



Health and Wealth in Maryland: Do Economic Indicators Correlate Spatially with Water Quality?

Juan Botero

Kelsey Stockert

Tiona Johnson

Mark Rogers

Becky Wood



Research Question



?

- Do areas with low socio-economic indicators correlate with areas of poor ambient water quality?

Objectives



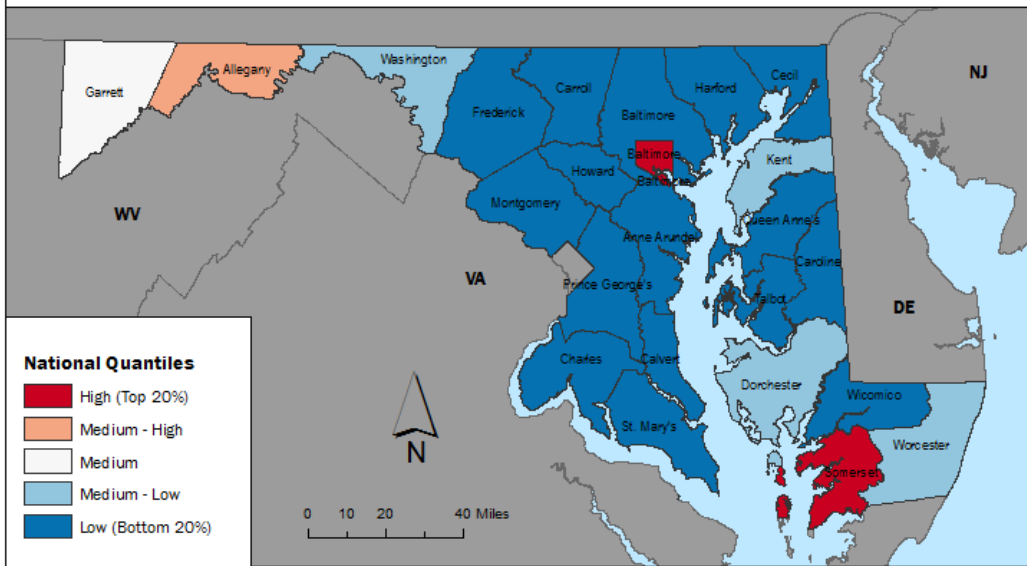
?

- Identify areas most vulnerable to environmental health concerns
 - Everyone has the right to a healthy environment
- Assist officials in preventing long term public health problems.
 - A clean environment boosts the economy

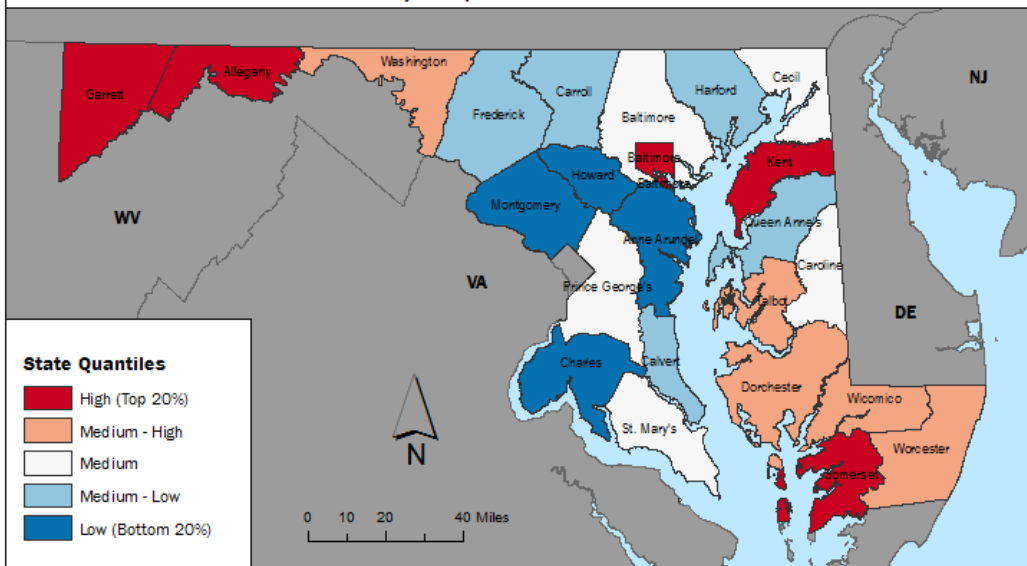


Social Vulnerability Index (SOVI)

County Comparison within the Nation



County Comparison within the State



- NOAA/University of South Carolina partnership using U.S. Census Bureau ACS data

- Combines 42 socioeconomic variables into one index

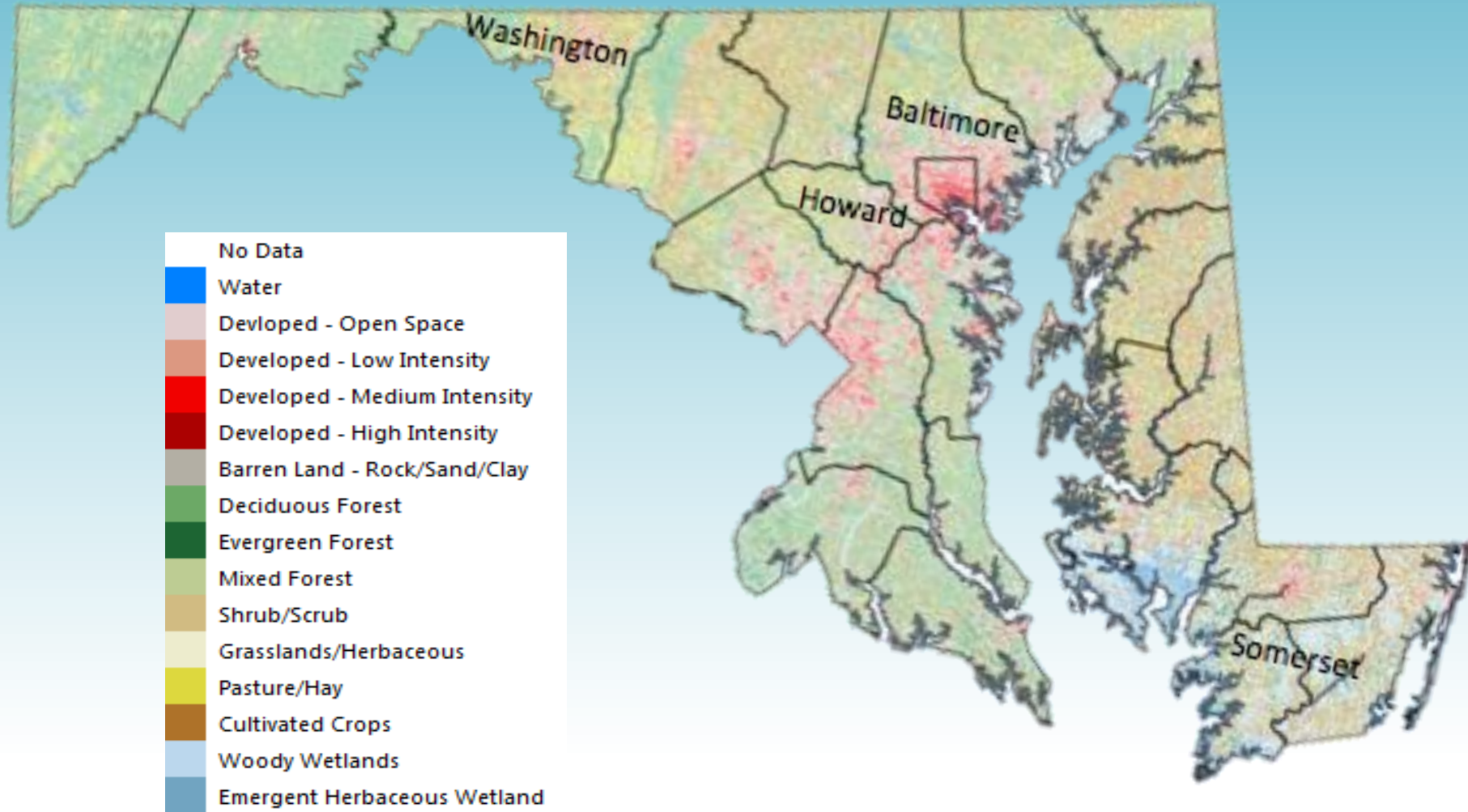
Maryland Policies Attempt to Address Environmental Justice – But May Fall Short



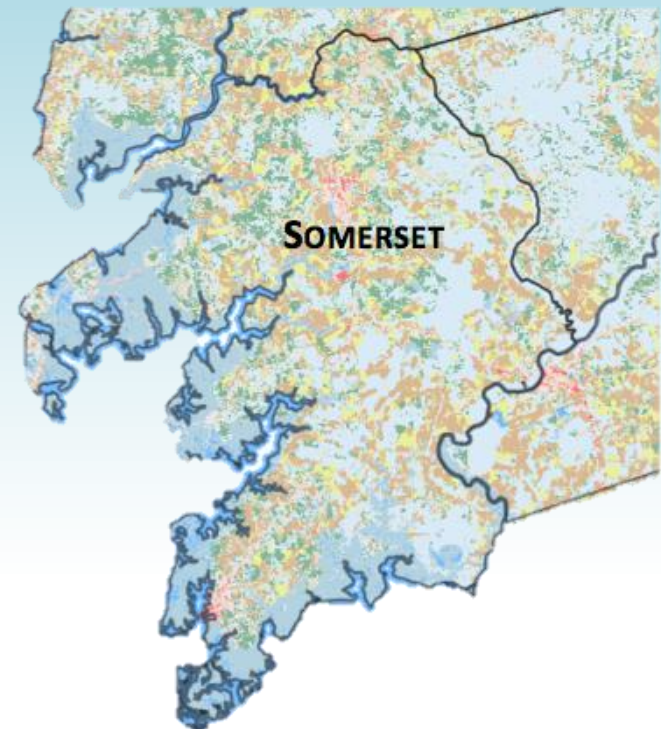
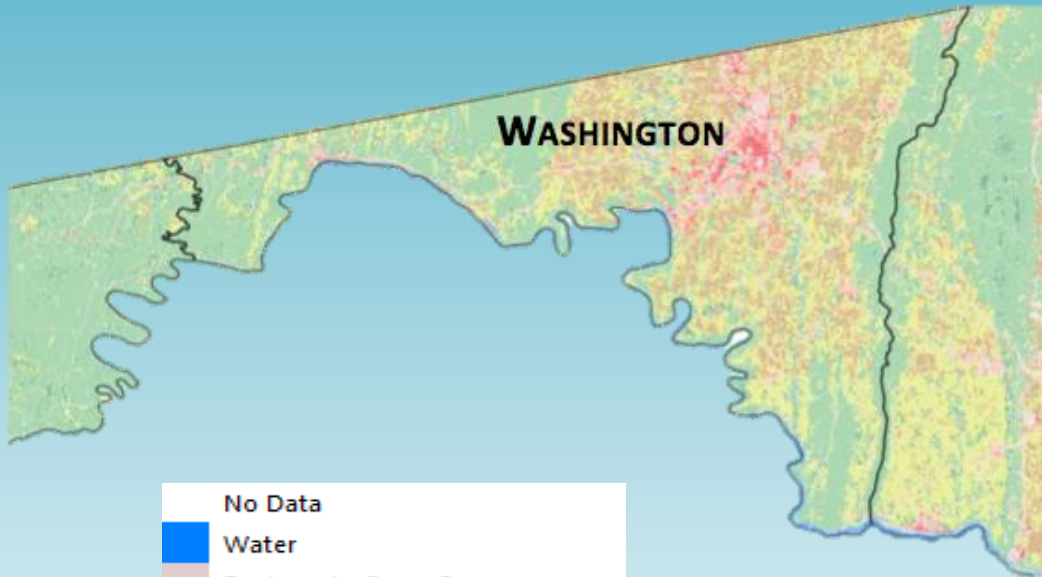
- MD expands EPA definition of environmental justice to add that citizens should a) be protected from public health hazards and b) have access to the socioeconomic resources necessary to address their livelihood and health (MDE)
- Nutrient trading and Chesapeake Bay TMDL may exacerbate injustice
- Potential policy solution: require that tradable nutrient credits be achieved upstream only, to ensure that downstream pollution does not increase (law in VA)



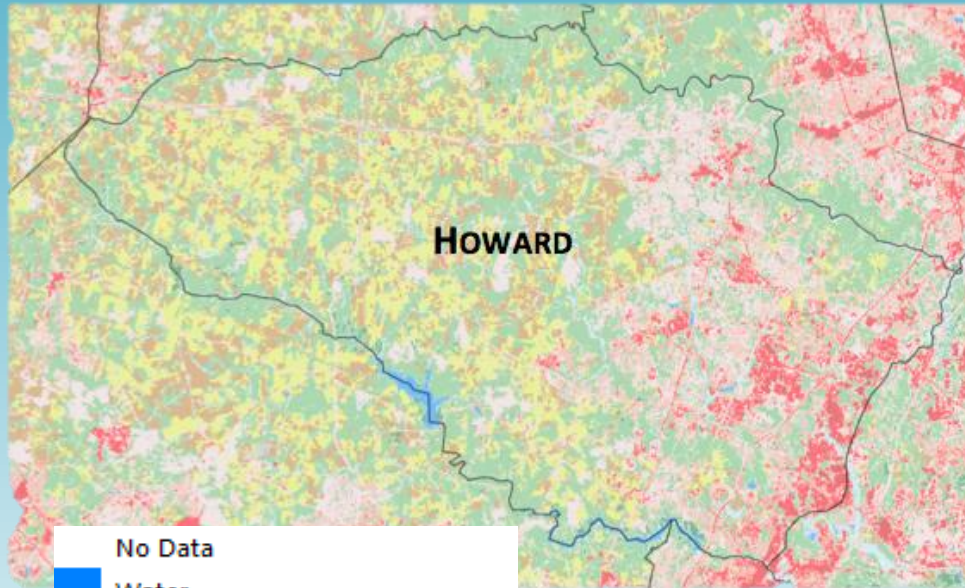
Four Counties Chosen for Comparison



Rural Counties: Same land use classification and median income



Urban Counties: High Intensity Development, Higher Median Income



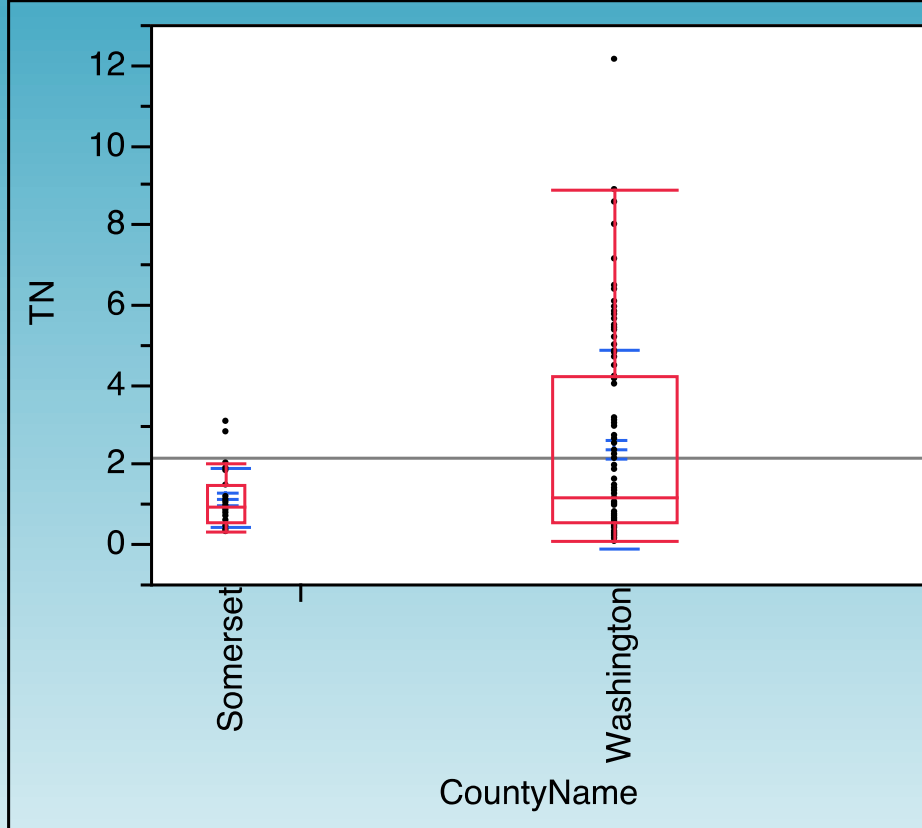
Methods

- Identified QGIS layers
- Obtained water quality data about turbidity, TN, TP, and DO from Maryland's random designed stream sampling program (MDSS)
- Socioeconomic data includes Social Vulnerability Index and associated data from the U.S. Census (median income, poverty levels, educational attainment, and more)
- Calculated correlation coefficients



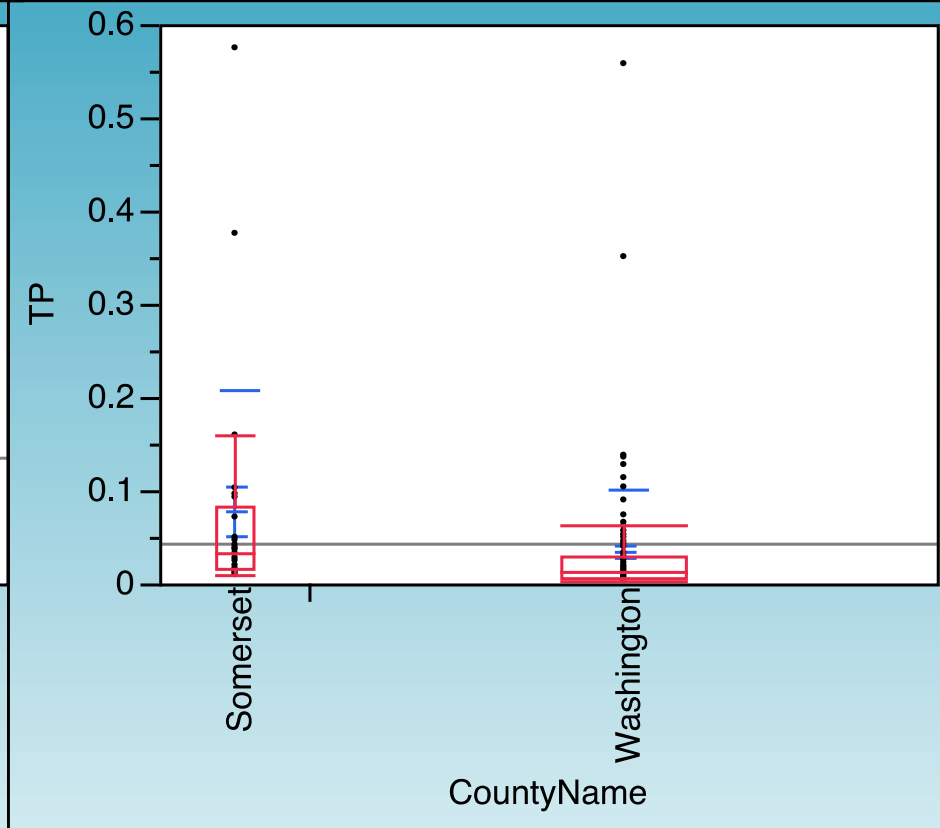
MDSS Sampling Sites





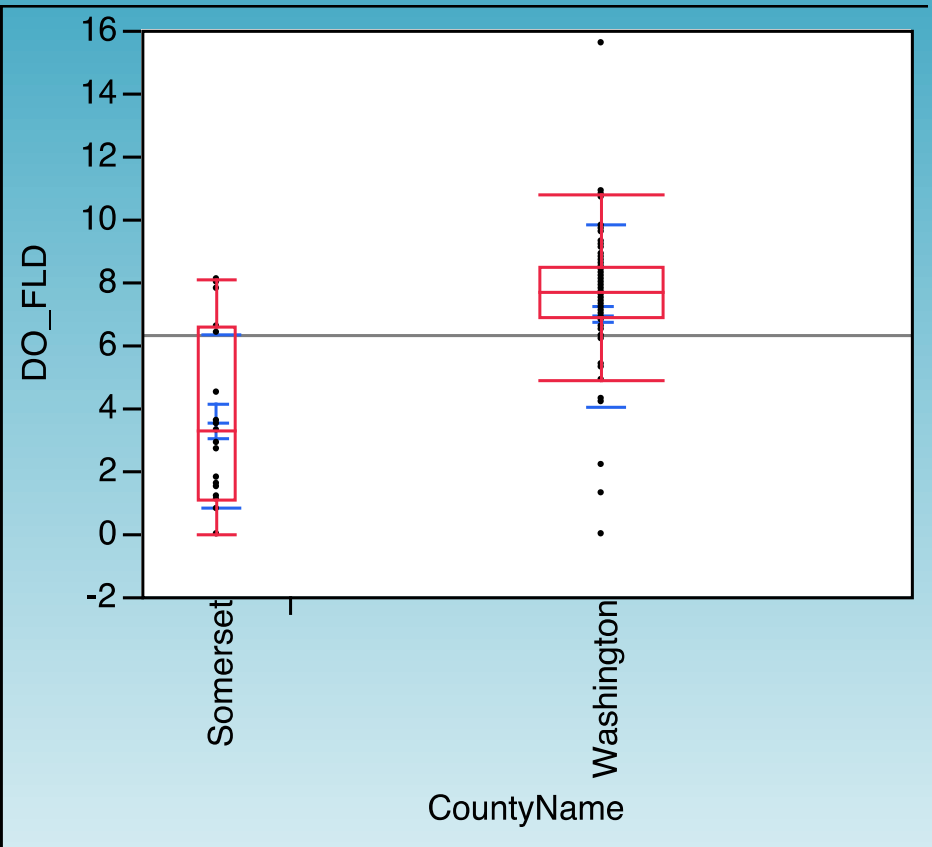
Somerset = 1.1 mg/l
Washington = 2.4 mg/l

$P < 0.001$



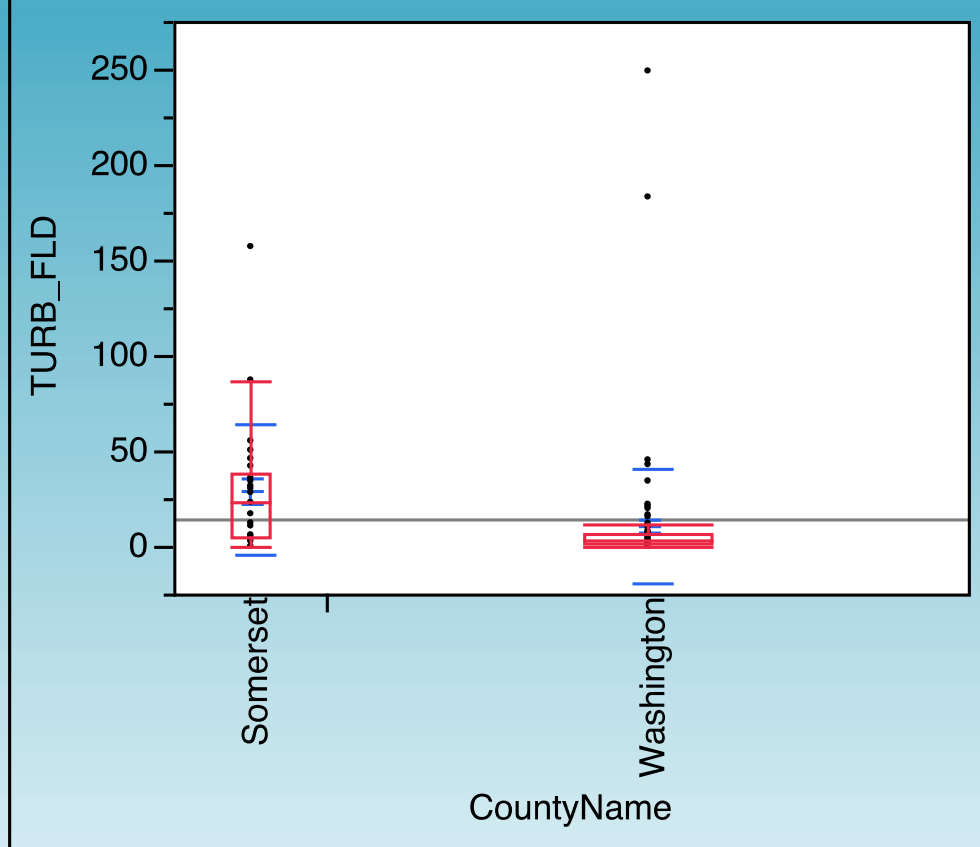
Somerset = 0.077 mg/l
Washington = 0.033 mg/l

$P = 0.11$



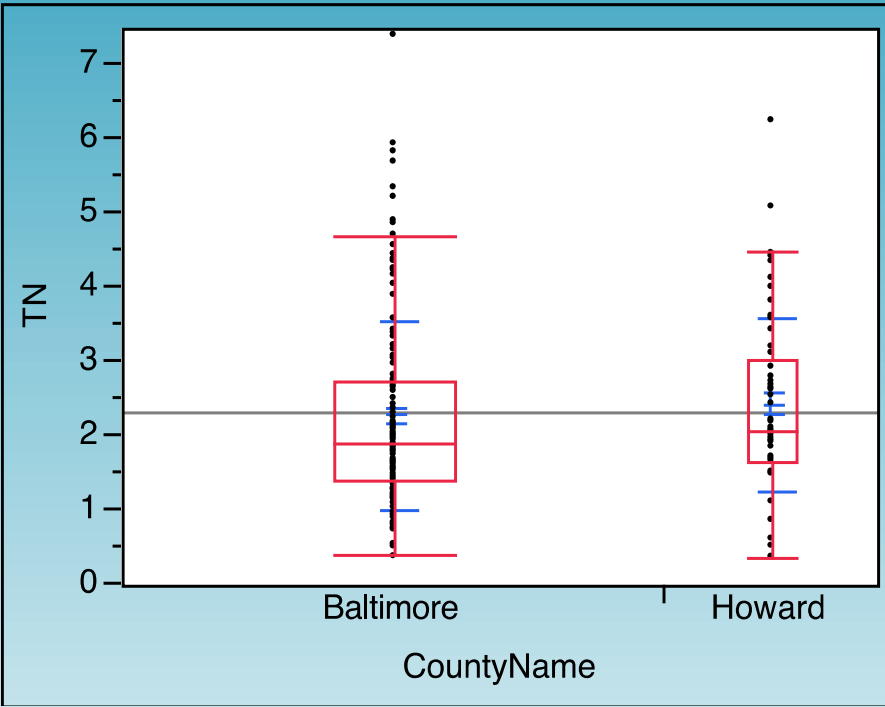
Somerset = 3.5 mg/l
Washington = 6.9 mg/l

$P < 0.001$



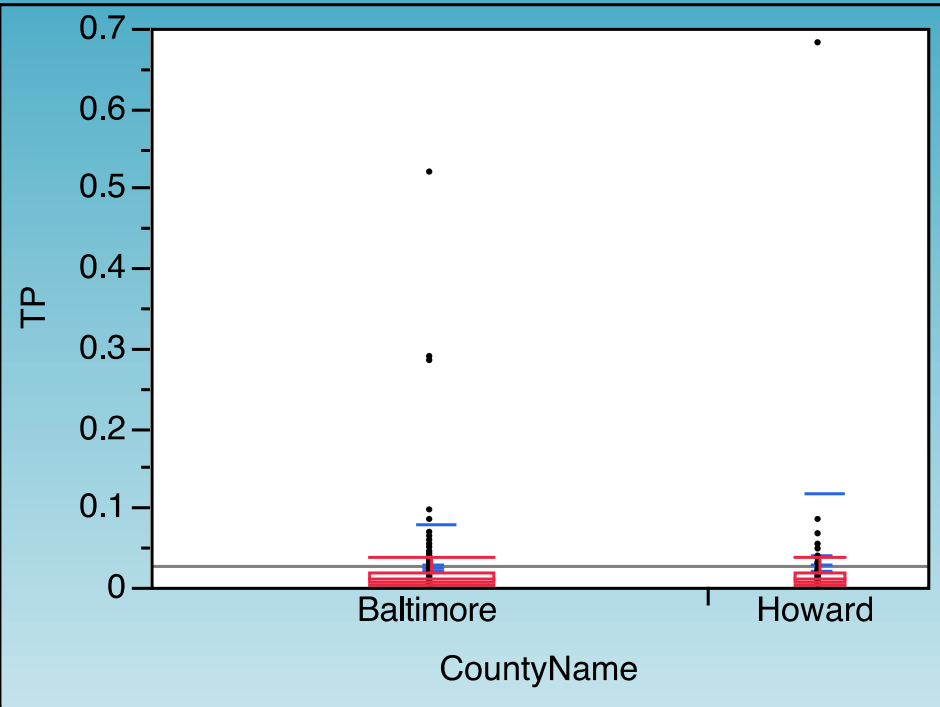
Somerset = 28.8 NTU
Washington = 9.9 NTU

$P < 0.001$



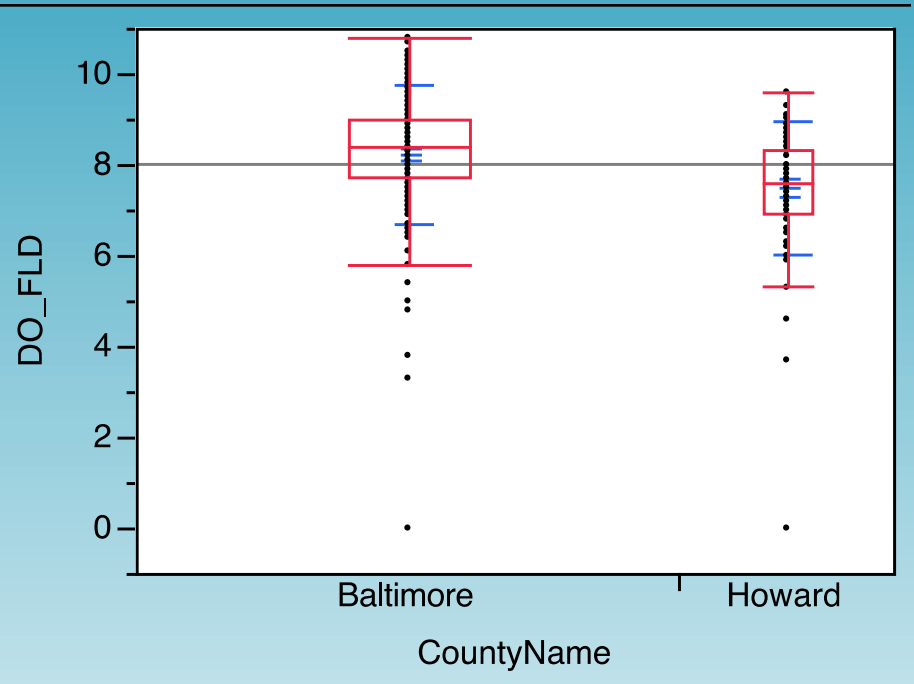
Baltimore = 2.2 mg/l
Howard = 2.4 mg/l

$P < 0.41$



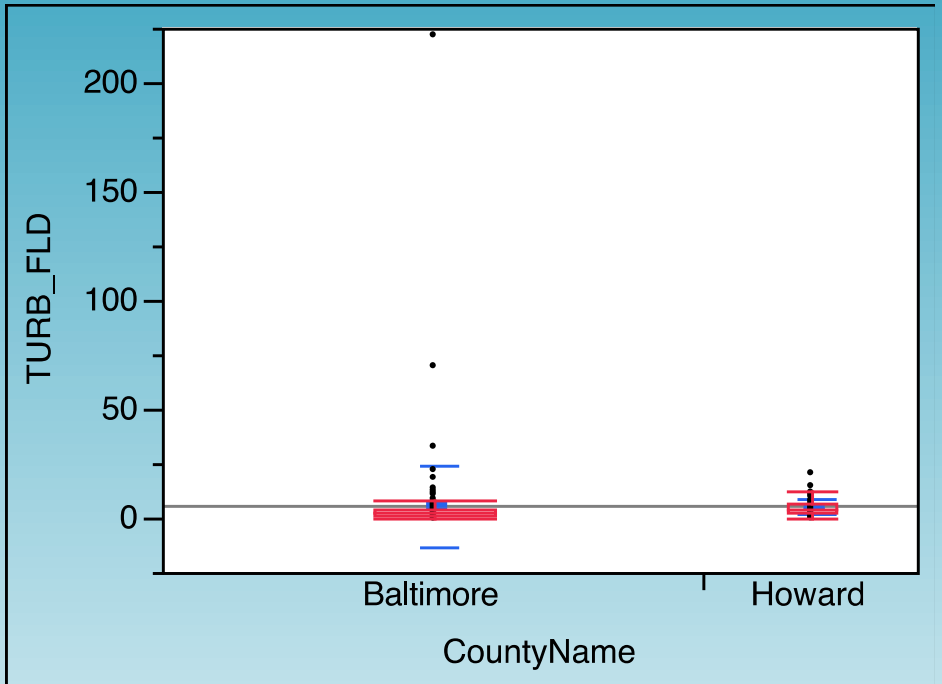
Baltimore = 0.024 mg/l
Howard = 0.029 mg/l

$P < 0.68$



Baltimore = 8.2 mg/l
 Howard = 7.5 mg/l

P= .0014

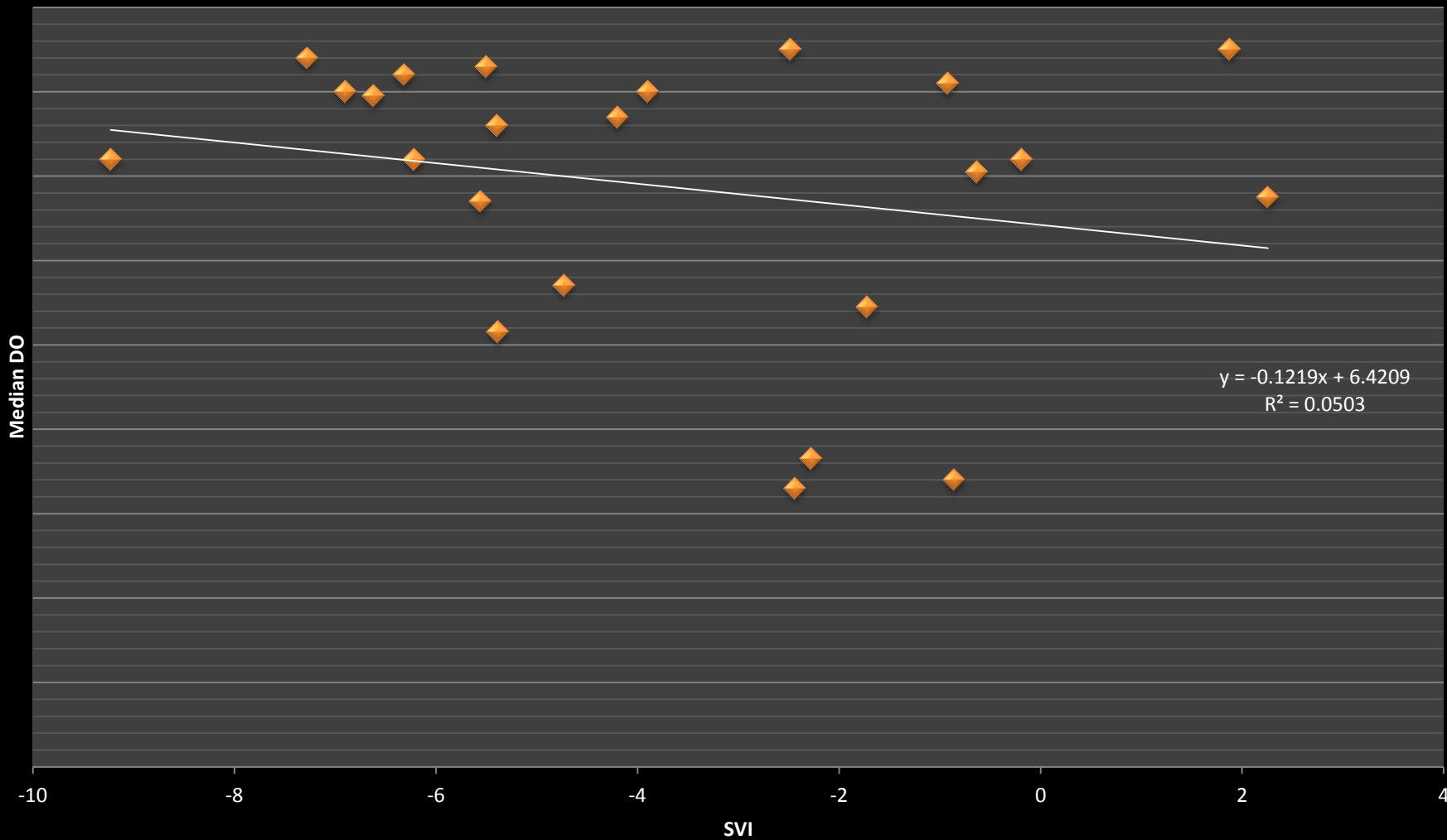


Baltimore = 5.3 NTU
 Howard = 4.8 NTU

P= 0.76

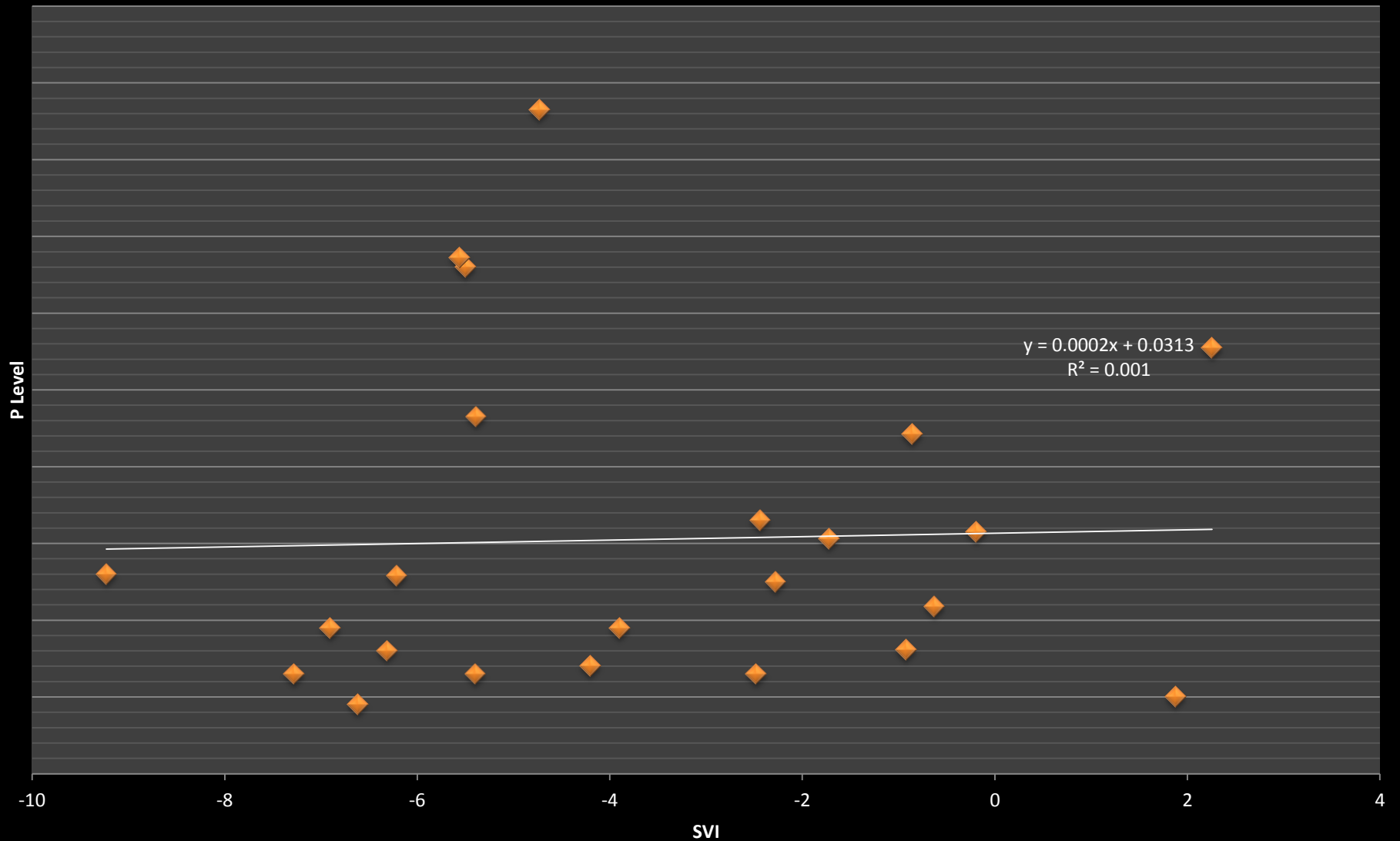
No Significant Correlation Between Water Quality and Social Vulnerability

Median DO Level Vs Social Vulnerability Index



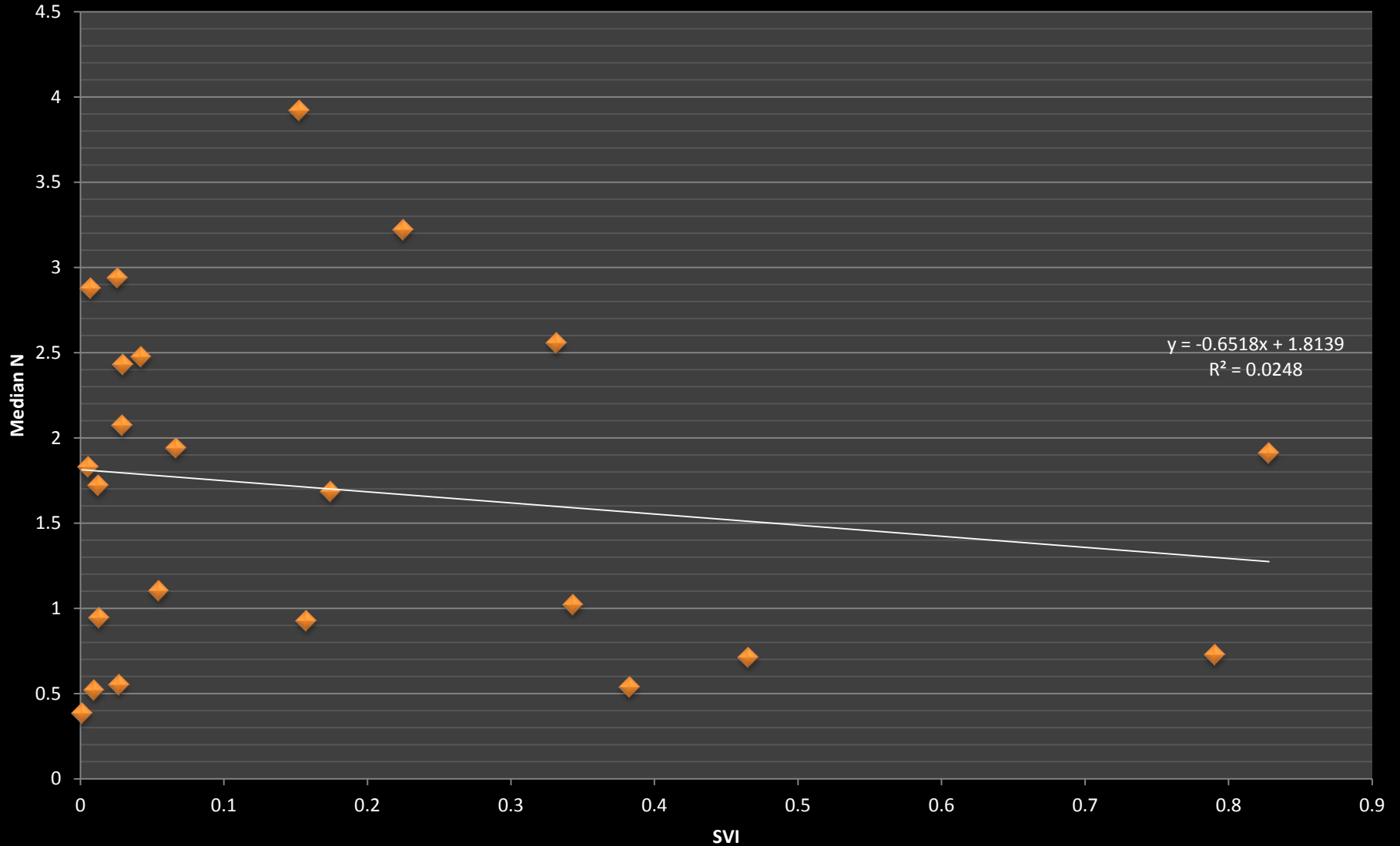
No Significant Correlation Between Water Quality and Social Vulnerability

P Level Vs Social Vulnerability Index



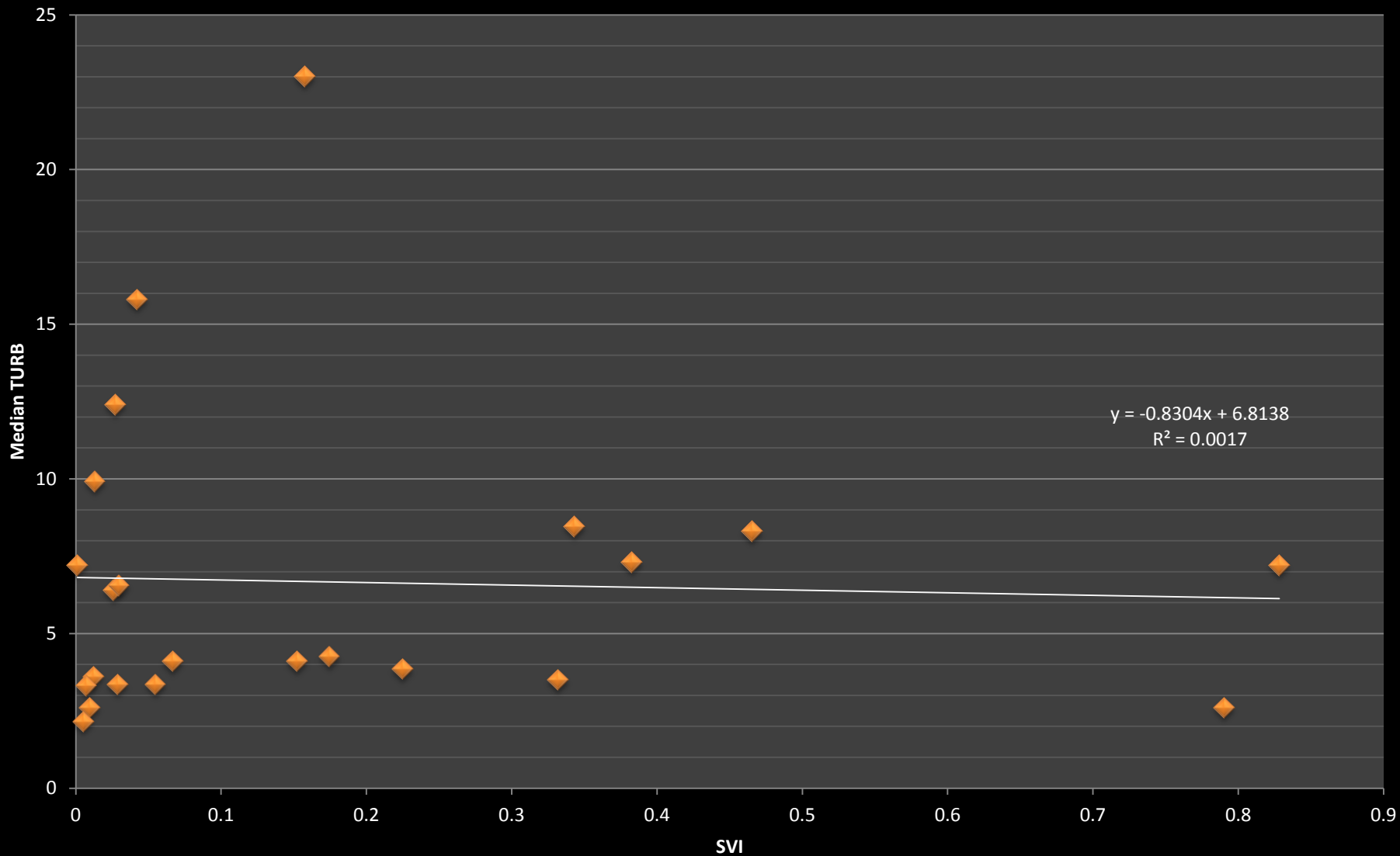
No Significant Correlation Between Water Quality and Social Vulnerability

N level Vs Social Vulnerability Index



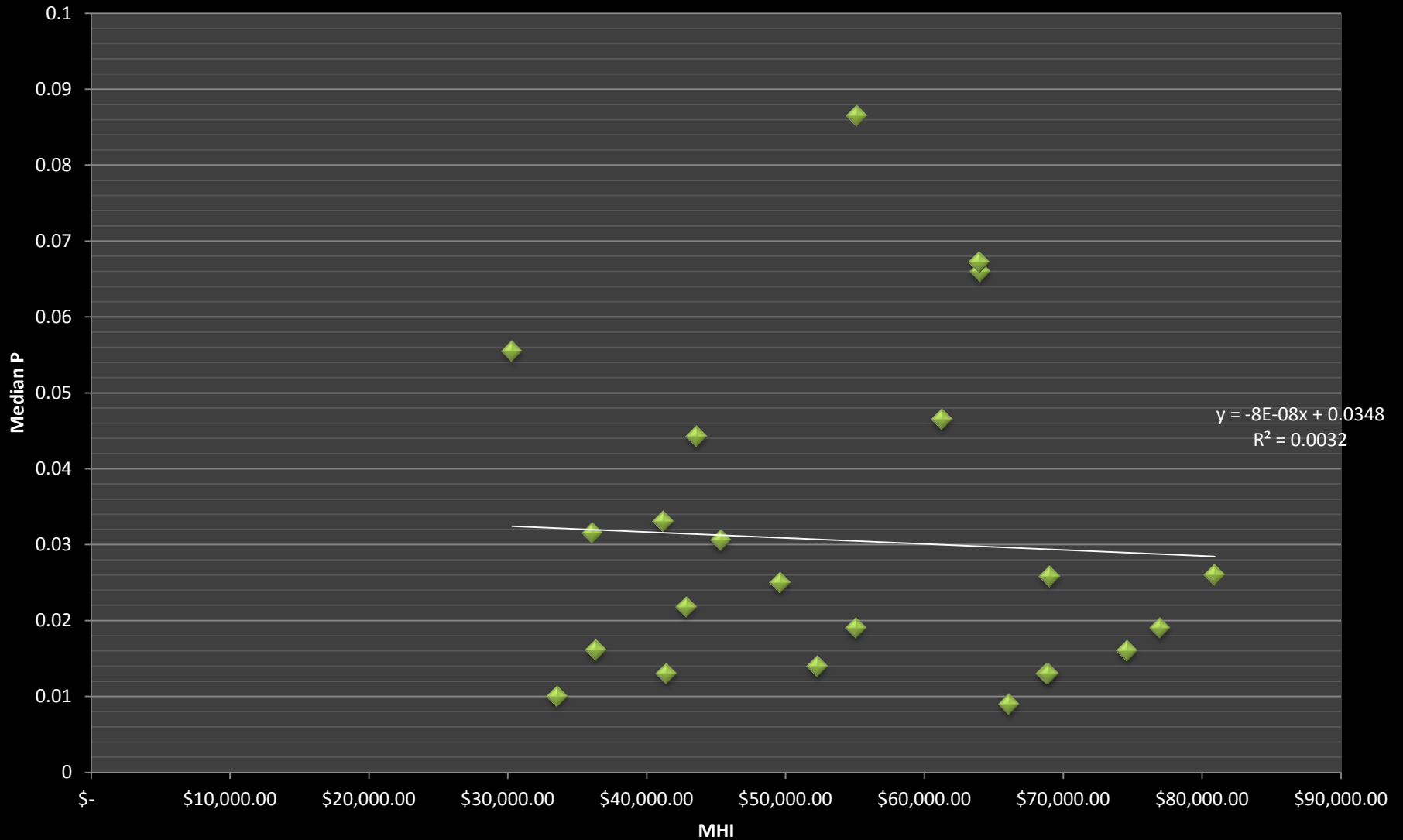
No Significant Correlation Between Water Quality and Social Vulnerability

TURB level Vs Social Vulnerability Index



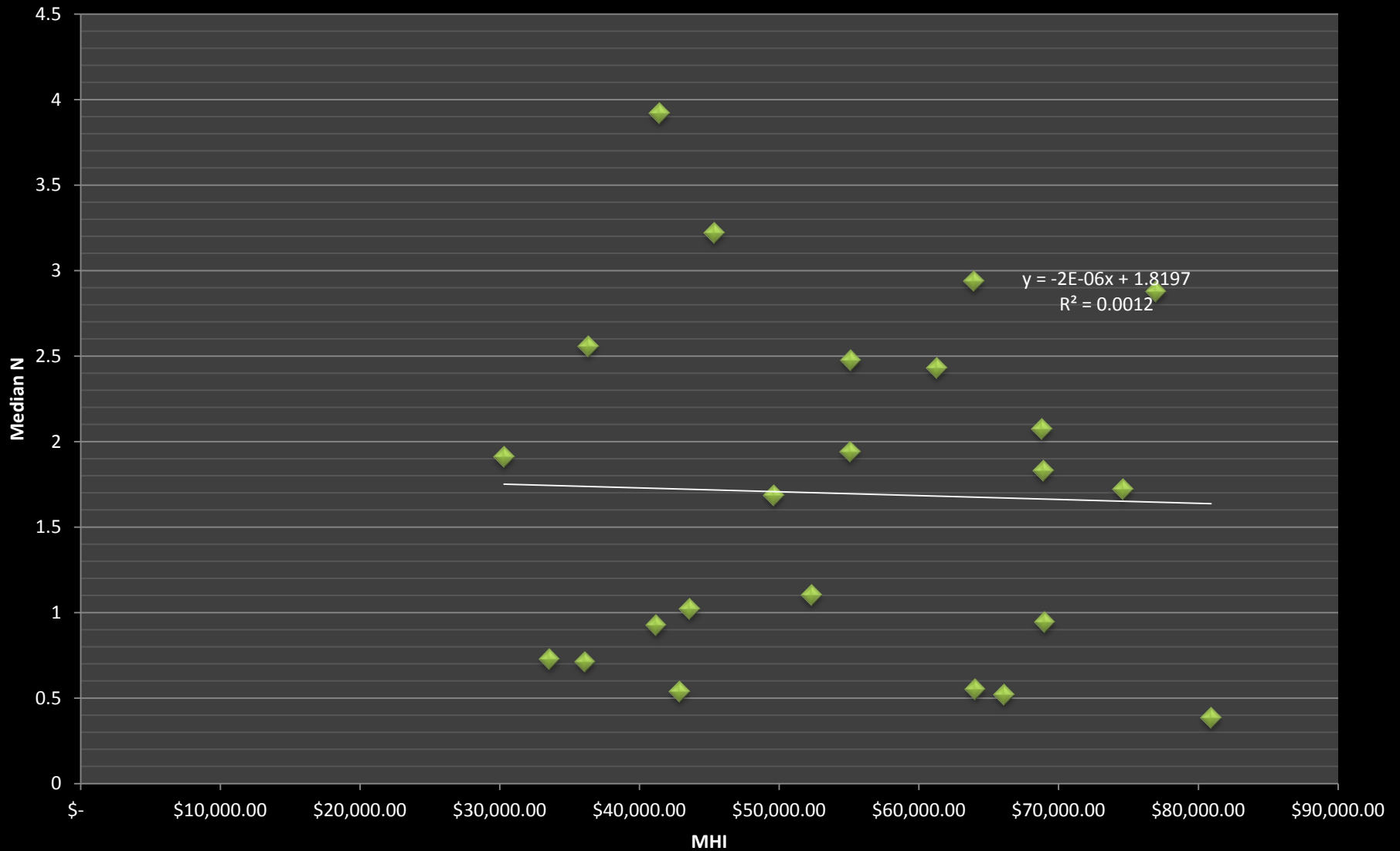
No Significant Correlation Between Water Quality and Median Income

Median P level Vs median household income (2004)



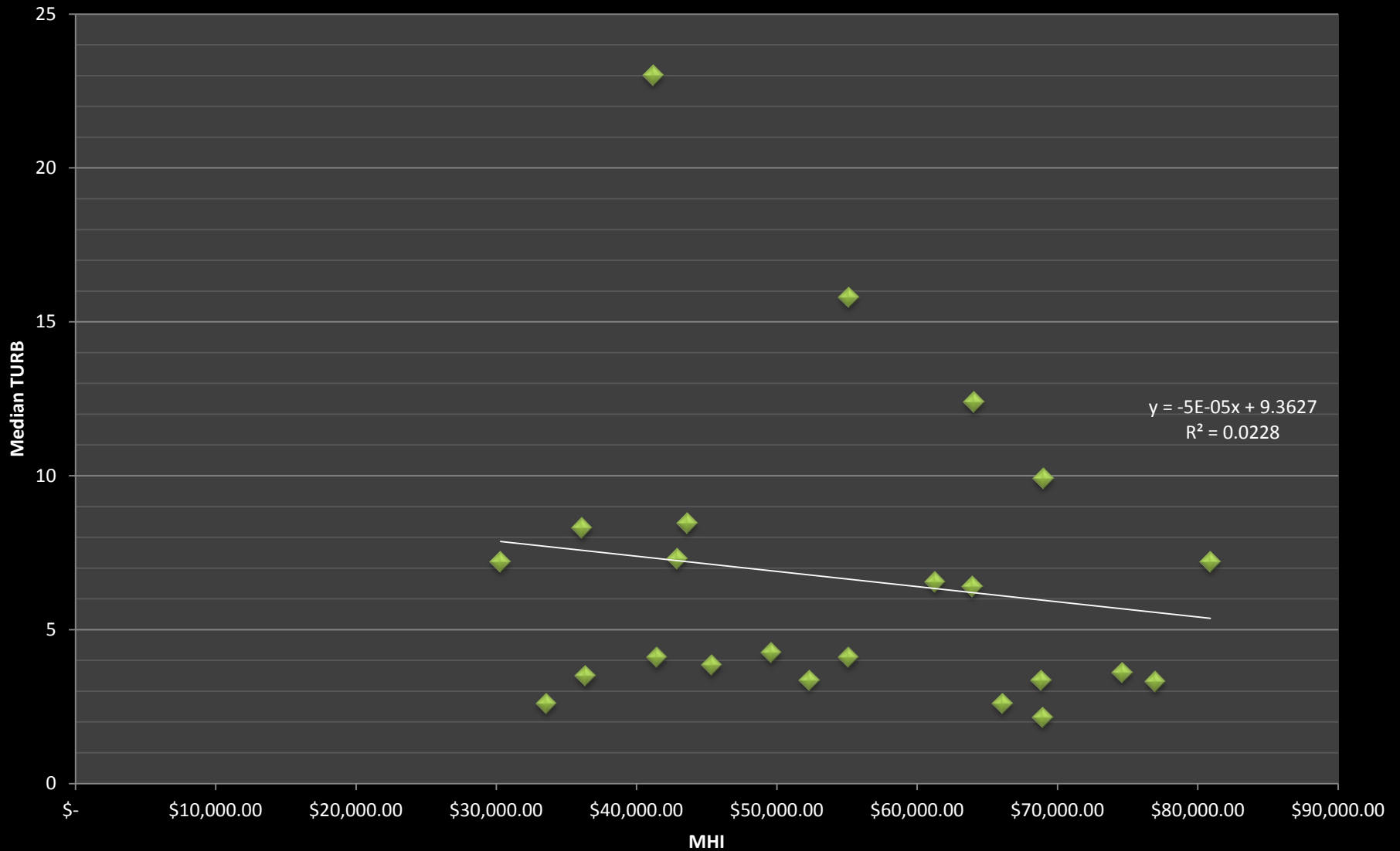
No Significant Correlation Between Water Quality and Median Income

Median N Level Vs median household income (2004)



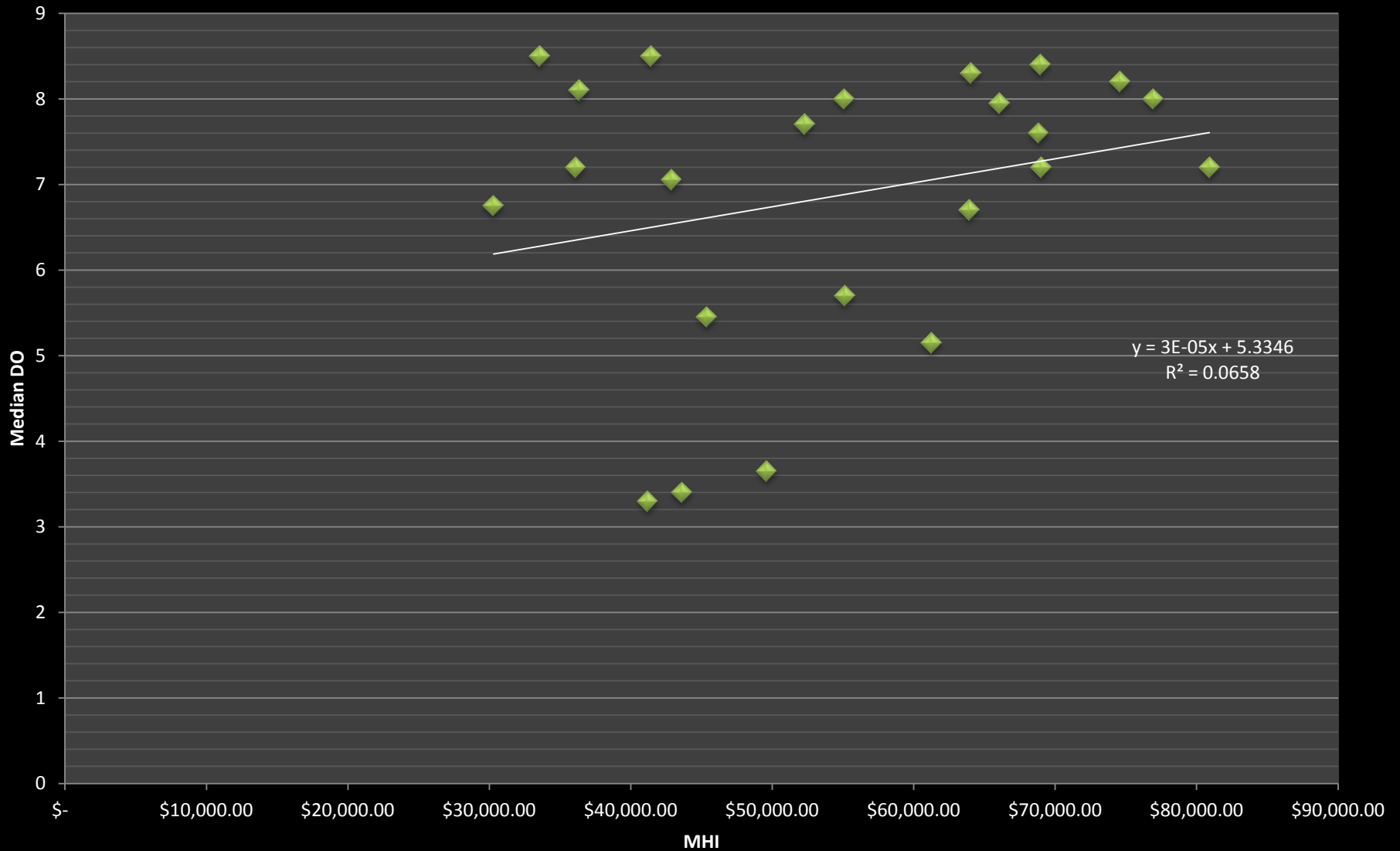
No Significant Correlation Between Water Quality and Median Income

Median TURB level Vs median household income (2004)



No Significant Correlation Between Water Quality and Median Income

Median DO Level Vs median household income (2004)



What We Learned

- Scaling down (your research questions) can be just as important as scaling up
- Know your data's limitations!
- Knowing how to do it in ArcMap \neq knowing how to do it in QGIS



Moving forward with this research

Assess causation: are the wealthy exporting pollution?

Obtain finer grain data (city, voting block) and analyze point sources of pollution

Compare state policies in the Chesapeake Bay and present plan to policymakers



Questions?

