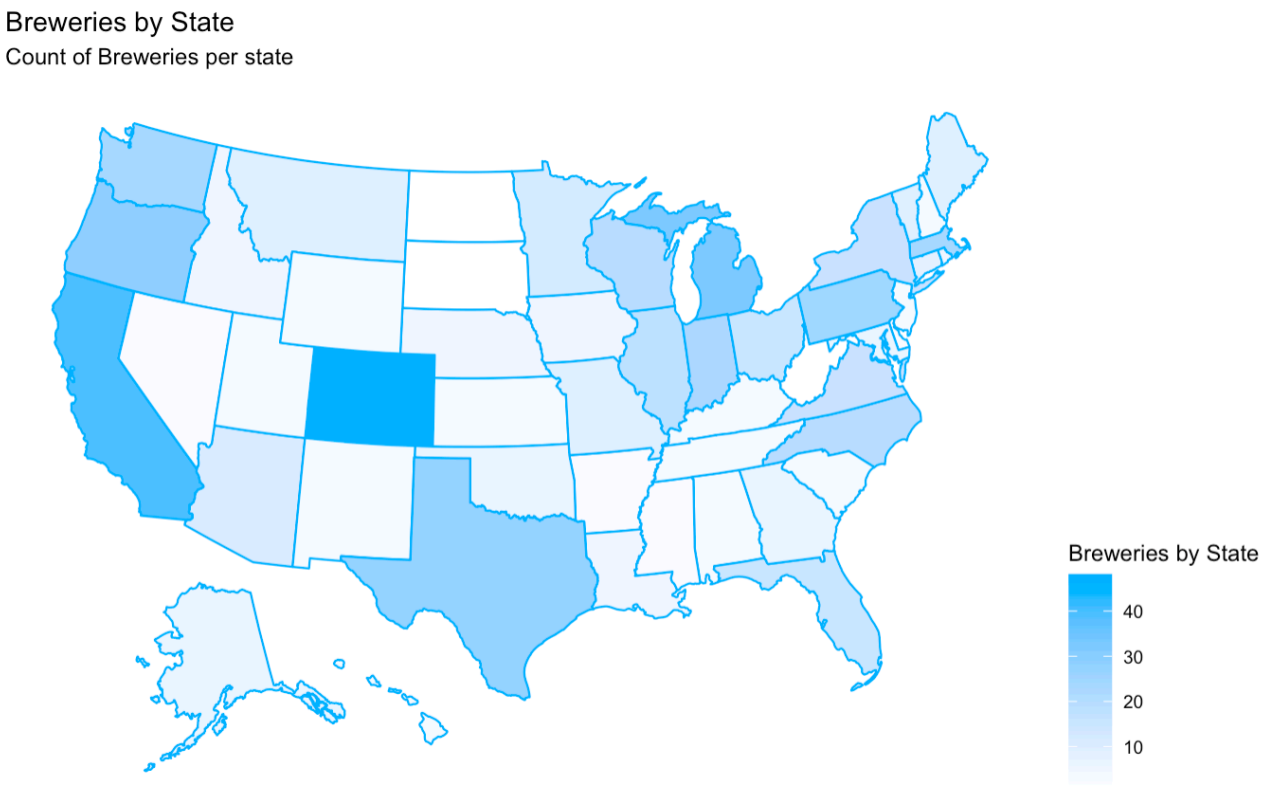
Craft Breweries in the US

A review of Alcohol by Volume and Bitterness across Breweries in the United States

Analysis by Josh Eysenbach and Julia Layne

Number of Breweries per State



State	Breweries
CO	47
CA	39
MI	32
OR	29
TX	28
PA	25
MA	23
WA	23
IN	22
WI	20
NC	19
IL	18
NY	16
VA	16
FL	15
OH	15
MN	12
AZ	11
VT	10
ME	9
MO	9
MT	9
CT	8
AK	7
GA	7

State	Breweries
MD	7
OK	6
IA	5
ID	5
LA	5
NE	5
RI	5
HI	4
KY	4
NM	4
SC	4
UT	4
WY	4
AL	3
KS	3
NH	3
NJ	3
TN	3
AR	2
DE	2
MS	2
NV	2
DC	1
ND	1
SD	1
WV	1

Top 5: Colorado, California, Michigan, Oregon, and Texas

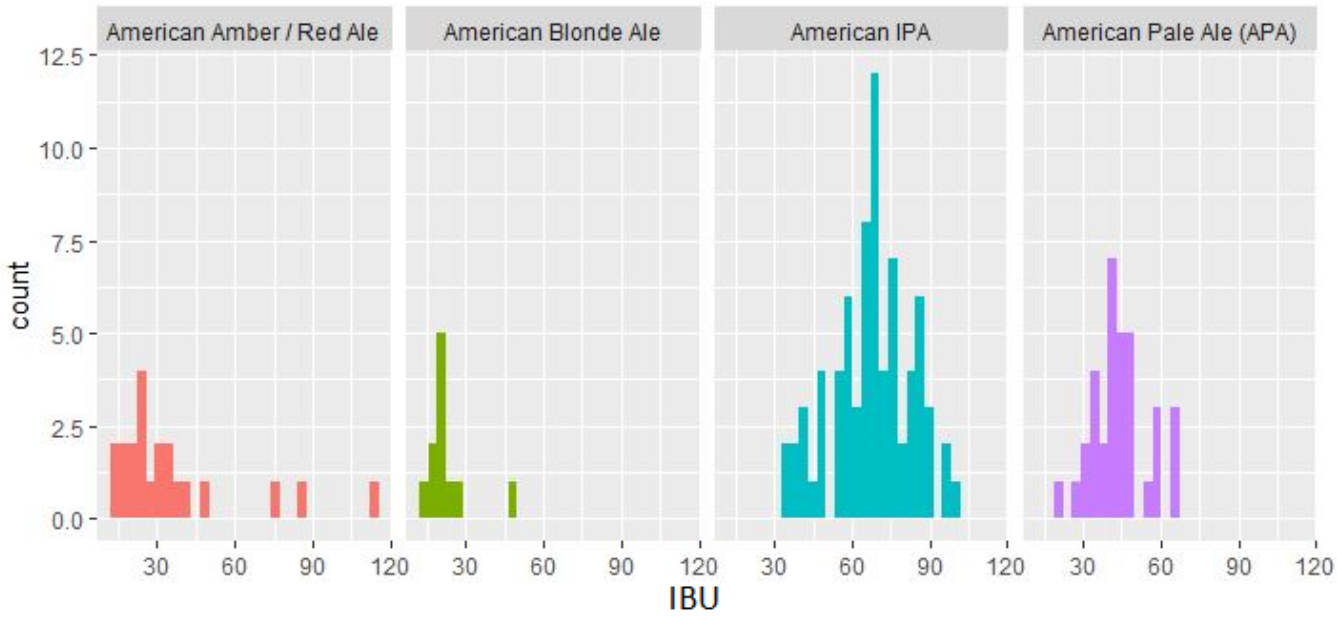
Budweiser

Missing Data

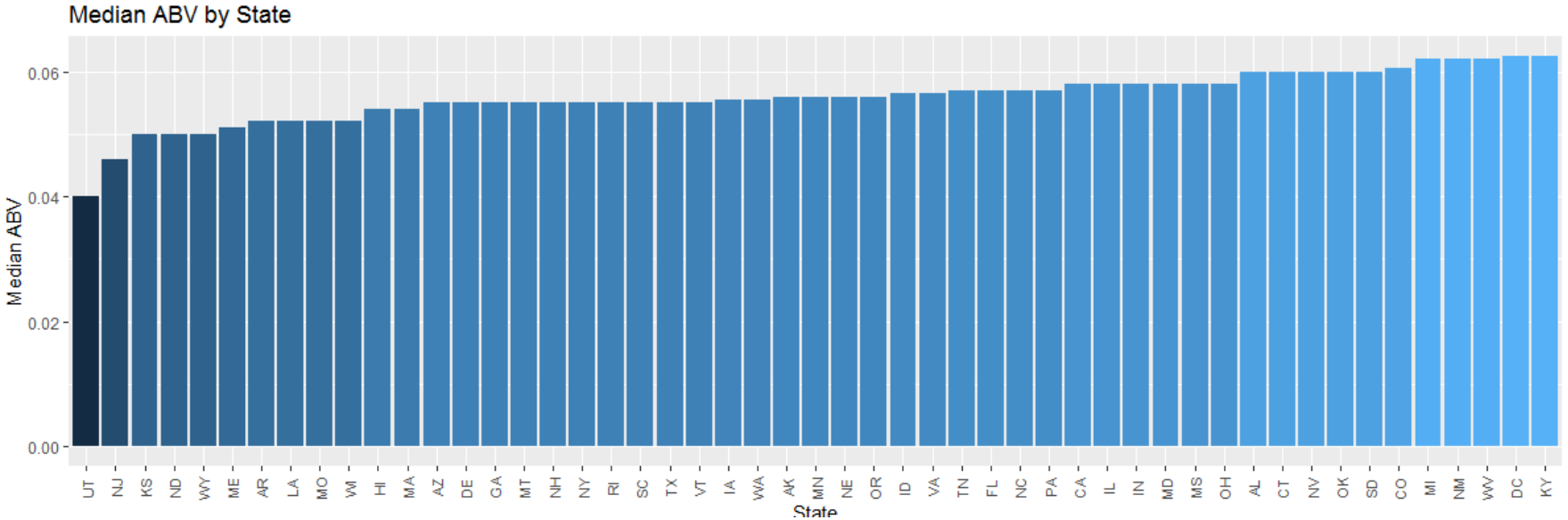
- There are 1005 beers with missing values for IBU
- We found values vary greatly by beer type and within types
- We've decided to remove the missing values to avoid distorting results replacing over 40% of the data

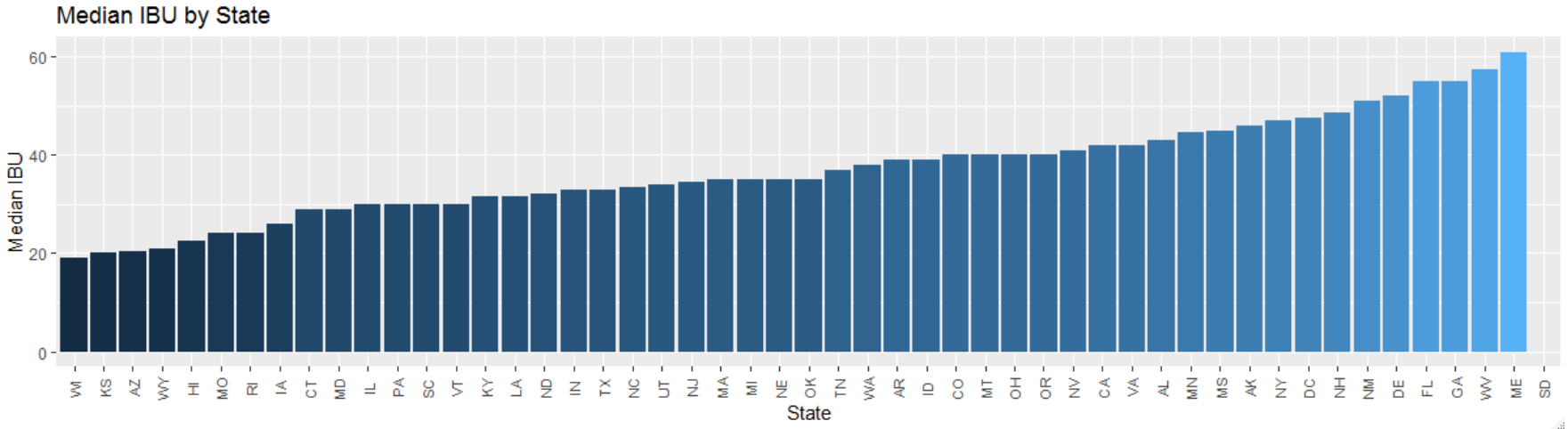
Missing Values
ABV: 62
IBU: 1005

IBU Distributions by Beer Style



Median ABV and IBU by State





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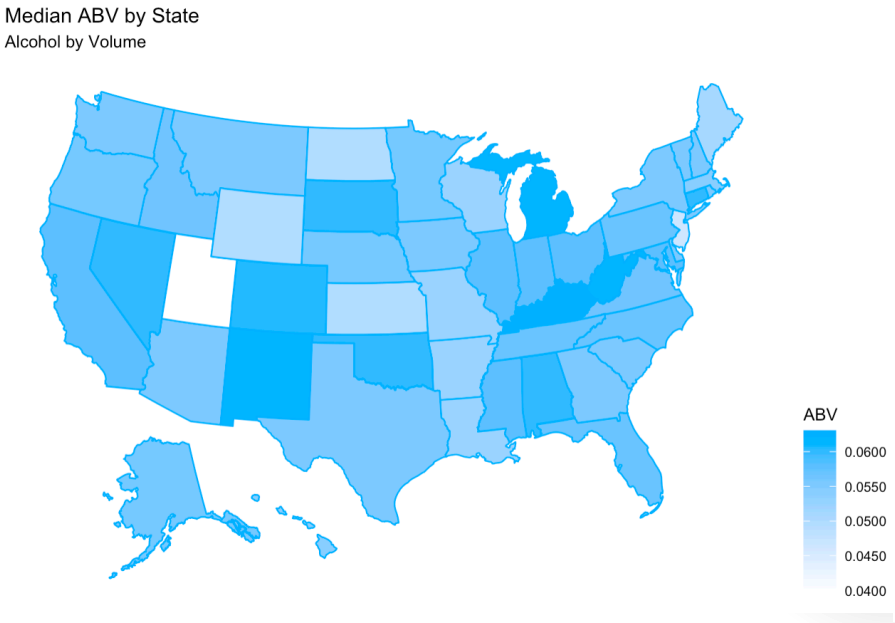
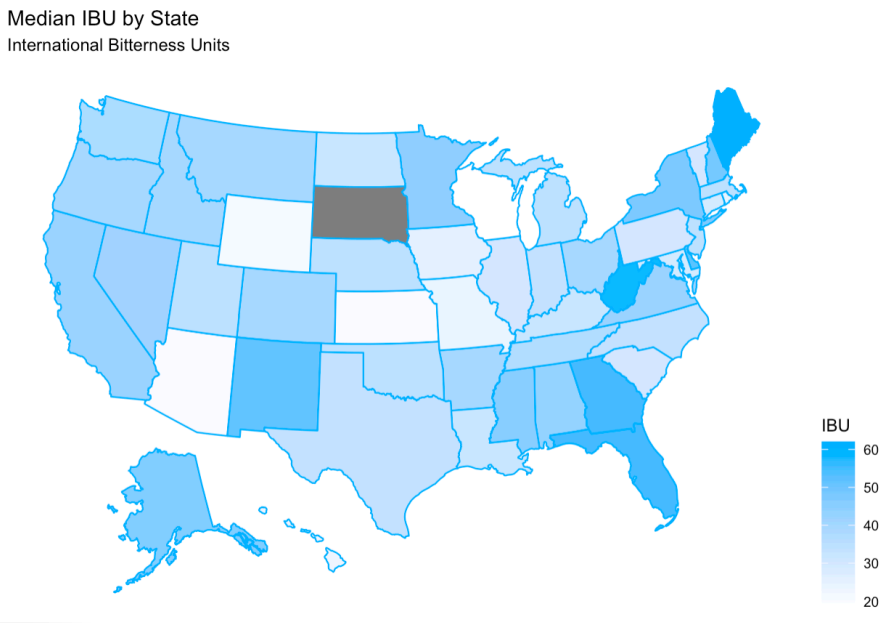




State	Median ABV	Median IBU
AK	0.056	46.0
AL	0.060	43.0
AR	0.052	39.0
AZ	0.055	20.5
CA	0.058	42.0
CO	0.061	40.0
CT	0.060	29.0
DC	0.063	47.5
DE	0.055	52.0
FL	0.057	55.0
GA	0.055	55.0
HI	0.054	22.5
ID	0.057	39.0

State	Median ABV	Median IBU
IL	0.058	30.0
IN	0.058	33.0
KS	0.050	20.0
KY	0.063	31.5
LA	0.052	31.5
MA	0.054	35.0
MD	0.058	29.0
ME	0.051	61.0
MI	0.062	35.0
MN	0.056	44.5
MO	0.052	24.0
MS	0.058	45.0
MO	0.052	24.0

State	Median ABV	Median IBU
MS	0.058	45.0
MT	0.055	40.0
NC	0.057	33.5
ND	0.050	32.0
NE	0.056	35.0
NH	0.055	48.5
NJ	0.046	34.5
NM	0.062	51.0
NV	0.060	41.0
NY	0.055	47.0
OH	0.058	40.0
OK	0.060	35.0
OR	0.056	40.0

State	Median ABV	Median IBU
PA	0.057	30.0
RI	0.055	24.0
SC	0.055	30.0
SD	0.060	NA
TN	0.057	37.0
TX	0.055	33.0
UT	0.040	34.0
VA	0.057	42.0
VT	0.055	30.0
WA	0.056	38.0
WI	0.052	19.0
WV	0.062	57.5
WY	0.050	21.0

Budweiser

States with Highest ABV and IBU

States with Highest Median ABV:

Kentucky and Washington D.C
(*6.25%*)

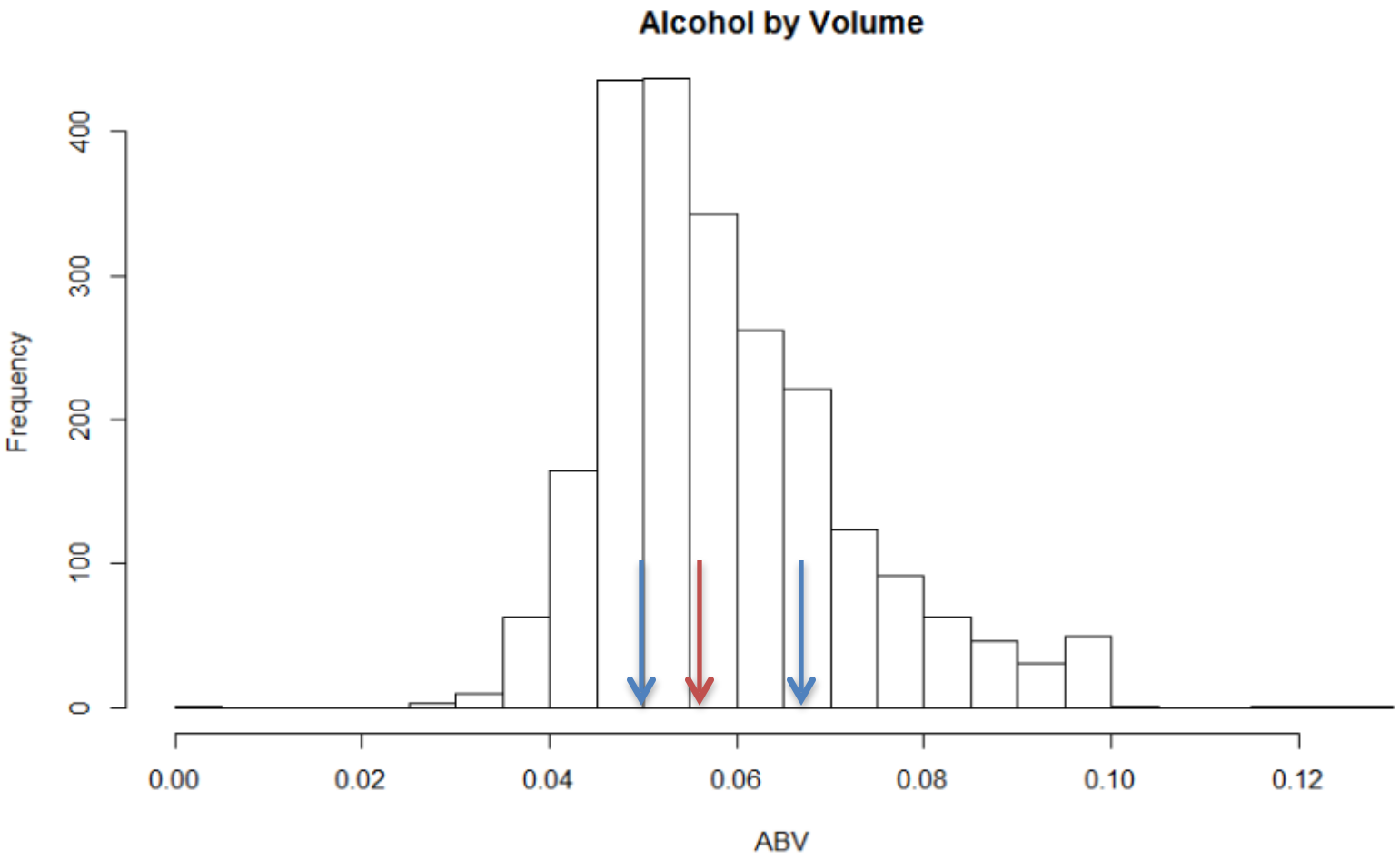
State with Highest Median IBU:

Maine
(*61*)

The beer with the highest ABV is located in **Colorado**
(*Lee Hill Series Vol. 5 Belgian Quadrupel Ale*)

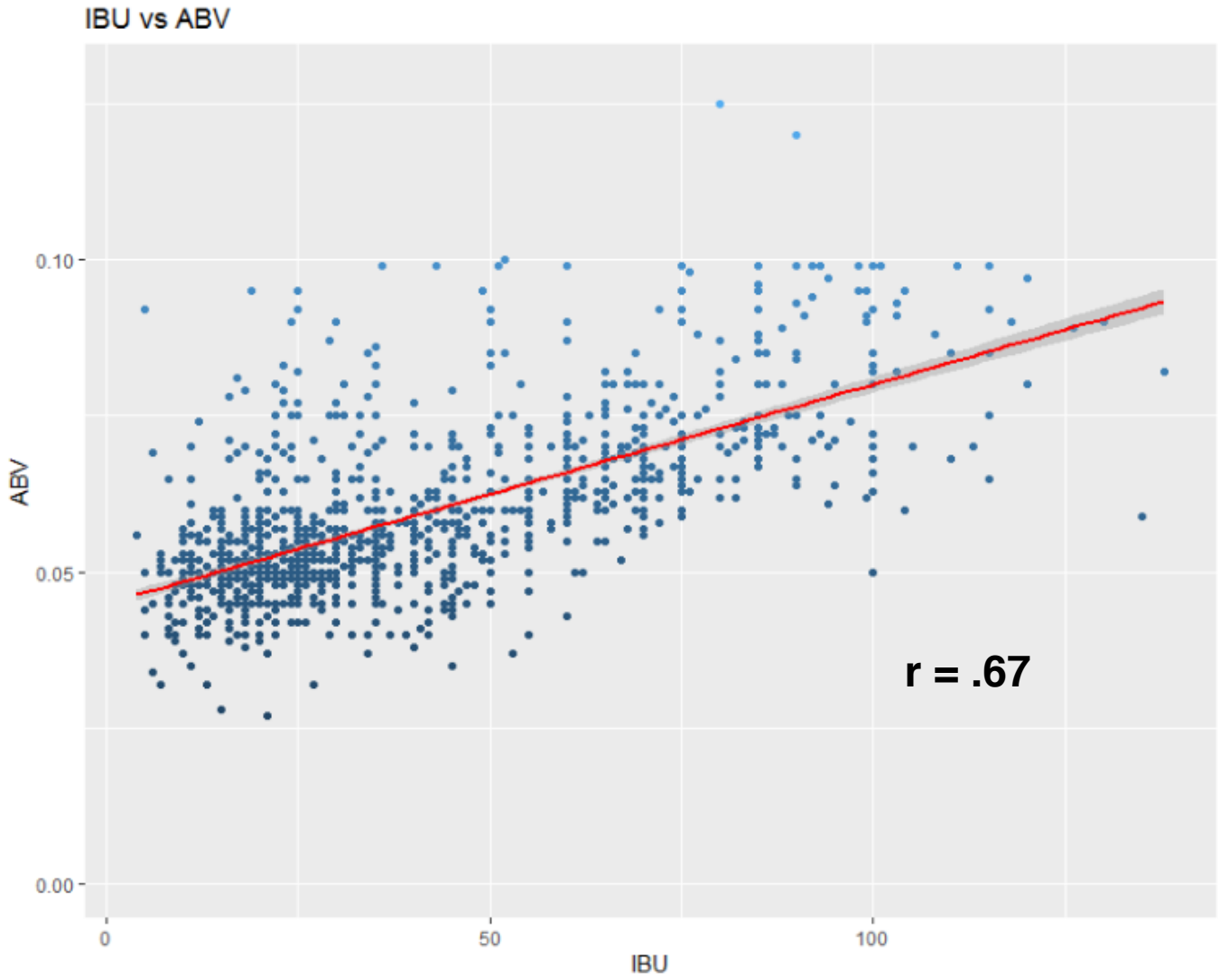
The beer with the highest IBU is located in **Oregon**
(*Bitter Bitch Imperial IPA*)

Stats and Distribution of ABV



Mean	Std. dev.	Min	1st Q	Median	3rd Q	Max
0.06	0.014	0.001	0.05	0.056	0.067	0.128

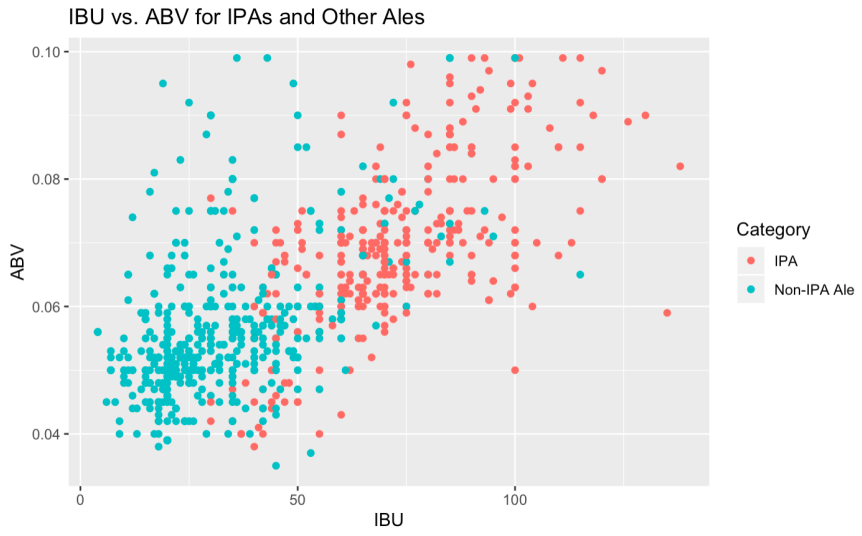
Relationship Between IBU and ABV

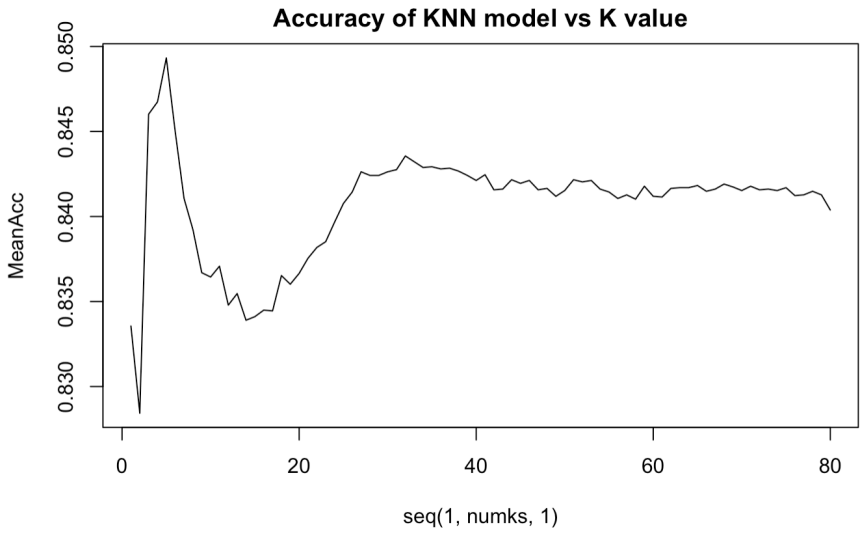


*ABV = .00035*IBU + .0449*

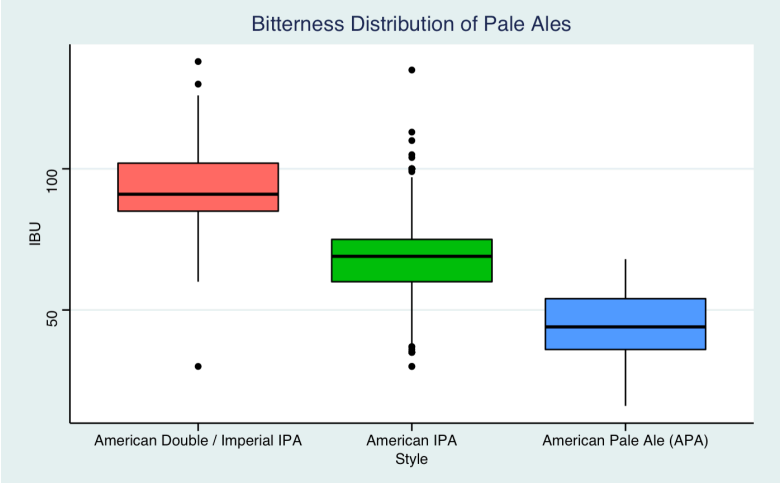
IPAs vs Non-IPA Ales

- Seeing the grouping of IPA and Non-IPA charted, a KNN model seemed appropriate for predicting beer style
- Comparing the accuracy of different K's to estimate showed k= 5 had they greatest accuracy at 86.57%

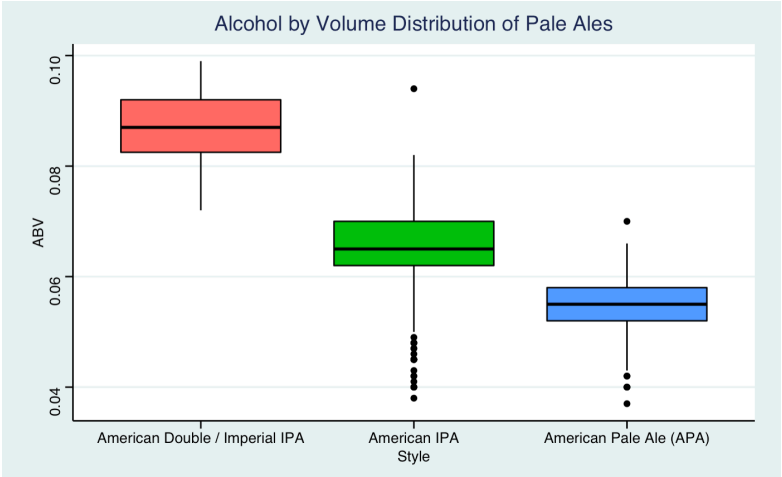


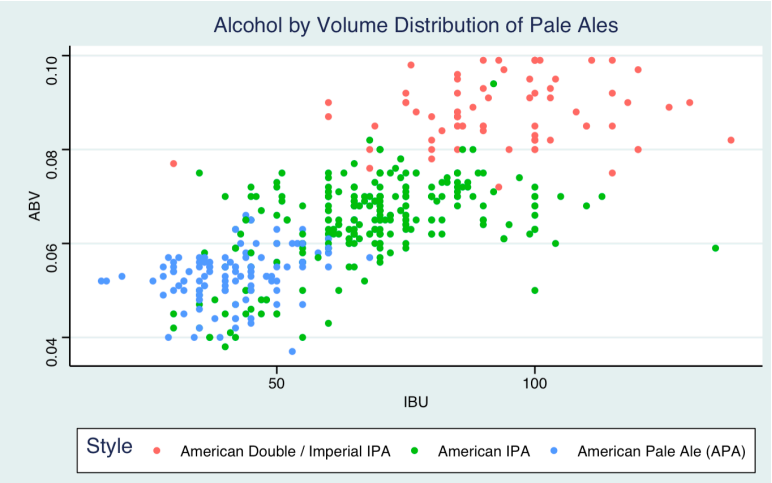


ABV and IBU Distinct in Pale Ale Styles



- Visually on we see what appear to be distinct ranges between Pale Ale Styles
- Two ANOVAs confirmed that both ABV and IBU are distinct between at least two of the pale ale styles ($p < 2e^{16}$)
- Following this with Tukey-Kramer tests, we confirmed all groups are distinct in both ABV and IBU (p value so small it evaluated to 0)





BUD IPA

- Based on our comparisons between styles there are distinct ranges for an American IPA on both IBU and ABV. We suggest the IBU and ABV be within the 50% Middle distribution of the American IPA style
- Bitterness should be between 60 and 75 IBUs to stay in a distinct IPA range, but not too high to stray from Bud's signature drinkability
- Alcohol content should be a blend between the range or the American IPA and Overall ABVs of 6.2% and 6.7% to make it as widely available as possible while staying true to the IPA style

American IPA IBU (Suggested)	60 IBU	75 IBU
American IPA ABV	6.2%	7%
Overall American ABV	5%	6.7%
Suggested ABV Range	6.2%	6.7%

Middle 50% distributions and suggested ranges for IBU ABV