Introduction

Seasonal fluctuations of pharmaceuticals observed in the literature is suspected to be driven by consumption habits. But the limited access to drug consumption at fine scale has so far not allowed to confirm this. This study highlights existing correlation between measured concentration of antibiotics and sales data at month scale.

The study was conducted in Lausanne (Switzerland) for antibiotics azithromycin, ciprofloxacin, clarithromycin, clindamycin, metronidazole, norfloxacin, ofloxacin, sulfamethoxazole, trimethoprim.

Seasonal cycle in total sales

Fig 1: monthly sales fluctuations of clarithromycin relative to annual sales, ambulatory and hospital

Fig 2: average relative monthly contribution of hospitals in clarithromycin respect to total sales

Seasonal cycle at WWTP discharge

Fig 3: monthly fluctuation of WWTP volumes discharged relative to mean annual discharge

In winter, when consumption of antibiotics is the highest, volumes at WWTP are most important

Dilution effects increased

Mitigation of seasonal concentration cycle

Modeled vs Measured seasonal fluctuations

Predicted Environmental Concentration

\[ PEC = \frac{A F_{\text{excreta}}}{V} \]

A : consumption
V: volume treated at WWTP
\( F_{\text{excreta}} \): excretion rate

Fig 4: Modeled vs Measured concentration at WWTP inlet for antibiotic clarithromycin

Discussion

- Seasonal fluctuations in antibiotics ambulatory sales but not in hospital prescriptions
- Contribution of hospitals to total load range from 5% to 35% for antibiotics studied
- Contribution of hospitals to total load highly variable with time
- Seasonal cycles in concentrations observed at WWTP softened by seasonal flow discharged