**Data Science Math Probability**

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The following summary table shows the percentage of population who are college educated and also the percentage of population living below poverty level in each of the Midwest states.

|  |  |  |  |
| --- | --- | --- | --- |
| **State** | **Percent of College Educated Residents** | **Count of county In Metro** | **Percent of resident below poverty** |
| IL | 18.78 | 102.00 | 13.07 |
| IN | 16.62 | 92.00 | 10.31 |
| MI | 19.42 | 83.00 | 14.22 |
| OH | 16.89 | 88.00 | 13.03 |
| WI | 20.01 | 72.00 | 11.89 |

Within each state, the correlation of college education and poverty level are inversely related. The analysis was done at county level within each state. With the highest correlation being in Ohio state: -0.5. Although correlation does not suggest causation, the trend is uniform across all 5 states.

|  |  |
| --- | --- |
| **County Level College Education and Poverty Correlation** | |
| **States** | **Correlation** |
| WI | -0.41804331 |
| OH | -0.508687811 |
| IL | -0.257362817 |
| IN | -0.201868508 |
| MI | -0.399198465 |

The table below examines the probability that a person to be college educated and living below poverty within each state. The calculation was simply the multiplication of percentage of college educated residents and percentage of residents below poverty. As we can see the highest percentage of outlier are in Michigan as shown by our boxplot in R.

|  |  |  |
| --- | --- | --- |
| **Probability of College educated Person Living below poverty** | |  |
| **States** | **Calculation** | **Probability** |
| IL | 18.78\*13.07 | 0.024568214 |
| IN | 16.62\*10.31 | 0.017152081 |
| MI | 19.42\*14.22 | 0.027626611 |
| OH | 16.89\*13.03 | 0.022013441 |
| WI | 20.01\*11.89 | 0.023808893 |

Conclusion: The college level education and poverty level are negatively correlated across 5 states in Midwest US. Although there are a few outlier counties which have higher college educated population but also higher poverty, the probability of these cases are lower than 0.02%.