Rainfall Comparison in Seattle, WA vs St. Louis, MO: Final Report

The research question is whether it rains more in Seattle or in St. Louis. The question was motivated by empirical observations of people living in each of the cities. The answer was unclear even after discussing anecdotical data. For this reason, the project consisted of retrieving data from the National Oceanic and Atmospheric Administration (NOAA), cleaning it, and analyzing it through numerical summaries and graphs.

The first concern is the ambiguity of the research question. It can be interpreted in two different ways. Some people may consider the amount of rain while others may be more preoccupied with the number of rainy days. Depending on the criterion we use, the answer will be different. This is clearly shown in the following numerical summaries.

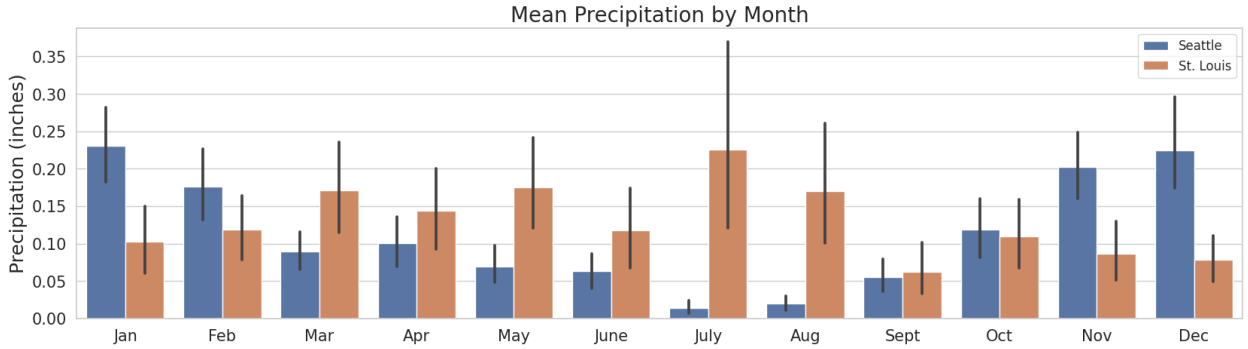
The first table summarizes the amount of rain (in inches) that each city had per year and the total across the 5-year period between 2018 and 2022. We can see that in St. Louis, it usually rains more in terms of quantity. The only exception was the year 2021.

city	2018	2019	2020	2021	2022	total
SEA	37.24	38.65	43.22	44.43	43.28	206.82
STL	42.60	53.99	50.00	42.48	48.94	238.01

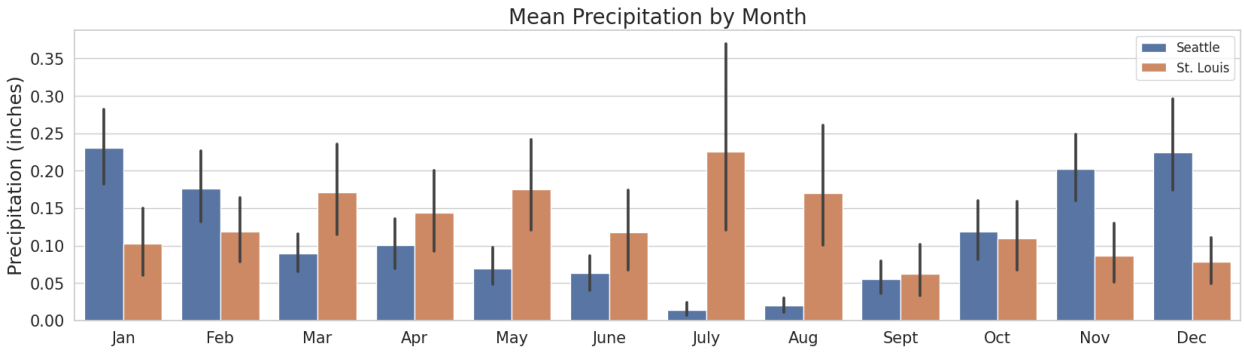
The next table describes the number of rainy days per city and year. In terms of the number of rainy days, it rains more in Seattle.

city	2018	2019	2020	2021	2022	total
SEA	187	195	222	202	193	999
STL	117	135	120	117	109	598

Even though we have somewhat answered the research question, examining monthly trends can provide additional insights and enhance the analysis. We can identify patterns, seasonal variations, and potential differences in rainfall between Seattle and St. Louis throughout the year.



The following graph shows the mean precipitation by month. Even though the overall quantity of precipitation tends to be higher in St. Louis, there are seasonal elements that affect the comparison. For instance, in November, December, and January, it rains more, in terms of quantity, in Seattle. Remember that we should also consider the standard deviation. In these three months, we can see that the difference is substantial as it is greater than the standard deviation from the Seattle and the St. Louis standard deviations. We can see that in February, there appears to be a transitional period because the mean quantity of rainfall is still greater in Seattle but the difference with St. Louis is within a standard deviation. It means that in a given year, it is likely that it could rain more in St. Louis. The rest of the months show that St. Louis has higher mean precipitation. Points of interest are July and August because in those months the difference between the amount of rain is the largest.



The second graph shows the mean number of rainy days per month. In most months, Seattle has a higher mean of rainy days, the only exception is July. Once again, we need to consider the standard deviations because, for Seattle, the standard deviation in July is quite big. It means that there are years in which July has the same or more rainy days than St. Louis. We can also identify a seasonal trend. Starting in September, the number of rainy days in Seattle increases. It peaks in December and reaches parity with St. Louis around May and June.

The conclusion of the projects is that, yearly, it rains more in St. Louis in terms of the quantity of precipitation in inches. While in Seattle, it rains more yearly, with the criterion of the number of rainy days. However, when we look at the monthly level, we can understand why the answer was not easily perceptible with anecdotical knowledge. The reason is that there is a season in which St. Louis has less quantity of precipitation (in inches) than Seattle. Likewise, Seattle has a dry season in which there are more rainy days in St. Louis. Therefore, we can give an answer to the question in a yearly aggregation but giving an answer on a monthly level is more nuanced as there is variation across the months.