



# Analysis of New Jersey Arsenic Concentration Data

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## Abstract

For this project, I analyzed Arsenic concentration data between 2002 and 2014 for different locations across New Jersey. First, I graphed out Arsenic values over time to determine general trends in data. I then examined Arsenic values in different counties to determine if some counties are responsible for the higher arsenic concentration.

## Introduction

Arsenic is a natural element that is commonly found in water, and as such can find it's way into drinking water sources. Specifically, arsenic levels are higher from ground sources of water, like wells, as opposed to surface sources, like lakes. Because arsenic has been linked to cancer and other detrimental health effects, monitoring the levels of arsenic in drinking water is important.<sup>1</sup> The Environmental Protection Agency has specified that the maximum arsenic level in drinking water is 10 micrograms per liter. The New Jersey Private Well Testing Act, effective September 2002, takes a step toward water quality transparency. It requires buyers or sellers to test untreated well water and have landowners test private well water provided to tenants.<sup>2</sup>

## Goals and Hypothesis

- Organize and understand trends in the NJ Private Well Testing Act data
- Perform statistical analysis to determine correlation coefficients
- Determine mean arsenic averages of different counties in New Jersey
- See whether arsenic concentration has increased over time
- Pinpoint the locations in New Jersey that have higher Arsenic concentrations than allowed

## Methods

### Data Collection

- Northern 12 NJ counties are required by the NJ Private Well Testing act to provide arsenic data
- Arsenic in NJ ground water has geologic origins but can also be tied to land usage
- Arsenic levels are in micrograms per liter
- Method of arsenic data collection vary, from measurements taken at the kitchen tap to those taken at the holding tank. There are 7 different types of methods

### Data Analysis

- Graphed out all 40,000 + arsenic values 2002 to 2014 for initial observations
- Calculated yearly means between 2002 to 2014 to determine higher-level trends
- For each county that had 100+ data points, graphed out the Arsenic concentration levels over time
- Calculated county arsenic means to determine the counties that have the greatest arsenic concentrations

## Results

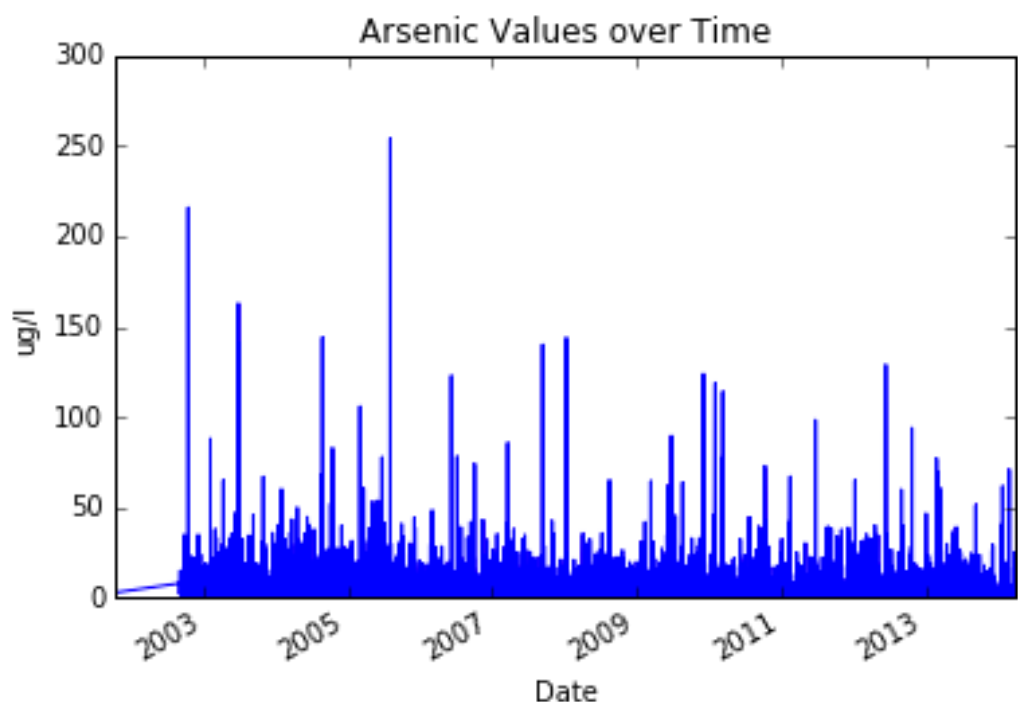


Figure 1

- Arsenic concentration in micrograms per liter from September 2002 to April 2014
- 40,000+ data points
- Notice the significant outliers, making it difficult to run regressions

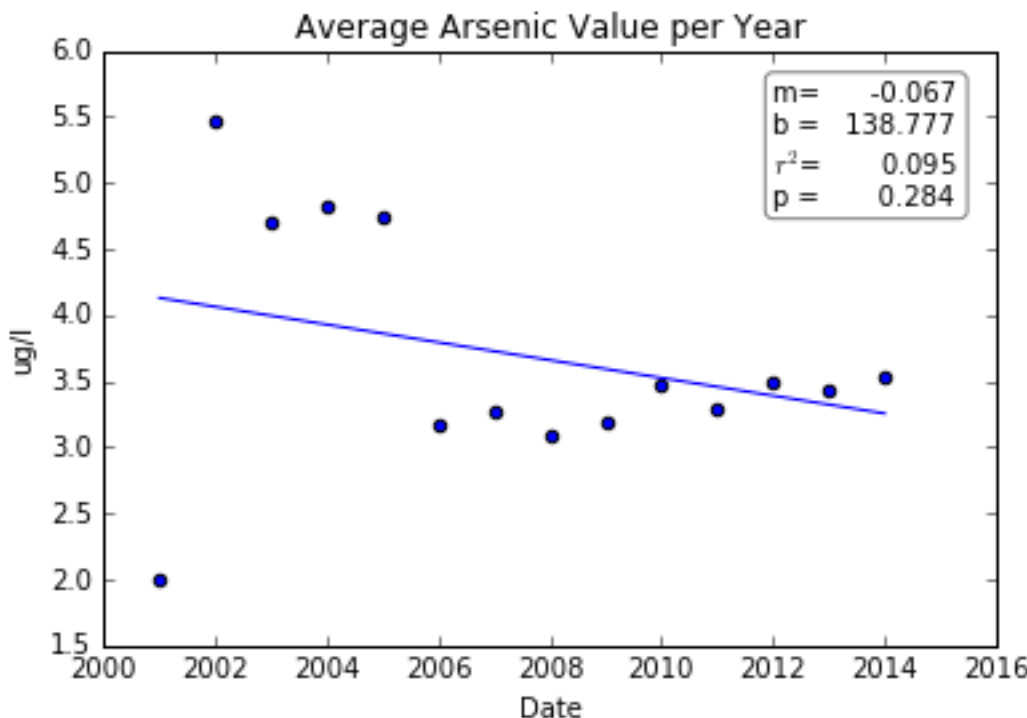


Figure 2

- Average arsenic concentration per year
- Notice that  $r^2 = 0.95$ , a low correlation coefficient suggesting that there is not a linear relationship between date and Arsenic values

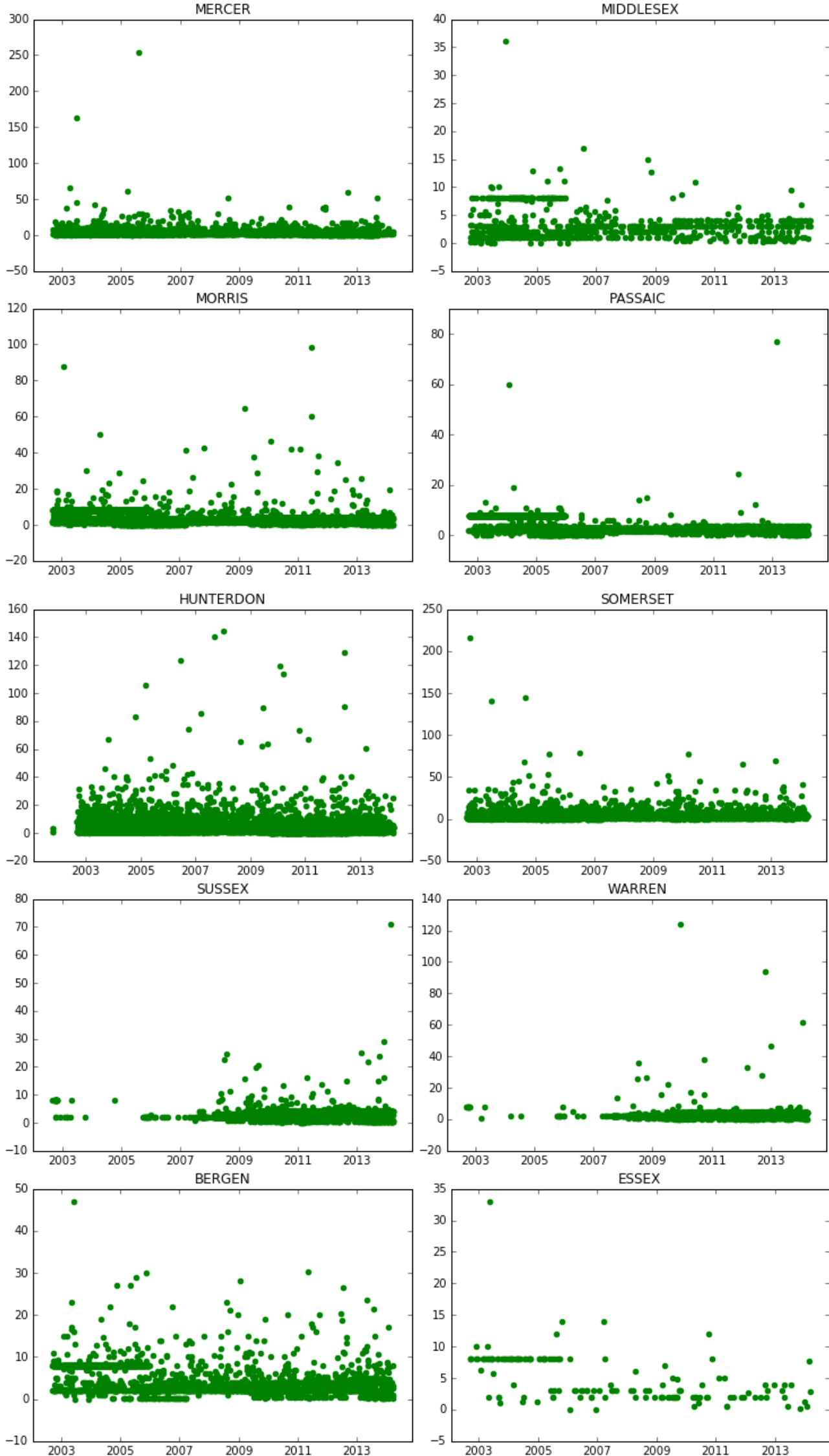


Figure 3

- Arsenic value broken down by different counties to determine which counties are more responsible for higher Arsenic concentrations
- Only counties with 100+ data points shown
- Essex has the highest concentration, partially because in the early 2000's there was a streak of about 10 micrograms per liter, but Essex county has noticeably fewer data points than other counties
- Sussex county arsenic levels stay low and have few outliers, making it one of the locations that has the lowest overall mean

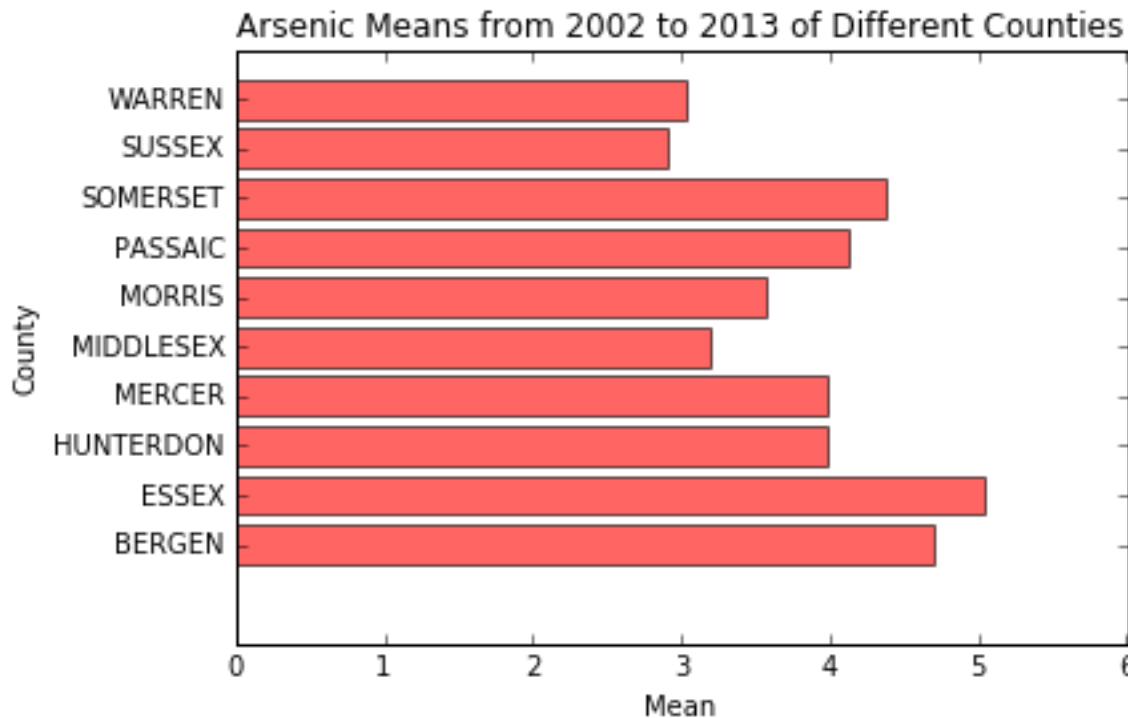


Figure 4

- Mean data for different counties
- Essex, Bergen, and Somerset have the highest mean values
- Sussex, Warren, and Middlesex have the lowest mean values

## Conclusions

- Analyzed NJ Arsenic concentration in drinking water from the NJ Private Well Testing Act data
- Difficult to perform linear regressions because of outliers, and the linear regression for mean Arsenic concentrations per year had a low  $r^2$  value
- Graphed out Arsenic values per county and found that Essex has the highest mean Arsenic concentration

## References

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