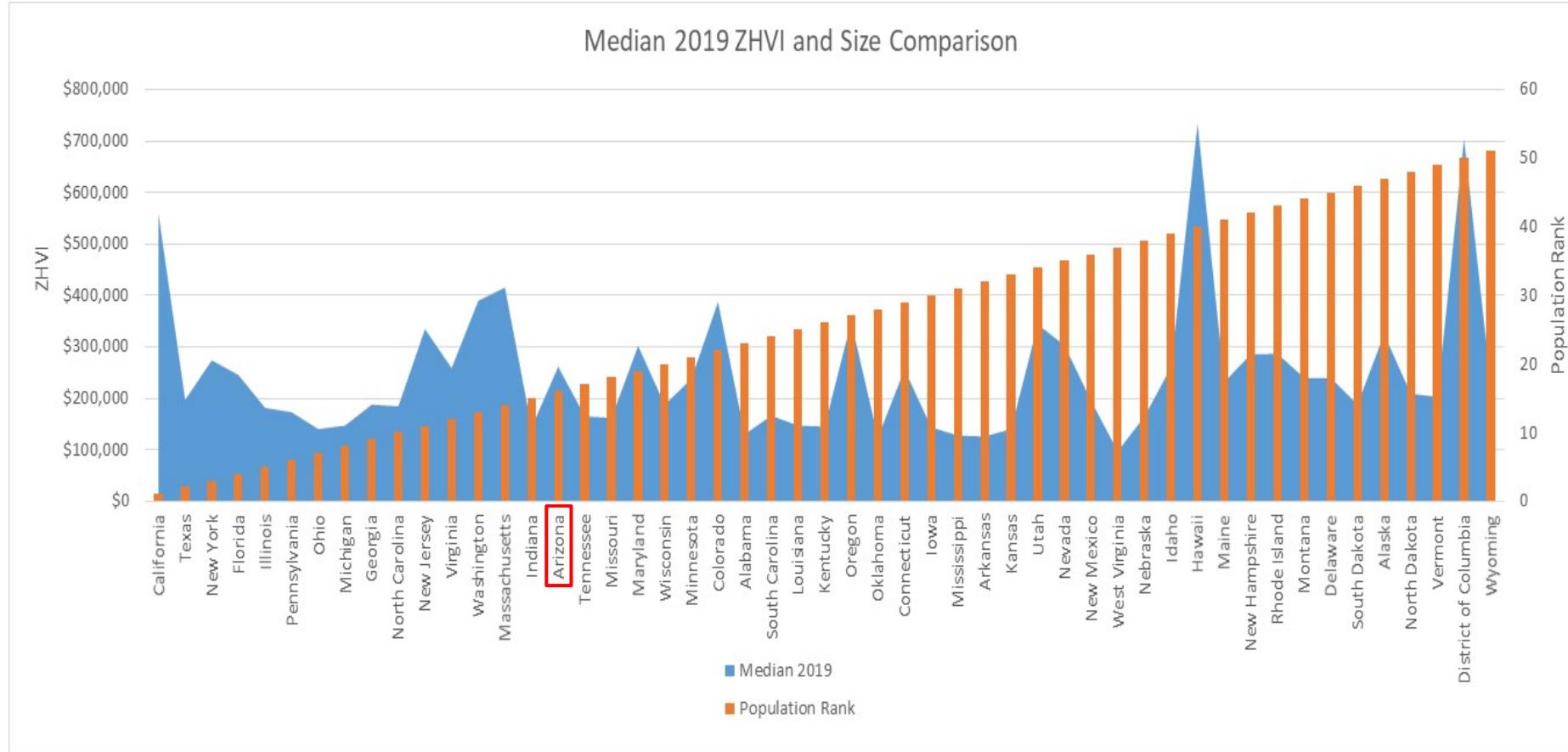


Arizona vs National Average Historical Price Appreciation



Pricing Factor: Population

State Median Home Value vs Population



State Median Home Value vs State Population Rank

```
> size
[1] 37 28 32 31 23 7 33 15 30 26 8 25 18 38 17 24 6 5 10 20 9 46 36 2 49 48 51 41 21 45 44 4 29 12 39 16
3 42 43 19 35 47 11
[44] 34 27 22 13 14 1 50 40
> zhvi_states
[1] 97150 123850 125950 127750 129950 140050 140300 143700 143900 145100 147100 147150 161900 164200 164850 166
250 172950 181450
[19] 184550 187400 187550 188050 195350 197200 202850 208850 226950 231550 238000 239500 239750 245200 256100 258
800 260050 261250
[37] 273900 285900 286450 301750 303400 324600 334600 343450 348850 387200 389500 415300 557300 705000 733800
> plot(size,zhvi_states,xlab = "State Population Rank",ylab = "Median Home Value per State")
> regress.plot<-lm(zhvi_states~size)
> abline(regress.plot)
> summary(regress.plot)

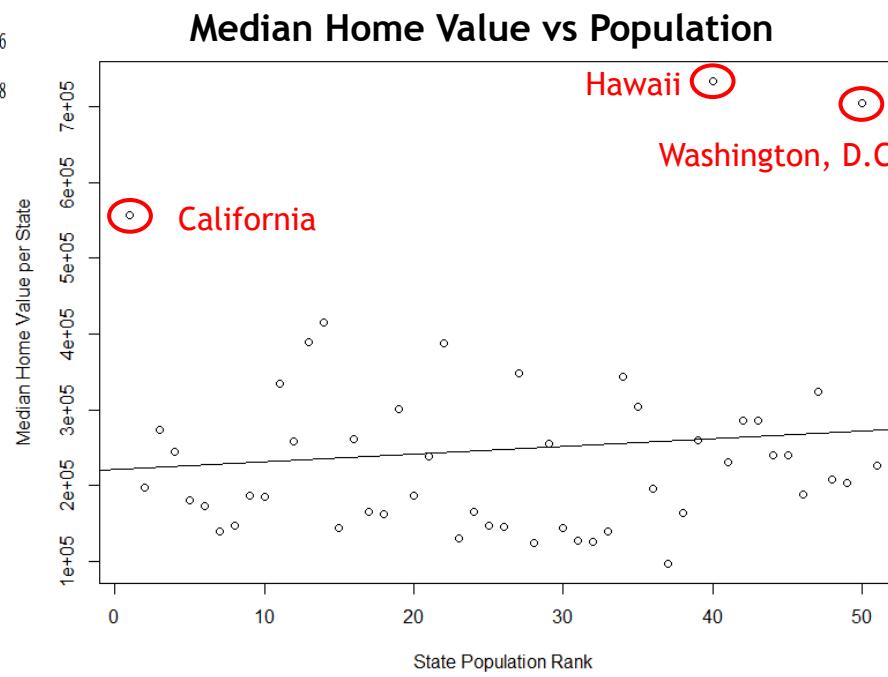
Call:
lm(formula = zhvi_states ~ size)

Residuals:
    Min      1Q  Median      3Q     Max 
-161391 -80947 -42937  36085  472253 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept) 221469    37650  5.882 3.55e-07 ***
size        1002     1260   0.795   0.43      
---
Signif. codes:  0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 132500 on 49 degrees of freedom
Multiple R-squared:  0.01274, Adjusted R-squared:  0.007411 
F-statistic: 0.6322 on 1 and 49 DF   p-value: 0.4304

> cor(size,zhvi_states)
[1] 0.1128608
```



AZ Home Value vs Math Proficiency

```
> math  
[1] 44 38 32 38 38 32 34 36 32 27 25 34 42  
> zhvi  
[1] 285800 217300 215950 309800 226950 149000 361300 147800 201900 160150 211250 145500 166150  
> plot(math,zhvi)  
> regress.plot<-lm(zhvi~math)  
> abline(regress.plot)  
> summary(regress.plot)
```

Call:
`lm(formula = zhvi ~ math)`

Residuals:

Min	1Q	Median	3Q	Max
-73710	-56889	-3989	29141	148617

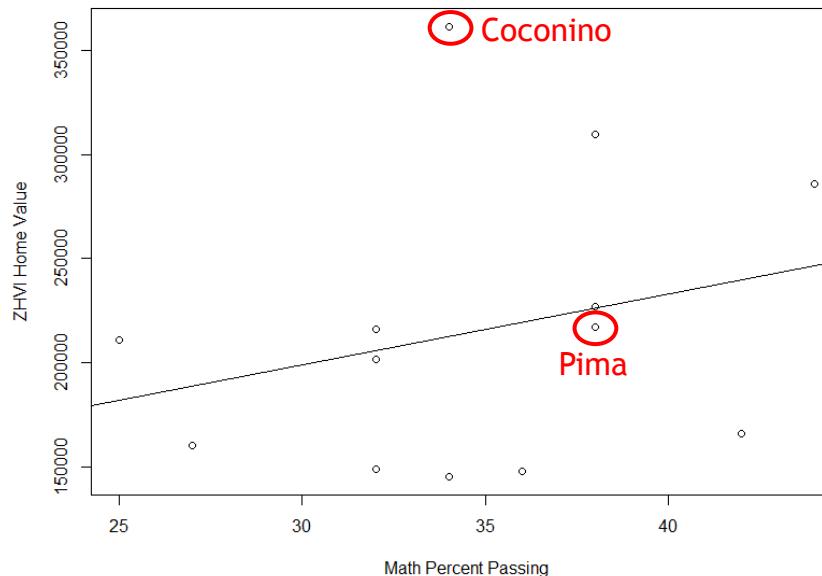
Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	97181	127631	0.761	0.462
math	3397	3631	0.936	0.370

Residual standard error: 67050 on 11 degrees of freedom
Multiple R-squared: 0.07373, Adjusted R-squared: -0.01048
F-statistic: 0.8755 on 1 and 11 DF, p-value: 0.3695

```
> cor(math,zhvi)  
[1] 0.2715263
```

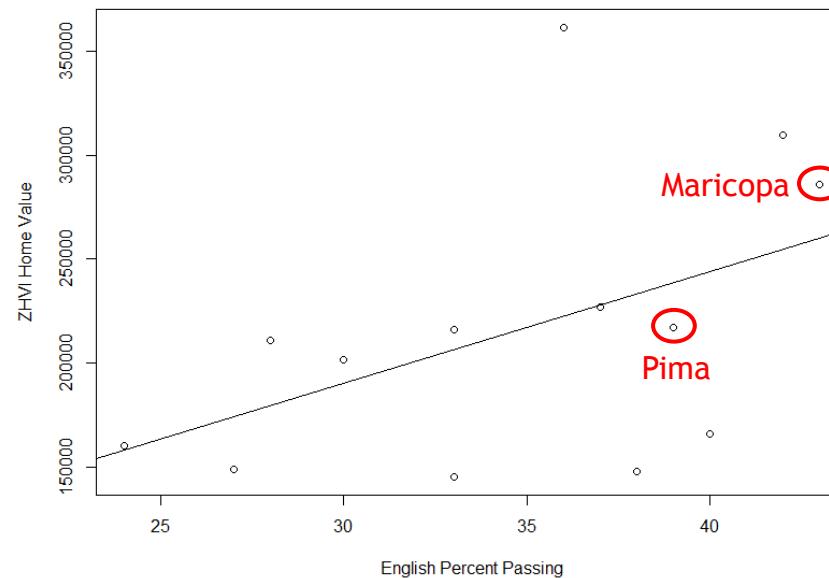
Home Value and Math Proficiency
AZ Counties



AZ Home Value vs English Proficiency

```
> eng  
[1] 43 39 33 42 37 27 36 38 30 24 28 33 40  
> zhvi  
[1] 285800 217300 215950 309800 226950 149000  
[7] 361300 147800 201900 160150 211250 145500  
[13] 166150  
> plot(eng,zhvi,xlab = "English Percent Passing",ylab = "ZHVI Home Value")  
> regress.plot<-lm(zhvi~eng)  
> abline(regress.plot)  
> summary(regress.plot)  
  
Call:  
lm(formula = zhvi ~ eng)  
  
Residuals:  
    Min      1Q Median      3Q     Max  
-85668 -25408   1849  25486 138570  
  
Coefficients:  
            Estimate Std. Error t value Pr(>|t|)  
(Intercept) 29443     104633   0.281   0.7836  
eng          5369      2982   1.801   0.0992 .  
---  
Signif. codes:  
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
Residual standard error: 62050 on 11 degrees of freedom  
Multiple R-squared:  0.2277 , Adjusted R-squared:  0.1575  
F-statistic: 3.243 on 1 and 11 DF, p-value: 0.09919  
  
> cor(eng,zhvi)  
[1] 0.4771547
```

Home Value and English Proficiency
AZ Counties



State Median Home Value vs Violent Crime Rate

```
> vrate
[1] 302.0 406.0 480.1 278.5 427.4 284.9
[7] 348.6 365.3 273.5 211.6 427.3 514.7
[13] 442.9 280.4 608.4 497.7 314.1 370.0
[19] 329.5 290.3 377.3 326.5 597.4 405.9
[25] 99.3 265.1 195.5 127.8 229.1 489.1
[31] 323.7 540.5 236.9 196.2 212.2 399.9
[37] 381.8 196.1 219.2 446.1 635.6 635.8
[43] 261.2 215.6 232.3 309.1 285.2 391.4
[49] 396.1 1244.4 259.2

> zhvi_states
[1] 97150 123850 125950 127750 129950 140050
[7] 140300 143700 143900 145100 147100 147150
[13] 161900 164200 164850 166250 172950 181450
[19] 184550 187400 187550 188050 195350 197200
[25] 202850 208850 226950 231550 238000 239500
[31] 239750 245200 256100 258800 260050 261250
[37] 273900 285900 286450 301750 303400 324600
[43] 334600 343450 348850 387200 389500 415300
[49] 557300 705000 733800

> plot(vrate,zhvi_states,xlab = "Violent Crime Rate per State", ylab = "Median Home Value per State")
> regress.plot<-lm(zhvi_states~vrate)
> abline(regress.plot)
> summary(regress.plot)

Call:
lm(formula = zhvi_states ~ vrate)

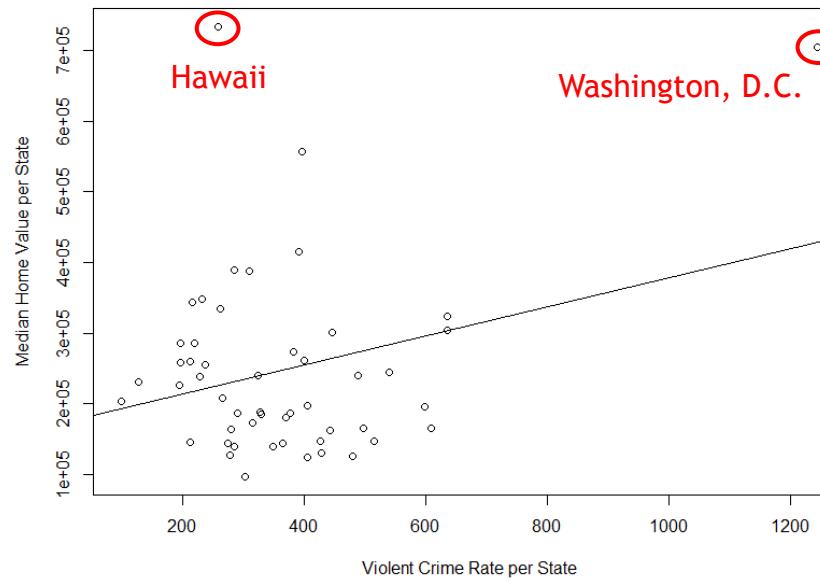
Residuals:
    Min      1Q  Median      3Q     Max 
-145469 -95673 -33778  40663  508013 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept) 172242.6   40960.8   4.205 0.00011 ***
vrate        206.6     101.1   2.044 0.04637 *  
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 

Residual standard error: 128000 on 49 degrees of freedom
Multiple R-squared:  0.07855, Adjusted R-squared:  0.05974 
F-statistic: 4.177 on 1 and 49 DF,  p-value: 0.04637

> cor(vrate,zhvi_states)
[1] 0.2802616
```

Median Home Value vs Violent Crime Rate



State Median Home Value vs Property Crime Rate

```
> prate
[1] 2034.7 2990.7 3338.0 2921.2 3177.6 2799.1
[7] 2735.2 2649.4 2093.8 2246.9 2043.9 3458.8
[13] 2906.5 2523.5 3060.6 3460.3 1931.7 2075.9
[19] 2873.1 2088.3 3281.2 1863.9 3542.3 3019.4
[25] 1524.4 2110.3 1964.7 1986.4 2297.5 2982.0
[31] 2472.9 3415.5 1920.4 1930.3 1854.8 3197.5
[37] 1718.2 1962.7 2173.6 2507.5 2625.4 2760.0
[43] 1734.1 2878.5 2879.0 2530.1 3706.1 1857.1
[49] 2441.1 5182.5 3050.0

> zhvi_states
[1] 97150 123850 125950 127750 129950 140050
[7] 140300 143700 143900 145100 147100 147150
[13] 161900 164200 164850 166250 172950 181450
[19] 184550 187400 187550 188050 195350 197200
[25] 202850 208850 226950 231550 238000 239500
[31] 239750 245200 256100 258800 260050 261250
[37] 273900 285900 286450 301750 303400 324600
[43] 334600 343450 348850 387200 389500 415300
[49] 557300 705000 733800

> plot(prate,zhvi_states,xlab = "Property Crime Rate per State", ylab = "Median Home Value per State")
> regress.plot<-lm(zhvi_states~prate)
> abline(regress.plot)
> summary(regress.plot)

Call:
lm(formula = zhvi_states ~ prate)

Residuals:
    Min      1Q      Median      3Q      Max 
-157704 -95833 -23084  59517 464314 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept) 119436.32 72279.54 1.652 0.1048    
prate        49.20   26.88  1.830 0.0733    

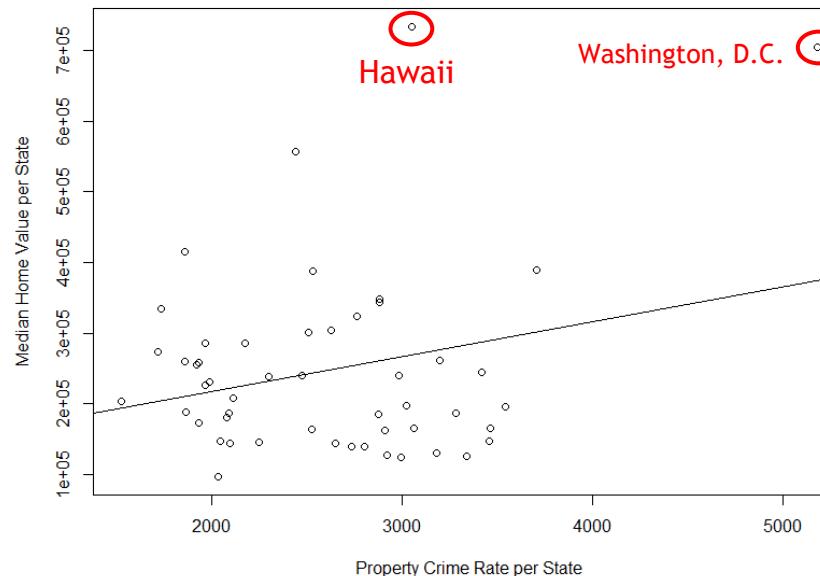
```

```
(Intercept)
prate
---
signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 129000 on 49 degrees of freedom
Multiple R-squared:  0.06398, Adjusted R-squared:  0.04488 
F-statistic: 3.349 on 1 and 49 DF,  p-value: 0.07332
```

```
> cor(prate,zhvi_states)
[1] 0.2529424
```

Median Home Value vs Property Crime Rate



Conclusions

- ▶ Location
 - ▶ A larger population does not equate to a higher home value.
 - ▶ Larger population ↗ larger demand
- ▶ Education
 - ▶ Buy a home in an area with a strong school district.
 - ▶ In Arizona, proficiency in English language arts (ELA) is a stronger indicator for higher home values than proficiency in Mathematics.
- ▶ Crime
 - ▶ Buy a home in an area with a low crime rate.
 - ▶ Nationwide, a lower violent crime rate is a stronger indicator for higher home values than a lower property crime rate.
- ▶ Don't buy a home in Washington, D.C.