Modeling Emerging Pollutant Concentrations from Human Population Density

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Introduction

- Pharmaceuticals and personal care products (PPCPs) are a broad class of compounds including antibiotics, stimulants, prescription medications, over-the-counter drugs, sanitization products, and insect repellents
- The pollution of PPCPs in natural waterways is a growing concern
- Through a meta-analysis of studies from across the US, this research project attempts to utilize preexisting data sets of PPCP concentration in conjunction with US census data to observe possible patterns between the two
- The objective of this study is to test the hypothesis: Human population size alone can be used to predict the concentration of PPCPs

Methods

| Paper collection | Input location data from collected papers to ArcGIS |
| Population data collection from GIS locations and census data | Join population and PPCP concentration data |

Classes | Examples
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Antibiotic | Sulfamethoxazole, Tylosin
Stimulant | Caffeine, Cotinine,
Prescription Drug | Acetaminophen, Trimethoprim
Organic Wastewater Contaminant | Fluoranthene, Triclosan
Steroids and Hormones | Cholesterol, Coprostanol, Estriol

Results

Correlations between PPCP classes and population size

- No significant relationships
- Steroid and hormone (p = 0.0658) Fig.1
- Organic wastewater contaminants (p = 0.291) Fig.2
- Prescription drugs (p = 0.157) Fig.3
- Stimulant (p = 0.539) Fig.4
- Antibiotics (p = 0.208) Fig.5

Preliminary Conclusion

- No significant relationships were found between any class of PPCP and its corresponding populations
- Human population size alone may not be enough to predict the concentration of PPCPs in the environment
- Additional factors (stream order, seasonality, alternative pollutant sources) may play a larger role in the concentration of PPCPs

Further Analyses

- A wider range of papers may be used to provide a more comprehensive data set
- Alternative methods for calculating the population data may be explored

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